Department of Design and Construction

PROJECT ID: **S136-367**

THE CITY OF NEW YORK
DEPARTMENT OF DESIGN AND CONSTRUCTION
DIVISION OF PUBLIC BUILDINGS

30-30 THOMSON AVENUE
LONG ISLAND CITY, NEW YORK 11101-3045
TELEPHONE (718) 391-1000
WEBSITE www.nyc.gov/buildnyc

VOLUME 1 OF 3

BID BOOKLET

FOR FURNISHING ALL LABOR AND MATERIALS
NECESSARY AND REQUIRED FOR:

Staten Island 1 & 3 Garage - Phase 2

LOCATION: **1000 West Service Road**
BOROUGH: **Staten Island, NY 10314**
CITY OF NEW YORK

CONTRACT NO. 1 **GENERAL CONSTRUCTION WORK**

DSNY

TEN Arquitectos

Date: **November 20, 2019**

20-026

Department of Design and Construction

Lorraine Grillo
Commissioner

Jamie Torres-Springer
First Deputy Commissioner

Rachel Laiserin
Chief Financial Officer
Finance and Procurement

December 29, 2020

CERTIFIED MAIL - RETURN RECEIPT REQUEST
PRISMATIC DEVELOPMENT CORP.
60 US HIGHWAY 46
FAIRFIELD, NJ 07004

RE: FMS ID: S136-367
E-PIN: 85020B0038001
DDC PIN: 8502020TR0001C
STATEN ISLAND 1 & 3 GARAGE - PHASE 2-
STATEN ISLAND
NOTICE OF AWARD

Dear Contractor:

You are hereby awarded the above referenced contract based upon your bid in the amount of $127,888,567.00 submitted at the bid opening on February 21, 2020. Within ten (10) days of your receipt of this notice of award, you are required to take the actions set forth in Paragraphs (1) through (3) below. For your convenience, attached please find a copy of Schedule A of the General Conditions to the Contract, which sets forth the types and amounts of insurance coverage required for this contract.

(1) Execute two copies of the Agreement. Attached are the Signature Agreement pages which must be completed and returned to the agency. The Agreement must be signed by an officer of the corporation or a partner of the firm.

(2) Submit to the Contracts Unit two properly executed performance and payment bonds. If required for this contract, copies of performance and payment bonds are attached.

(3) Submit to the Contracts Unit the following insurance documentation: (a) original certificate of insurance for general liability in the amount required by Schedule A, and (b) original certificates of insurance or other proof of coverage for workers' compensation and disability benefits, as required by New York State Law. The insurance documentation specified in this paragraph is required for registration of the contract with the Comptroller's Office.

Department of Design and Construction

On or before the contract commencement date, you are required to submit all other certificates of insurance and/or policies in the types and amounts required by Schedule A. Such certificates of Insurance and/or policies must be submitted to the Agency Chief Contracting Office, Attention: Risk Manager, Fourth Floor at the above indicated department address.

Your attention is directed to the section of the Information for Bidders entitled "Failure to Execute Contract". As indicated in this section, in the event you fail to execute the contract and furnish the required bonds within the (10) days of your receipt of this notice of award, your bid security will be retained by the City and you will be liable for the difference between your bid price and the price for which the contract is subsequently awarded, less the amount of the bid security retained.

As of August 16, 2019, please be advised that Contract Site Safety Plans for DDC projects must be submitted through DDC's online Site Safety Plan (SSP) application (available via our Agency Portal – *DDC Anywhere*).

To create an account and begin your Site Safety Pan submission using SSP, click on the link below:

DDC Portal **https://ddcanywhere.nyc/Registration/Registration**

For questions regarding this web-based application, please contact DDC via email at: appsupport@ddc.nyc.gov.

Sincerely,

Lorraine Holley

Lorraine Holley
Deputy ACCO

NOTICE TO BIDDERS:

- **PROJECT LABOR AGREEMENT:** This contract is subject to a Project Labor Agreement ("PLA") entered into between the City and the Building and Construction Trades Council of Greater New York ("BCTC") affiliated Local Unions. By submitting a bid, the Contractor agrees that the PLA is binding on the Contractor and all subcontractors of all tiers. The bidder to be awarded the contract will be required to execute a "Letter of Assent" prior to award.

  The Bidder is advised to review the following: (1) Notice regarding the PLA, (2) the PLA, and (3) the Letter of Assent, all of which are set forth at the beginning of Volume 2 of the Contract Documents.

- **SINGLE CONTRACT:** As stated above, this contract is subject to a PLA. The requirements of the Wicks Law for separate prime contractors DO NOT APPLY to any project that is covered by a PLA. Accordingly, the requirements of the Wicks Law for separate prime contractors do not apply to this Project. The Project consists of a single contract, the Contract for General Construction Work.

  The Bidder is advised to review the Notice set forth at the beginning of Volume 2 of the Contract Documents. The Notice specifies revisions to the Contract Documents to provide that the Project consists of a single contract and to delete any and all references to separate prime contractors.

NYC Bond Collateral Assistance Fund

If your business is bidding or planning to bid on a project as a prime or subcontractor with a City agency or the NYC Economic Development Corporation (NYCEDC) and the project requires surety bonding, you may be eligible* to receive up to $500,000 in Collateral Assistance to enhance your surety bond application from a participating bond service provider coordinated with the NYC Department of Small Business Services (SBS).

*To be eligible, you must:
- Have an operating construction business, AND
- Be bidding or planning to bid as a prime or subcontractor on a contract with a City agency or NYCEDC that requires bonding
- Additional Eligiblity requirements may apply.

How it works:
Step 1:Fill out the Bond Collateral Assistance Fund inquiry form at nyc.gov/bondfund
Step 2:If Eligible, the bond service provider will contact you within two business days
Step 3:Begin the bond application process

For more information: Call 311 or visit nyc.gov/bondfund

(NO FURTHER TEXT ON THIS PAGE)

PROJECT ID: S136-367

CITY OF NEW YORK
DEPARTMENT OF DESIGN AND CONSTRUCTION
DIVISION OF PUBLIC BUILDINGS

BID BOOKLET

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BID BOOKLET
PART A

CITY OF NEW YORK
DEPARTMENT OF DESIGN AND CONSTRUCTION
DIVISION OF PUBLIC BUILDINGS

SPECIAL NOTICE TO BIDDERS

BID SUBMISSION REQUIREMENTS

THE BID SHALL CONSIST OF TWO (2) SEPARATE, SEALED ENVELOPES. THE DOCUMENTS THAT MUST BE COMPLETED AND INCLUDED IN EACH SEPARATE ENVELOPE ARE LISTED BELOW.

BID ENVELOPE #1: Bid Envelope #1 shall contain the following items:

- Bid Form, including Affirmation
- Bid Security (if required, see page 22)
- Schedule B: M/WBE Utilization Plan (if participation goals have been established)

BID ENVELOPE #2: Bid Envelope #2 shall contain **ONLY** the following item:

- Bidder's Identification of Subcontractors (see pages 16 & 17)

FAILURE TO SUBMIT THE FOUR ITEMS LISTED ABOVE WILL RESULT IN THE DISQUALIFICATION OF THE BID

BID ENVELOPE #1: In addition to the items listed above, Bid Envelope #1 shall also contain the following items: DO NOT Include the items listed below in Bid Envelope #2.

- Bid Breakdown (if required, see page 21)
- Safety Questionnaire
- Construction Employment Report (if bid is $1,000,000 or more)
- Bidder's Certification of Compliance with Iran Divestment Act
- Special Experience Requirements Qualification Form (if required, see pages 3, 4)
- Any Addenda issued prior to the receipt of bids

FAILURE TO SUBMIT THE EIGHT ITEMS LISTED ABOVE MAY RESULT IN THE DISQUALIFICATION OF THE BID.

NOTES:

(1) All of the above referred to blank forms to be completed and submitted with the bid are included in the BID BOOKLET.

(2) If the bidder has any questions or requires additional information, please contact the Agency Contact Person noted on Attachment 1 of this Bid Booklet.

(3) PASSPort Compliance: The Bidder is advised that Vendex Questionnaires and procedures have been replaced by the PASSPort system. Compliance with PASSPort is mandatory for contract award. PASSPort details are set forth in Part B of this Bid Booklet.

(4) SPECIAL EXPERIENCE REQUIREMENTS: The Bidder is advised that Special Experience Requirements may apply to this contract. Such requirements are set forth on pages 3 and 4 of this Bid Booklet.

(5) SPECIAL EXPERIENCE REQUIREMENTS FOR ASBESTOS: The Bidder is advised that this contract contains strict requirements regarding the prior experience and licensing of the subcontractor who will perform any required asbestos abatement work. These special experience requirements are set forth in the section of the specifications which describes any required asbestos abatement work.

Special Notice to Bidders – Proprietary Items

A. General: A proprietary item required for the Project is specified below. The contractor is required to provide and install such proprietary item. The Contractor must provide the specified item from the designated manufacturer. Substitutions are not permissible and will not be approved. More detailed information regarding the item is set forth in the Specifications. Such information includes item description, as well as requirements for installation and related materials.

B. Payment: For the required proprietary item, an allowance amount is indicated. The allowance provides a stipulated amount to reimburse the Contractor for the purchase of the proprietary item from the designated manufacturer. Payment from the allowance shall be limited to the purchase price of the specified proprietary item and shall exclude any costs above and beyond the purchase price. Payment from the allowance shall not include any of the following costs with respect to the specified proprietary item: (1) any mark-up for the Contractor's overhead and profit, (2) any costs for transportation, including delivery, shipping or special handling costs, (3) any costs for installation, and (4) any costs for related materials. Payment for the specified proprietary item shall be based on the invoice actually provided by the manufacturer.

C. Bid Form: A total allowance amount for the purchase of all required proprietary items is set forth on the Bid Form. In preparing the lump sum portion of its bid, the Contractor shall:

(1) Exclude from its bid any costs for the purchase of the proprietary items, and

(2) Include in its bid any costs above and beyond the purchase price, including without limitation, costs for transportation, delivery, installation, related materials and overhead.

D. Required Proprietary Item(s):

CONTRACT NO. 1:

1. Proprietary Item: *Roofing (Existing Building)*
   Specification Section: *075216*
   Manufacturer: *Siplast*
   Allowance Amount: *Not to Exceed $9,567*

SPECIAL EXPERIENCE REQUIREMENTS

Special Experience Requirements apply as indicated below.

Bidder(s):	**General Construction Work**	**___X___ YES**	**_____ NO**
Specific Areas of Work:	**General Construction Work**	**___X___ YES**	**_____ NO**
	HVAC Work	**___X___ YES**	**_____ NO**
	Electrical Work	**___X___ YES**	**_____ NO**
Manufacturer:	**HVAC Work**	**___X___ YES**	**_____ NO**
	Electrical Work	**___X___ YES**	**_____ NO**

(A) **SPECIAL EXPERIENCE REQUIREMENTS FOR THE BIDDER IF APPLICABLE:** The special experience requirements set forth below apply to the bidder only if indicated above. Compliance with such special experience requirements will be determined solely by the City prior to an award of contract. Failure to comply with the special experience requirements will result in the rejection of the bid as non-responsive.

- The bidder must, within the last five (5) consecutive years prior to the bid opening, have successfully completed in a timely fashion at least three (3) projects similar in scope and type to the required work.

(B) **QUALIFICATION FORM**: For each project submitted to demonstrate compliance with the special experience requirements, the bidder(s) indicated above must complete the Qualification Form included in the Bid Booklet. The City will only evaluate a project if the following criteria are met: (1) the project is described on the Qualification Form, and (2) all information on the Qualification Form is provided. The City will not evaluate any project which does not comply with the criteria set forth herein, including any project which is referred to only on the resume of an individual.

(C) **CONDITIONS**: The City may, in determining compliance with the special experience requirements set forth above, consider prior projects completed by principal(s) or other employees of the bidder while affiliated with another entity, subject to the conditions set forth below.

- Any principal or other employee on whose prior experience the bidder is relying to demonstrate compliance with this special experience requirement must have held the following: (a) a significant management role in the prior entity with which he/she was affiliated, and (b) a significant management role in the entity submitting the bid for a period of six months or from the inception of the bidding entity. If the bidder is relying on the prior experience of a principal or employee, it must submit documentation confirming the position held by such principal or employee in the prior entity, as well as in the bidding entity.

- The bidder may not rely on the experience of its principals or other employees to demonstrate compliance with any other requirements, including without limitation, financial requirements or requirements for a specified minimum amount of annual gross revenues.

(D) **JOINT VENTURES**: In the event the bidder is a joint venture, at least one firm in the joint venture must meet the above described experience requirements.

(E) **SPECIAL EXPERIENCE REQUIREMENTS FOR SPECIFIC AREAS OF WORK**: The special experience requirements set forth below apply to the contractor or subcontractor that will perform specific areas of work. Compliance with such experience requirements will be evaluated after an award of contract. Within two (2) weeks of such award, the contractor will be required to submit the qualifications of the contractor or subcontractor that will perform these specific areas of work. If the bidder intends to perform these specific areas of work with its own forces, it must demonstrate compliance with the special experience requirements. If the bidder intends to subcontract these specific areas of work, its proposed subcontractor(s) must demonstrate compliance with the special experience requirements. Once approved, no substitution will be permitted, unless the qualifications of the proposed replacement have been approved in writing in advance by the City. The bidder is advised to carefully review these special experience requirements prior to submitting its bid, as such experience requirements will be strictly enforced.

(1) Special experience requirements apply to the contractor or subcontractor that will perform specific areas of work specified in the section(s) set forth below.

General Construction Work

- Section 034500: Architectural Pre-Cast Concrete
- Section 072000: Thermoplastic Membrane Roofing
- Section 075216: Modified Bituminous Membrane Roofing

HVAC Work

- Section 235600: Solar Hot Water System

Electrical Work

- Section 481400: Solar Energy Electrical Power Generation System

(2) Special experience requirements applicable to the contractor or subcontractor who will perform specific areas of work are summarized below.

- For Section 034500, the contractor or subcontractor performing the work of this section must, within the last five (5) consecutive years prior to the bid opening, have successfully completed in a timely fashion at least three (3) projects similar in scope, size and type to the required work. In addition, for the contractor or subcontractor performing the work must be licensed or approved by the manufacturer.

- For Sections 235600 and 481400, the contractor or subcontractor performing the work of this section must, within the last five (5) consecutive years prior to the bid opening, have successfully completed in a timely fashion at least three (3) projects similar in scope, size and type to the required work. In addition, for section 481400, the contractor or subcontractor performing the work must be approved by the New York State Energy Research and Development Authority (NYSERDA).

- For Section 072000, the contractor or subcontractor performing the work of this section must be a company regularly engaged in performing roofing projects with its own workforce and have successfully completed in a timely fashion at least three (3) roofing projects similar in scope, size and type to the required work within the last three (3) consecutive years prior to the bid opening. At least one of those projects must have been performed within the last twelve (12) months. The three (3) qualifying projects must have utilized one or more of the roofing systems specified for the project being bid herein, been installed by the contractor's or subcontractor's company utilizing its own workforce and must have qualified for, and have been issued, the warranty provided by the manufacturer of the roofing system. In addition, the contractor or subcontractor must be a certified or authorized installer for at least one of the manufacturer's roofing systems specified herein and shall submit proof of same.

- For Section 075216, the contractor or subcontractor performing the work of this section must be a company regularly engaged in performing roofing projects with its own workforce and have successfully completed in a timely fashion at least three (3) roofing projects similar in scope, size and type to the required work within the last three (3) consecutive years prior to the bid opening. At least one of those projects must have been performed within the last twelve (12) months. The three (3) qualifying projects must have utilized the Siplast Paradiene roof system specified for the project being bid herein, been installed by the contractor's or subcontractor's company utilizing its own workforce and must have qualified for, and have been issued, the warranty provided by the Siplast. In addition, the contractor or subcontractor must be a certified or authorized installer for the Siplast Paradiene roof system specified herein and shall submit proof of same.

(3) For each project submitted to demonstrate compliance with the special experience requirements for specific

areas of work, the contractor or proposed subcontractor will be required to complete the Qualification Form included in the Bid Booklet.

a. The City will only evaluate a project if the following criteria are met: (1) the project is described on the Qualification Form, and (2) all information on the Qualification Form is provided. The City will not evaluate any project which does not comply with the criteria set forth herein, including any project which is referred to only on the resume of an individual.

b. For Sections 072000 and 075216, the contractor or subcontractor must specify, for each qualifying project submitted, the type of roofing system utilized and provide proof that the manufacturer's warranty for that project was issued. The City will only evaluate a project if the following criteria are met: (1) the project is described on the Qualification Form, and (2) all information required to be provided by the contractor or subcontractor on the Qualification Form is actually provided. The City will not evaluate any project which does not comply with the criteria set forth herein, including any project which is referred to only on the resume of an individual.

(F) **SPECIAL EXPERIENCE REQUIREMENTS FOR MANUFACTURER(S)**: The special experience requirements set forth below apply to the manufacturer(s) that will supply or fabricate specific material or equipment. Compliance with such experience requirements will be evaluated after an award of contract. Within two (2) weeks of award, the contractor will be required to submit the qualifications of the proposed manufacturer(s). Once approved, no substitution will be permitted, unless the qualifications of the proposed replacement have been approved in writing in advance by the City.

(1) Special experience requirements apply to the manufacturer(s) of material and/or equipment specified in the section(s) set forth below.

General Construction Work

- Section 034500: Architectural Pre-Cast Concrete
- Section 072000: Thermoplastic Membrane Roofing

HVAC Work

- Section 235600: Solar Hot Water System

Electrical Work

- Section 481400: Solar Energy Electrical Power Generation System

(2) Special experience requirements applicable to the manufacturer(s) of specified material or equipment are summarized below.

- The manufacturer providing the material or equipment specified in this section must, for the past five (5) years, have been regularly engaged in the manufacture of material or equipment similar in type to that required for this Project. Such similar material or equipment provided by the manufacturer must have been in satisfactory service for not less than five (5) years.

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Qualification Form

Project ID: S136-367

List previous projects completed to meet the special experience requirements for this contract. Please photocopy this form for submission of all required projects.

Name of Contractor: Prismatic Development Corporation

Name of Project: Southwest Brooklyn Marine Transfer Station

Location of Project: Brooklyn, New York

Owner or Owner's representative (Architect or Engineer) who is familiar with the work performed:

Name: Glenn Brue, NYC DDC

Title: Program Director Phone Number: 718-391-2648

Brief description of work completed: Construction of a new 100,000 square foot concrete and steel structure. The Marine Transfer Station is a fully enclosed three level facility built next to the water designed for the indoor transfer of solid waste from collection vehicles to sealed containers that will be loaded onto barges for disposal at a landfill.

Was the work performed as a prime or a subcontractor: Prime

Amount of Contract: $140,000,000.

Date of Completion: May 2018

****

Name of Contractor: Prismatic Development Corporation

Name of Project: Major Building Renovations for the Manhattan Psychiatric Center

Location of Project: Wards Island, New York City, New York

Owner or Owner's representative (Architect or Engineer) who is familiar with the work performed:

Name: John McCullough, TDX

Title: Program Manager Phone Number: 212-655-8483

Brief description of work completed: This project consists of the full interior renovations of previously demolished spaces, construction of a new 16 story elevator tower, elevators, new steel frame stair tower with masonry exterior, architectural demolition, asbestos abatement, sitework, site utilities, structural work, HVAC, BMS, electric, plumbing, fire protection, telecom, fire alarm and security.

Was the work performed as a prime or a subcontractor: Prime

Amount of Contract: $167,000,000.

Date of Completion: March 2020

Qualification Form

Project ID: S136-367

List previous projects completed to meet the special experience requirements for this contract. Please photocopy this form for submission of all required projects.

Name of Contractor: Prismatic Development Corporation

Name of Project: New York State Insurance Fund Comprehensive Building Renovations

Location of Project: New York City, New York

Owner or Owner's representative (Architect or Engineer) who is familiar with the work performed:

Name: John Murdaugh

Title: Building Manager Phone Number: 347-723-1800

Brief description of work completed: Comprehensive renovation of the existing 350,000 SF office building. The building consists of 20 stories which includes two stories below grade, 14 stories of open office areas, one floor with an auditorium and training rooms, and a three story building systems penthouse. The work consist of the demolition and replacement of all architectural components and MEP systems.

Was the work performed as a prime or a subcontractor: Prime

Amount of Contract: $93,000,000.

Date of Completion: March 2020

****

Name of Contractor:

Name of Project:

Location of Project:

Owner or Owner's representative (Architect or Engineer) who is familiar with the work performed:

Name:

Title: Phone Number:

Brief description of work completed:

Was the work performed as a prime or a subcontractor:

Amount of Contract:

Date of Completion:

Qualification Form

Project ID: S136-367

List previous projects completed to meet the special experience requirements for this contract. Please photocopy this form for submission of all required projects.

Name of Contractor: _____

Name of Project: _____

Location of Project: _____

Owner or Owner's representative (Architect or Engineer) who is familiar with the work performed:

Name: _____

Title: _____ Phone Number: _____

Brief description of work completed: _____

_____

_____

Was the work performed as a prime or a subcontractor: _____

Amount of Contract: _____

Date of Completion: _____

****

Name of Contractor: _____

Name of Project: _____

Location of Project: _____

Owner or Owner's representative (Architect or Engineer) who is familiar with the work performed:

Name: _____

Title: _____ Phone Number: _____

Brief description of work completed: _____

_____

_____

Was the work performed as a prime or a subcontractor: _____

Amount of Contract: _____

Date of Completion: _____

MWBE PROGRAM

M/WBE UTILIZATION PLAN

M/WBE Program Requirements: The requirements for the M/WBE Program are set forth on the following pages of this Bid Booklet, in the section entitled "Notice to All Prospective Contractors".

Schedule B: M/WBE Utilization Plan: Schedule B: M/WBE Utilization Plan for this Contract is set forth in this Bid Booklet on the pages following the section entitled "Notice to All Prospective Contractors". The M/WBE Utilization Plan (Part I) indicates whether Participation Goals have been established for this Contract. If Participation Goals have been established for this Contract, the bidder must submit an M/WBE Utilization Plan (Part II) with its bid.

Waiver: The bidder may seek a full or partial pre-award waiver of the Participation Goals in accordance with the "Notice to All Prospective Contractors" (See Part A, Section 10). The bidder's request for a waiver must be submitted at least seven (7) calendar days prior to the bid date. Waiver requests submitted after the deadline will not be considered. The form for requesting a waiver of the Participation Goals is set forth in the M/WBE Utilization Plan (Part III).

Rejection of the Bid: The bidder must complete Schedule B: M/WBE Utilization Plan (Part II) set forth in this Bid Booklet on the pages following the section entitled "Notice to All Prospective Contractors". A Schedule B submitted by the bidder which does not include the Vendor Certification and Required Affirmations (See Section V of Part II) will be deemed to be non-responsive, unless a full waiver of the Participation Goals is granted (Schedule B, Part III). In the event that the City determines that the bidder has submitted a Schedule B where the Vendor Certification and Required Affirmations are completed but other aspects of the Schedule B are not complete, or contain a copy or computation error that is at odds with the Vendor Certification and Required Affirmations, the bidder will be notified by the Agency and will be given four (4) calendar days from receipt of notification to cure the specified deficiencies and return a completed Schedule B to the Agency. Failure to do so will result in a determination that the Bid is non-responsive.

Receipt of notification is defined as the date notice is emailed or faxed (if the bidder has provided an email address or fax number), or no later than five (5) days from the date of mailing or upon delivery, if delivered.

Impact on LBE Requirements: If Participation Goals have been established for the participation of M/WBEs, the contractor is not required to comply with the Locally Based Enterprise Program ("LBE"). The LBE Program is set forth in Article 67 of the Contract.

NOTICE TO ALL PROSPECTIVE CONTRACTORS

PARTICIPATION BY MINORITY-OWNED AND WOMEN-OWNED BUSINESS ENTERPRISES IN CITY PROCUREMENT

ARTICLE I. M/WBE PROGRAM

Local Law No. 129 of 2005 added and Local Law 1 of 2013 amended Section 6-129 of the Administrative Code of the City of New York (hereinafter "Section 6-129"). Section 6-129 establishes the program for participation in City procurement ("M/WBE Program") by minority- owned business enterprises ("MBEs") and women-owned business enterprises ("WBEs"), certified in accordance with Section 1304 of the New York City Charter. As stated in Section 6¬-129, the intent of the program is to address the impact of discrimination on the City's procurement process, and to promote the public interest in avoiding fraud and favoritism in the procurement process, increasing competition for City business, and lowering contract costs. The contract provisions contained herein are pursuant to Section 6-129, and the rules of the Department of Small Business Services ("DSBS") promulgated thereunder.

If this Contract is subject to the M/WBE Program established by Section 6-129, the specific requirements of MBE and/or WBE participation for this Contract are set forth in Schedule B of the Contract (entitled the "M/WBE Utilization Plan"), and are detailed below. The Contractor must comply with all applicable MBE and WBE requirements for this Contract.

All provisions of Section 6-129 are hereby incorporated in the Contract by reference and all terms used herein that are not defined herein shall have the meanings given such terms in Section 6-129. Article I, Part A, below, sets forth provisions related to the participation goals for construction, standard and professional services contracts. Article I, Part B, below, sets forth miscellaneous provisions related to the M/WBE Program.

PART A

PARTICIPATION GOALS FOR CONSTRUCTION, STANDARD AND PROFESSIONAL SERVICES CONTRACTS OR TASK ORDERS

1. The **MBE and/or WBE Participation Goals** established for this Contract or Task Orders issued pursuant to this Contract, ("Participation Goals"), as applicable, are set forth on Schedule B, Part I to this Contract (see Page 1, line 1 Total Participation Goals) or will be set forth on Schedule B, Part I to Task Orders issued pursuant to this Contract, as applicable.

The **Participation Goals** represent a percentage of the total dollar value of the Contract or Task Order, as applicable, that may be achieved by awarding subcontracts to firms certified with New York City Department of Small Business Services as MBEs and/or WBEs, and/or by crediting the participation of prime contractors and/or qualified joint ventures as provided in Section 3 below, unless the goals have been waived or modified by Agency in accordance with Section 6¬-129 and Part A, Sections 10 and 11 below, respectively.

2. If **Participation Goals** have been established for this Contract or Task Orders issued pursuant to this Contract, Contractor agrees or shall agree as a material term of the Contract that Contractor shall be subject to the **Participation Goals,** unless the goals are waived or modified by Agency in accordance with Section 6-129 and Part A, Sections 10 and 11 below, respectively.

3. If **Participation Goals** have been established for this Contract or Task Order issued pursuant to this Contract, a Contractor that is an MBE and/or WBE shall be permitted to count its own participation toward fulfillment of the relevant **Participation Goal**, provided that in accordance with Section 6-129 the value of Contractor's participation shall be determined by subtracting from the total value of the Contract or Task Order, as applicable, any amounts that the Contractor pays to direct subcontractors (as defined in Section 6-129(c)(13)), and provided further that a Contractor that is certified as both an MBE and a WBE may count its own participation either toward the goal for MBEs or the goal for WBEs, but not both.

A Contractor that is a qualified joint venture (as defined in Section 6-129(c)(30)) shall be permitted to count a percentage of its own participation toward fulfillment of the relevant **Participation Goal**. In accordance with Section 6-129, the value of Contractor's participation shall be determined by subtracting from the total value of the Contract or Task Order, as applicable, any amounts that Contractor pays to direct subcontractors, and then multiplying the remainder by the percentage to be applied to total profit to

determine the amount to which an MBE or WBE is entitled pursuant to the joint venture agreement, provided that where a participant in a joint venture is certified as both an MBE and a WBE, such amount shall be counted either toward the goal for MBEs or the goal for WBEs, but not both.

4. A. If **Participation Goals** have been established for this Contract, a prospective contractor shall be required to submit with its bid or proposal, as applicable, a completed Schedule B, M/WBE Utilization Plan, Part II (see Pages 2-4) indicating: (a) whether the contractor is an MBE or WBE, or qualified joint venture; (b) the percentage of work it intends to award to direct subcontractors; and (c) in cases where the contractor intends to award direct subcontracts, a description of the type and dollar value of work designated for participation by MBEs and/or WBEs, and the time frames in which such work is scheduled to begin and end. In the event that this M/WBE Utilization Plan indicates that the bidder or proposer, as applicable, does not intend to meet the **Participation Goals**, the bid or proposal, as applicable, shall be deemed non-responsive, unless Agency has granted the bidder or proposer, as applicable, a pre- award waiver of the Participation Goals in accordance with Section 6-129 and Part A, Section 10 below.

B. (i) If this Contract is for a master services agreement or other requirements type contract that will result in the issuance of Task Orders that will be individually registered ("Master Services Agreement") and is subject to M/WBE **Participation Goals**, a prospective contractor shall be required to submit with its bid or proposal, as applicable, a completed Schedule B, M/WBE Participation Requirements for Master Services Agreements That Will Require Individually Registered Task Orders, Part II (page 2) indicating the prospective contractor's certification and required affirmations to make all reasonable good faith efforts to meet participation goals established on each individual Task Order issued pursuant to this Contract, or if a partial waiver is obtained or such goals are modified by the Agency, to meet the modified **Participation Goals** by soliciting and obtaining the participation of certified MBE and/or WBE firms. In the event that the Schedule B indicates that the bidder or proposer, as applicable, does not intend to meet the **Participation Goals** that may be established on Task Orders issued pursuant to this Contract, the bid or proposal, as applicable, shall be deemed non-responsive.

(ii) **Participation Goals** on a Master Services Agreement will be established for individual Task Orders issued after the Master Services Agreement is awarded. If **Participation Goals** have been established on a Task Order, a contractor shall be required to submit a Schedule B – M/WBE Utilization Plan For Independently Registered Task Orders That Are Issued Pursuant to Master Services Agreements, Part II (see Pages 2-4) indicating: (a) whether the contractor is an MBE or WBE, or qualified joint venture; (b) the percentage of work it intends to award to direct subcontractors; and (c) in cases where the contractor intends to award direct subcontracts, a description of the type and dollar value of work designated for participation by MBEs and/or WBEs, and the time frames in which such work is scheduled to begin and end. The contractor must engage in good faith efforts to meet the **Participation Goals** as established for the Task Order unless Agency has granted the contractor a pre-award waiver of the Participation Goals in accordance with Section 6-129 and Part A, Section 10 below.

C. THE BIDDER/PROPOSER MUST COMPLETE THE SCHEDULE B INCLUDED HEREIN (SCHEDULE B, PART II). A SCHEDULE B SUBMITTED BY THE BIDDER/PROPOSER WHICH DOES NOT INCLUDE THE VENDOR CERTIFICATION AND REQUIRED AFFIRMATIONS (SEE SECTION V OF PART II) WILL BE DEEMED TO BE NON-RESPONSIVE, UNLESS A FULL WAIVER OF THE PARTICIPATION GOALS IS GRANTED (SCHEDULE B, PART III). IN THE EVENT THAT THE CITY DETERMINES THAT THE BIDDER/PROPOSER HAS SUBMITTED A SCHEDULE B WHERE THE VENDOR CERTIFICATION AND REQUIRED AFFIRMATIONS ARE COMPLETED BUT OTHER ASPECTS OF THE SCHEDULE B ARE NOT COMPLETE, OR CONTAIN A COPY OR COMPUTATION ERROR THAT IS AT ODDS WITH THE VENDOR CERTIFICATION AND AFFIRMATIONS, THE BIDDER/PROPOSER WILL BE NOTIFIED BY THE AGENCY AND WILL BE GIVEN FOUR (4) CALENDAR DAYS FROM RECEIPT OF NOTIFICATION TO CURE THE SPECIFIED DEFICIENCIES AND RETURN A COMPLETED SCHEDULE B TO THE AGENCY. FAILURE TO DO SO WILL RESULT IN A DETERMINATION THAT THE BID/PROPOSAL IS NON-RESPONSIVE. RECEIPT OF NOTIFICATION IS DEFINED AS THE DATE NOTICE IS E-MAILED OR FAXED (IF THE BIDDER/PROPOSER HAS PROVIDED AN E-MAIL ADDRESS OR FAX NUMBER), OR NO LATER THAN FIVE (5) CALENDAR DAYS FROM THE DATE OF MAILING OR UPON DELIVERY, IF DELIVERED.

5. Where an **M/WBE** Utilization Plan has been submitted, the Contractor shall, within 30 days of issuance by Agency of a notice to proceed, submit a list of proposed persons or entities to which it intends to award subcontracts within the subsequent 12 months. In the case of multi-year contracts, such list shall also be submitted every year thereafter. The Agency may also require the Contractor to report periodically about the contracts awarded by its direct subcontractors to indirect subcontractors (as defined in Section 6-129(c)(22)). **PLEASE NOTE: If this Contract is a public works project subject to GML §101(5) (i.e., a contract valued at or**

below $3M for projects in New York City) or if the Contract is subject to a project labor agreement in accordance with Labor Law §222, and the bidder is required to identify at the time of bid submission its intended subcontractors for the Wicks trades (plumbing and gas fitting; steam heating, hot water heating, ventilating and air conditioning (HVAC); and electric wiring), the Contractor must identify all those to which it intends to award construction subcontracts for any portion of the Wicks trade work at the time of bid submission, regardless of what point in the life of the contract such subcontracts will occur. In identifying intended subcontractors in the bid submission, bidders may satisfy any Participation Goals established for this Contract by proposing one or more subcontractors that are MBEs and/or WBEs for any portion of the Wicks trade work. In the event that the Contractor's selection of a subcontractor is disapproved, the Contractor shall have a reasonable time to propose alternate subcontractors.

6. MBE and WBE firms must be certified by DSBS in order for the Contractor to credit such firms' participation toward the attainment of the **Participation Goals**. Such certification must occur prior to the firms' commencement of work. A list of MBE and WBE firms may be obtained from the DSBS website at www.nyc.gov/buycertified, by emailing DSBS at buyer@sbs.nyc.gov, by calling (212) 513-6356, or by visiting or writing DSBS at 110 William St., New York, New York, 10038, 7th floor. Eligible firms that have not yet been certified may contact DSBS in order to seek certification by visiting www.nyc.gov/getcertified, emailing MWBE@sbs.nyc.gov, or calling the DSBS certification helpline at (212) 513-6311. A firm that is certified as both an MBE and a WBE may be counted either toward the goal for MBEs or the goal for WBEs, but not both. No credit shall be given for participation by a graduate MBE or graduate WBE, as defined in Section 6-129(c)(20).

7. Where an **M/WBE** Utilization Plan has been submitted, the Contractor shall, with each voucher for payment, and/or periodically as Agency may require, submit statements, certified under penalty of perjury, which shall include, but not be limited to,: the total amount the Contractor paid to its direct subcontractors, and, where applicable pursuant to Section 6-129(j), the total amount direct subcontractors paid to indirect subcontractors; the names, addresses and contact numbers of each MBE or WBE hired as a subcontractor by the Contractor, and, where applicable, hired by any of the Contractor's direct subcontractors; and the dates and amounts paid to each MBE or WBE. The Contractor shall also submit, along with its voucher for final payment: the total amount it paid to subcontractors, and, where applicable pursuant to Section 6¬-129(j), the total amount its direct subcontractors paid directly to their indirect subcontractors; and a final list, certified under penalty of perjury, which shall include the name, address and contact information of each subcontractor that is an MBE or WBE, the work performed by, and the dates and amounts paid to each.

8. If payments made to, or work performed by, MBEs or WBEs are less than the amount specified in the Contractor's **M/WBE** Utilization Plan, Agency shall take appropriate action, in accordance with Section 6-129 and Article II below, unless the Contractor has obtained a modification of its **M/WBE** Utilization Plan in accordance with Section 6-129 and Part A, Section 11 below.

9. Where an **M/WBE** Utilization Plan has been submitted, and the Contractor requests a change order the value of which exceeds the greater of 10 percent of the Contract or Task Order, as applicable, or $500,000, Agency shall review the scope of work for the Contract or Task Order, as applicable, and the scale and types of work involved in the change order, and determine whether the **Participation Goals** should be modified.

10. Pre-award waiver of the **Participation Goals.** (a) A bidder or proposer, or contractor with respect to a Task Order, may seek a pre-award full or partial waiver of the **Participation Goals** in accordance with Section 6-129, which requests that Agency change one or more **Participation Goals** on the grounds that the **Participation Goals** are unreasonable in light of the availability of certified firms to perform the services required, or by demonstrating that it has legitimate business reasons for proposing a lower level of subcontracting in its M/WBE Utilization Plan.

(b) To apply for a full or partial waiver of the **Participation Goals**, a bidder, proposer, or contractor, as applicable, must complete Part III (Page 5) of Schedule B and submit such request no later than seven (7) calendar days prior to the date and time the bids, proposals, or Task Orders are due, in writing to the Agency by email at zhangji@ddc.nyc.gov or via facsimile at (718) 391-1886. Bidders, proposers, or contractors, as applicable, who have submitted requests will receive an Agency response by no later than two (2) calendar days prior to the due date for bids, proposals, or Task Orders; provided, however, that if that date would fall on a weekend or holiday, an Agency response will be provided by close-of-business on the business day before such weekend or holiday date.

(c) If the Agency determines that the **Participation Goals** are unreasonable in light of the availability of certified firms to perform the services required, it shall revise the solicitation and extend the deadline for bids and proposals, or revise the Task Order, as applicable.

(d) Agency may grant a full or partial waiver of the Participation Goals to a bidder, proposer or contractor, as applicable, who demonstrates—before submission of the bid, proposal or Task Order, as applicable—that it has legitimate business reasons for proposing the level of subcontracting in its M/WBE Utilization Plan. In making its determination, Agency shall consider factors that shall include but not be limited to, whether the bidder, proposer or contractor, as applicable, has the capacity and the bona fide intention to perform Contract without any subcontracting, or to perform the Contract without awarding the amount of subcontracts represented by the Participation Goals. In making such determination, Agency may consider whether the M/WBE Utilization Plan is consistent with past subcontracting practices of the bidder, proposer or contractor, as applicable, whether the bidder, proposer or contractor, as applicable, has made efforts to form a joint venture with a certified firm, and whether the bidder, proposer, or contractor, as applicable, has made good faith efforts to identify other portions of the Contract that it intends to subcontract.

11. Modification of M/WBE Utilization Plan. (a) A Contractor may request a modification of its M/WBE Utilization Plan after award of this Contract. PLEASE NOTE: If this Contract is a public works project subject to GML §101(5) (i.e., a contract valued at or below $3M for projects in New York City) or if the Contract is subject to a project labor agreement in accordance with Labor Law §222, and the bidder is required to identify at the time of bid submission its intended subcontractors for the Wicks trades (plumbing and gas fitting; steam heating, hot water heating, ventilating and air conditioning (HVAC); and electric wiring), the Contractor may request a Modification of its M/WBE Utilization Plan as part of its bid submission. The Agency may grant a request for Modification of a Contractor's M/WBE Utilization Plan if it determines that the Contractor has established, with appropriate documentary and other evidence, that it made reasonable, good faith efforts to meet the Participation Goals. In making such determination, Agency shall consider evidence of the following efforts, as applicable, along with any other relevant factors:

(i) The Contractor advertised opportunities to participate in the Contract, where appropriate, in general circulation media, trade and professional association publications and small business media, and publications of minority and women's business organizations;

(ii) The Contractor provided notice of specific opportunities to participate in the Contract, in a timely manner, to minority and women's business organizations;

(iii) The Contractor sent written notices, by certified mail or facsimile, in a timely manner, to advise MBEs or WBEs that their interest in the Contract was solicited;

(iv) The Contractor made efforts to identify portions of the work that could be substituted for portions originally designated for participation by MBEs and/or WBEs in the M/WBE Utilization Plan, and for which the Contractor claims an inability to retain MBEs or WBEs;

(v) The Contractor held meetings with MBEs and/or WBEs prior to the date their bids or proposals were due, for the purpose of explaining in detail the scope and requirements of the work for which their bids or proposals were solicited;

(vi) The Contractor made efforts to negotiate with MBEs and/or WBEs as relevant to perform specific subcontracts, or act as suppliers or service providers;

(vii) Timely written requests for assistance made by the Contractor to Agency's M/WBE liaison officer and to DSBS;

(viii) Description of how recommendations made by DSBS and Agency were acted upon and an explanation of why action upon such recommendations did not lead to the desired level of participation of MBEs and/or WBEs.

Agency's M/WBE officer shall provide written notice to the Contractor of the determination.

(b) The Agency may modify the **Participation Goals** when the scope of the work has been changed by the Agency in a manner that affects the scale and types of work that the Contractor indicated in its **M/WBE** Utilization Plan would be awarded to subcontractors.

12. If this Contract is for an indefinite quantity of construction, standard or professional services or is a requirements type contract and the Contractor has submitted an **M/WBE** Utilization Plan and has committed to subcontract work to MBEs and/or WBEs in order to meet the **Participation Goals**, the Contractor will not be deemed in violation of the M/WBE Program requirements for this Contract with regard to any work which was intended to be subcontracted to an MBE and/or WBE to the extent that the Agency has determined that such work is not needed.

13. If **Participation Goals** have been established for this Contract or a Task Order issued pursuant to this Contract, at least once annually during the term of the Contract or Task Order, as applicable, Agency shall review the Contractor's progress toward attainment of its M/WBE Utilization Plan, including but not limited to, by reviewing the percentage of work the Contractor has actually awarded to MBE and/or WBE subcontractors and the payments the Contractor made to such subcontractors.

14. If **Participation Goals** have been established for this Contract or a Task Order issued pursuant to this Contract, Agency shall evaluate and assess the Contractor's performance in meeting those goals, and such evaluation and assessment shall become part of the Contractor's overall contract performance evaluation.

PART B: MISCELLANEOUS

1. The Contractor shall take notice that, if this solicitation requires the establishment of an **M/WBE** Utilization Plan, the resulting contract may be audited by DSBS to determine compliance with Section 6-129. See §6-129(e)(10). Furthermore, such resulting contract may also be examined by the City's Comptroller to assess compliance with the **M/WBE** Utilization Plan.

2. Pursuant to DSBS rules, construction contracts that include a requirement for an **M/WBE** Utilization Plan shall not be subject to the law governing Locally Based Enterprises set forth in Section 6-108.1 of the Administrative Code of the City of New York.

3. DSBS is available to assist contractors and potential contractors in determining the availability of MBEs and/or WBEs to participate as subcontractors, and in identifying opportunities that are appropriate for participation by MBEs and/or WBEs in contracts.

4. Prospective contractors are encouraged to enter into qualified joint venture agreements with MBEs and/or WBEs as defined by Section 6-129(c)(30).

5. By submitting a bid or proposal the Contractor hereby acknowledges its understanding of the M/WBE Program requirements set forth herein and the pertinent provisions of Section 6-129, and any rules promulgated thereunder, and if awarded this Contract, the Contractor hereby agrees to comply with the M/WBE Program requirements of this Contract and pertinent provisions of Section 6-129, and any rules promulgated thereunder, all of which shall be deemed to be material terms of this Contract. The Contractor hereby agrees to make all reasonable, good faith efforts to solicit and obtain the participation of MBEs and/or WBEs to meet the required **Participation Goals.**

ARTICLE II. ENFORCEMENT

1. If Agency determines that a bidder or proposer, as applicable, has, in relation to this procurement, violated Section 6-129 or the DSBS rules promulgated pursuant to Section 6-129, Agency may disqualify such bidder or proposer, as applicable, from competing for this Contract and the Agency may revoke such bidder's or proposer's prequalification status, if applicable.

2. Whenever Agency believes that the Contractor or a subcontractor is not in compliance with Section 6-129 or the DSBS rules promulgated pursuant to Section 6-129, or any provision of this Contract that implements Section 6-129, including, but not limited to any **M/WBE** Utilization Plan, Agency shall send a written notice to the Contractor describing the alleged noncompliance and offering the Contractor an opportunity to be heard. Agency shall then conduct an investigation to determine whether such Contractor or subcontractor is in compliance.

3. In the event that the Contractor has been found to have violated Section 6-129, the DSBS rules promulgated pursuant to Section 6-129, or any provision of this Contract that implements Section 6-129, including, but not limited to, any **M/WBE** Utilization Plan, Agency may determine that one of the following actions should be taken:

(a) entering into an agreement with the Contractor allowing the Contractor to cure the violation;
(b) revoking the Contractor's pre-qualification to bid or make proposals for future contracts;
(c) making a finding that the Contractor is in default of the Contract;
(d) terminating the Contract;
(e) declaring the Contractor to be in breach of Contract;
(f) withholding payment or reimbursement;
(g) determining not to renew the Contract;
(h) assessing actual and consequential damages;

(i) assessing liquidated damages or reducing fees, provided that liquidated damages may be based on amounts representing costs of delays in carrying out the purposes of the M/WBE Program, or in meeting the purposes of the Contract, the costs of meeting utilization goals through additional procurements, the administrative costs of investigation and enforcement, or other factors set forth in the Contract;
(j) exercising rights under the Contract to procure goods, services or construction from another contractor and charge the cost of such contract to the Contractor that has been found to be in noncompliance; or
(k) taking any other appropriate remedy.

4. If an **M/WBE** Utilization Plan has been submitted, and pursuant to this Article II, Section 3, the Contractor has been found to have failed to fulfill its **Participation Goals** contained in its **M/WBE** Utilization Plan or the **Participation Goals** as modified by Agency pursuant to Article I, Part A, Section 11, Agency may assess liquidated damages in the amount of ten percent (10%) of the difference between the dollar amount of work required to be awarded to MBE and/or WBE firms to meet the **Participation Goals** and the dollar amount the Contractor actually awarded and paid, and/or credited, to MBE and/or WBE firms. In view of the difficulty of accurately ascertaining the loss which the City will suffer by reason of Contractor's failure to meet the **Participation Goals**, the foregoing amount is hereby fixed and agreed as the liquidated damages that the City will suffer by reason of such failure, and not as a penalty. Agency may deduct and retain out of any monies which may become due under this Contract the amount of any such liquidated damages; and in case the amount which may become due under this Contract shall be less than the amount of liquidated damages suffered by the City, the Contractor shall be liable to pay the difference.

5. Whenever Agency has reason to believe that an MBE and/or WBE is not qualified for certification, or is participating in a contract in a manner that does not serve a commercially useful function (as defined in Section 6-129(c)(8)), or has violated any provision of Section 6- 129, Agency shall notify the Commissioner of DSBS who shall determine whether the certification of such business enterprise should be revoked.

6. Statements made in any instrument submitted to Agency pursuant to Section 6-129 shall be submitted under penalty of perjury and any false or misleading statement or omission shall be grounds for the application of any applicable criminal and/or civil penalties for perjury. The making of a false or fraudulent statement by an MBE and/or WBE in any instrument submitted pursuant to Section 6-129 shall, in addition, be grounds for revocation of its certification.

7. The Contractor's record in implementing its **M/WBE** Utilization Plan shall be a factor in the evaluation of its performance. Whenever Agency determines that a Contractor's compliance with an **M/WBE** Utilization Plan has been unsatisfactory, Agency shall, after consultation with the City Chief Procurement Officer, file an advice of caution form for inclusion in VENDEX as caution data.

Tax ID #: 22-2433095

APT E-PIN#: 85020B0038

Contract # 1 - General Construction Work

SCHEDULE B - M/WBE Utilization Plan

Part I: M/WBE Participation Goals

Part I to be completed by contracting agency

Contract Overview

APT E-Pin #	85020B0038	**FMS Project ID#:**	S136-367
Project Title/Agency	Staten Island 1 & 3 Garage - Phase II		
PIN #	8502020TR0001C		
Bid/Proposal Response Date:	January 21, 2020		
Contracting Agency	Department of Design and Construction		
Agency Address	30-30 Thomson Avenue	**City** Long Island City **State** NY	**Zip Code** 11101
Contact Person	Brandon A. Milliner	**Title** MWBE Outreach & Compliance Analyst	
Telephone #	(718) 391-1416	**Email** Millinebr@ddc.nyc.gov	

Project Description *(attach additional pages if necessary)*

This project consists of a New Garage Building, Salt Shed structure, Fueling Station, Open-air Household waste drop-off area, Existing Building Repair shop and garage renovation, site development including outdoor DSNY truck parking with integrated plow rack storage, and personnel parking.

M/WBE Participation Goals for Services

Enter the participation percent for each group or for an unspecified goal. Please note that there are no goals for Asian Americans in Professional Services

Prime Contract Industry: **Construction**

Group	Percentage	
Unspecified *	**26**	**%**
or		
Black American	**Unspecified**	**%**
Hispanic American	**Unspecified**	**%**
Asian American	**Unspecified**	**%**
Women	**Unspecified**	**%**
Total Participation Goals	**26**	**%** Line 1

* Note: For this procurement, individual ethnicity and gender goals are not specified. The Total Participation Goals for construction contracts may be met by using Black American, Hispanic American,Asian American or Women certified firms or any combination of such firms.

Tax ID #: 22-2433095

APT E-
PIN#: 85020B0038

SCHEDULE B - Part II: M/WBE Participation Plan

Part II to be completed by the bidder/proposer:

Please note: For Non-M/WBE Prime Contractors who will NOT subcontract any services and will self-perform the entire contract, you must obtain a FULL waiver by completing the Waiver Application on pages 9 and 9a and timely submitting it to the contracting agency pursuant to the Notice to Prospective Contractors.. Once a FULL WAIVER is granted, it must be included with your bid or proposal and you do not have to complete or submit this form with your bid or proposal.

Section I: Prime Contractor Contact Information

Tax ID #	22-2433095	**FMS Vendor ID #**	
Business Name	Prismatic Development Corporation	**Contact Person**	Robert V. Gamba
Address	60 US Highway 46, Fairfield, NJ 07004		
Telephone #	973-882-1133	**Email**	rvg@prisdev.com

Section II: M/WBE Utilization Goal Calculation: Check the applicable box and complete subsection.

PRIME CONTRACTOR ADOPTING AGENCY M/WBE PARTICIPATION GOALS

☒ **For Prime Contractors (including Qualified Joint Ventures and M/WBE firms) adopting Agency M/WBE Participation Goals.**	**Total Bid/Proposal Value**		**Agency Total Participation Goals (Line 1, Page 6)**		**Calculated M/WBE Participation Amount**
Calculate the total dollar value of your total bid that you agree will be awarded to M/WBE subcontractors for services and/or credited to an M/WBE prime contractor or Qualified Joint Venture. Please review the Notice to Prospective Contractors for more information on how to obtain credit for M/WBE participation.	$ 127,888,567	X	26%	=	$ 33,251,000 **Line 2**

PRIME CONTRACTOR OBTAINED PARTIAL WAIVER APPROVAL: ADOPTING MODIFIED M/WBE PARTICIPATION GOALS

☐ **For Prime Contractors (including Qualified Joint Ventures and M/WBE firms) adopting Modified M/WBE Participation Goals.**	**Total Bid/Proposal Value**		**Adjusted Participation Goal (From Partial Waiver)**		**Calculated M/WBE Participation Amount**
Calculate the total dollar value of your total bid that you agree will be awarded to M/WBE subcontractors for services and/or credited to an M/WBE prime contractor or Qualified Joint Venture. Please review the Notice to Prospective Contractors for more information on how to obtain credit for M/WBE participation.	$	X		=	$ **Line 3**

Tax ID #: 22-2433095

APT E-
PIN#: 85020B0038

Section III: M/WBE Utilization Plan: How Proposer/Bidder Will Fulfill M/WBE Participation Goals. Please review Notice to Prospective Contractors for more information on how to obtain credit for M/WBE participation. Check applicable box. The Proposer or Bidder will fulfill the M/WBE Participation Goals:

☐ As an M/WBE Prime Contractor that will self-perform and/or subcontract to other M/WBE firms a portion of the contract the value of which is at least the amount located on Lines 2 or 3 above, as applicable. The value of any work subcontracted to non-M/WBE firms will not be credited towards fulfillment of M/WBE Participation Goals. Please check all that apply to Prime Contractor:

☐ MBE ☐ WBE

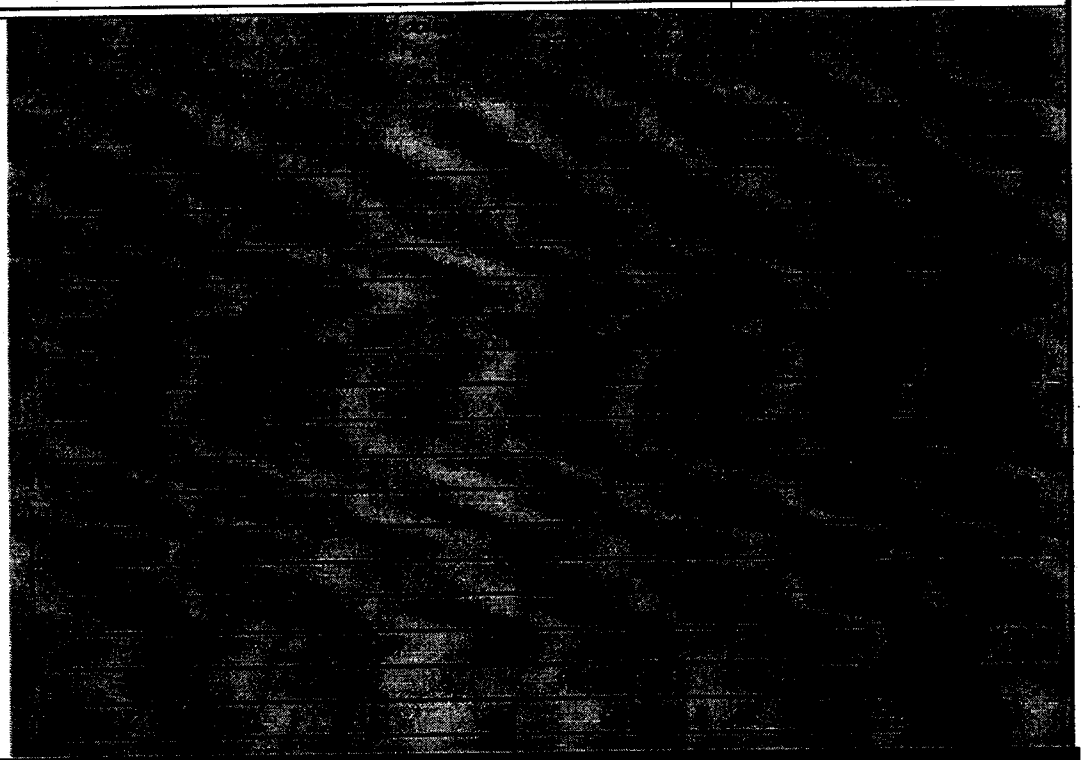
☐ As a Qualified Joint Venture with an M/WBE partner, in which the value of the M/WBE partner's participation and/or the value of any work subcontracted to other M/WBE firms is at least the amount located on Lines 2 or 3 above, as applicable. The value of any work subcontracted to non M/WBE firms will not be credited towards fulfillment of M/WBE Participation Goals.

☒ As a non M/WBE Prime Contractor that will enter into subcontracts with M/WBE firms the value of which is at least the amount located on Lines 2 or 3 above, as applicable.

Section IV: General Contract Information

What is the expected percentage of the total contract dollar value that you expect to award in subcontracts for services, regardless of M/WBE status? % 60

✓ Scopes of Subcontract Work



Section V: Vendor Certification and Required Affirmations

I hereby:

1) acknowledge my understanding of the M/WBE participation requirements as set forth herein and the pertinent provisions of Section 6-129 of the Administrative Code of the City of New York (Section 6-129), and the rules promulgated thereunder.

2) affirm that the information supplied in support of this M/WBE Utilization Plan is true and correct.

3) agree, if awarded this Contract, to comply with the M/WBE participation requirements of this Contract, the pertinent provisions of Section 6-129, and the rules promulgated thereunder, all of which shall be deemed to be material terms of this Contract.

4) agree and affirm that it is a material term of this Contract that the Vendor will award the total dollar value of the M/WBE Participation Goals to certified MBEs and/or WBEs, unless a full waiver is obtained or such goals are modified by the Agency; and

5) agree and affirm, if awarded this Contract, to make all reasonable, good faith efforts to meet the M/WBE Participation Goals, or if a partial waiver is obtained or such goals are modified by the Agency, to meet the modified Participation Goals by soliciting and obtaining the participation of certified MBEs and/or WBE firms.

Signature Michael Diekhaus Date 2/21/2020

Print Name Michael Diekhaus Title Chief Financial Officer

SCHEDULE B – PART III – REQUEST FOR WAIVER OF M/WBE PARTICIPATION REQUIREMENT

Contract Overview

Tax ID # ______________________ **FMS Vendor ID #** ______________________

Business Name ____

Contact Name ________________ **Telephone #** ________________ **Email** ________________

Type of Procurement ☐ **Competitive Sealed Bids** ☐ **Other** **Bid/Response Due Date** ________________

APT E-PIN # (for this procurement) ________________ Contracting Agency ________________

M/WBE Participation Goals (as described in bid/solicitation documents)

________ % **Agency M/WBE Participation Goal**

Proposed M/WBE Participation Goal (as anticipated by vendor seeking waiver)

________ % **of the total contract value anticipated <u>in good faith</u> by the bidder/proposer to be subcontracted for services and/or credited to an M/WBE Prime Contractor or Qualified Joint Venture.**

Basis for Waiver Request: *Check appropriate box & explain in detail below (attach additional pages if needed)*

☐ **Vendor does not subcontract services, and has the capacity and good faith intention to perform all such work itself with its own employees.**

☐ **Vendor subcontracts *some* of this type of work but at a *lower* % than bid/solicitation describes, and has the capacity and good faith intention to do so on this contract. (Attach subcontracting plan outlining services that the vendor will self-perform and subcontract to other vendors or consultants.)**

☐ **Vendor has other legitimate business reasons for proposing the M/WBE Participation Goal above. Explain under separate cover.**

References

[illegible]

CONTRACT NO. ________ **AGENCY** ________ **DATE COMPLETED** ________

Total Contract Amount $ ________ **Total Amount Subcontracted $** ________

Item of Work Subcontracted and Value of subcontract ________ **Item of Work Subcontracted and Value of subcontract** ________ **Item of Work Subcontracted and Value of subcontract** ________

CONTRACT NO. ________ **AGENCY** ________ **DATE COMPLETED** ________

Total Contract Amount $ ________ **Total Amount Subcontracted $** ________

Item of Work Subcontracted and Value of subcontract ________ **Item of Work Subcontracted and Value of subcontract** ________ **Item of Work Subcontracted and Value of subcontract** ________

CONTRACT NO. ________ **AGENCY** ________ **DATE COMPLETED** ________

Total Contract Amount $ ________ **Total Amount Subcontracted $** ________

Item of Work Subcontracted and Value of subcontract ________ **Item of Work Subcontracted and Value of subcontract** ________ **Item of Work Subcontracted and Value of subcontract** ________

3 most recent contracts performed for other entities. Include information for each subcontract awarded in performance of such contracts. Add more pages if necessary.
(Complete ONLY if vendor has performed fewer than 3 prior contracts.)

TYPE OF Contract _____ **ENTITY** _____ **DATE COMPLETED** _____

Manager at entity that hired vendor (Name/Phone No./Email) _____

Total Contract Amount $ _____ **Total Amount Subcontracted** $ _____

Type of Work Subcontracted _____

TYPE OF Contract _____ **AGENCY/ENTITY** _____ **DATE COMPLETED** _____

Manager at agency/entity that hired vendor (Name/Phone No./Email) _____

Total Contract Amount $ _____ **Total Amount Subcontracted** $ _____

Item of Work Subcontracted and Value of subcontract _____

Item of Work Subcontracted and Value of subcontract _____

Item of Work Subcontracted and Value of subcontract _____

TYPE OF Contract _____ **AGENCY/ENTITY** _____ **DATE COMPLETED** _____

Manager at entity that hired vendor (Name/Phone No./Email) _____

Total Contract Amount $ _____ **Total Amount Subcontracted** $ _____

Item of Work Subcontracted and Value of subcontract _____

Item of Work Subcontracted and Value of subcontract _____

Item of Work Subcontracted and Value of subcontract _____

VENDOR CERTIFICATION: *I hereby affirm that the information submitted in support of this waiver request is true and correct, and that this request is made in good faith.*

Signature: _____ **Date:** _____

Print Name: _____ **Title:** _____

Shaded area below is for agency completion only

NYCDDC Scope of Subcontract Work

2/28/2020

	Scopes of Subcontract Work		Estimated Value		Participation Goal by MWBEs		Time Frame (Duration)
Div 1	General Requirements	$	$	1,250,000	$	1,250,000	30 Months
Div 2	Existing Conditions	$	$	100,000	$	100,000	2 Months
Div 3	Concrete	$	$	3,250,000	$	2,325,000	18 Months
Div 4	Masonry	$	$	2,500,000	$	-	12 Months
Div 5	Metals	$	$	8,000,000	$	3,300,000	20 Months
Div 6	Wood, Plastics and Composites	$	$	600,000	$	600,000	6 Months
Div 7	Thermal and Moisture Protection	$	$	3,750,000	$	2,000,000	20 Months
Div 8	Openings	$	$	2,700,000	$	550,000	9 Months
Div 9	Finishes	$	$	1,800,000	$	1,400,000	6 Months
Div 10	Specialties	$	$	800,000	$	800,000	4 Months
Div 11	Equipment	$	$	-	$	-	4 Months
Div 12	Furnishings	$	$	-	$	-	4 Months
Div 14	Conveying Systems	$	$	600,000	$	-	12 Months
Div 21	Fire Supression	$	$	1,800,000	$	1,800,000	24 Months
Div 22	Plumbing	$	$	6,916,840	$	1,750,000	24 Months
Div 23	HVAC	$	$	14,768,600	$	3,800,000	24 Months
Div 26, 27, 28, 48	Electrical and Related	$	$	14,300,000	$	3,700,000	24 Months
Div 31, 32, 33	Earthwork and Related Sitework	$	$	12,000,000	$	7,500,000	25 Months
Div 43	Process Gas and Liquid Handling	$	$	1,800,000	$	1,800,000	3 Months

MWBE Value: $ 32,675,000

MWBE Percentage: 26%

= 76,935,440

60%

JZ
02/28/2020

1

BID FORM
THE CITY OF NEW YORK
DEPARTMENT OF DESIGN AND CONSTRUCTION
DIVISION OF PUBLIC BUILDINGS

BID FOR FURNISHING ALL LABOR AND MATERIAL NECESSARY AND REQUIRED FOR:

PROJECT ID: S136-367

Staten Island 1 & 3 Garage - Phase 2
1000 West Service Road
Staten Island, NY 10314

Name of Bidder: Prismatic Development Corporation

Date of Bid Opening: February 21, 2020

Bidder is: (Check one, whichever applies) Individual ( ) Partnership ( ) Corporation (X)

Place of Business of Bidder: 60 US Highway 46, Fairfield, NJ 07004

Bidder's Telephone Number: 973-882-1133 Bidder's Fax Number: 973-883-1132

Bidder's Email Address: rvg@prisdev.com

Residence of Bidder (If Individual): _____

If Bidder is a Partnership, fill in the following blanks:

Names of Partners	Residence of Partners

If Bidder is a Corporation, fill in the following blanks:
Organized under the laws of the State of New Jersey

Name and Home Address of President: Robert V. Gamba
60 Beachmont Terrace, North Caldwell, NJ 07006

Name and Home Address of Secretary: Michael Diekhaus
26 Winding Way, Woodland Park, NJ 07424

Name and Home Address of Treasurer:
Michael Diekhaus, 26 Winding Way, Woodland Park, NJ 07424

BID FORM

The above-named Bidder affirms and declares:

1. The said bidder is of lawful age and the only one interested in this bid; and no person, firm or corporation other than hereinbefore named has any interest in this bid, or in the Contract proposed to be taken.

2. By submission of this bid, each bidder and each person signing on behalf of any bidder certifies, and in the case of a joint bid each party thereto certifies as to its own organization, under penalty of perjury, that to the best of its knowledge and belief: (1) the prices in this bid have been arrived at independently without collusion, consultation, communication or agreement, for the purpose of restricting competition, as to any matter relating to such prices with any other bidder or with any competitor; (2) unless otherwise required by law, the prices quoted in this bid have not been knowingly disclosed by the bidder and will not knowingly be disclosed by the bidder prior to opening, directly or indirectly, to any other bidder or to any competitor; and (3) no attempt has been made or will be made by the bidder to induce any other person, partnership or corporation to submit or not to submit a bid for the purpose of restricting competition.

3. No councilman or other officer or employee or person whose salary is payable in whole or in part from the City Treasury is directly or indirectly interested in this bid, or in the supplies, materials, equipment, work or labor to which it relates, or in any of the profits thereof.

4. The bidder is not in arrears to the City of New York upon debt or contract or taxes, and is not a defaulter, as surety or otherwise, upon any obligation of the CIty of New York, and has not been declared not responsible, or disqualified, by any agency of the City of New York or State of New York, nor is there any proceeding pending relating to the responsibility or qualification of the bidder to receive public contracts except as set forth on the Affirmation included as page 17 of this Bid Booklet.

The bidder hereby affirms that is has paid all applicable City income, excise and other taxes for all years it has conducted business activities in New York City.

5. The bidder, as an individual, or as a member, partner, director or officer of the bidder, if the same be a firm, partnership or corporation, executes this document expressly warranting and representing that should this bid be accepted by the City and the Contract awarded to him, he and his subcontractors engaged in the performance: (1) will comply with the provisions of Section 6-108 of the Administrative Code of the City of New York and the non-discrimination provisions of Section 220a of the New York State Labor Law, as more expressly and in detail set forth in the Agreement; (2) will comply with Section 6-109 of the Administrative Code of the City of New York in relation to minimum wages and other stipulations as more expressly and in detail set forth in the Agreement; (3) have complied with the provisions of the aforesaid laws since their respective effective dates, and (4) will post notices to be furnished by the City, setting forth the requirements of the aforesaid laws in prominent and conspicuous places in each and every plant, factory, building and structure where employees engaged in the performance of the Contract can readily view it, and will continue to keep such notices posted until the supplies, materials and equipment, or work labor and services required to be furnished or rendered by the Contractor have been finally accepted by the City. In the event of any breach or violation of the foregoing, the Contractor may be subject to damages, liquidated or otherwise, cancellation of the Contract and suspension as a bidder for a period of three years. (The words, "the bidder", "he", "his", and "him" where used shall mean the individual bidder, firm, partnership or corporation executing this bid).

6. Compliance Report

The bidder, as an individual, or as a member, partner, director, or officer of the bidder, if the same be a firm, partnership, or corporation, (1) represents that his attention has been specifically drawn to Executive Order No. 50, dated April 25, 1980, on Equal Employment Compliance of the contract, and (2) warrants that he will comply with the provisions of Executive Order No. 50. The Employment Report must be submitted as part of the bid.

The bidder, as an individual, or as a member, partner, director, or officer of the bidder, if the same be a firm, partnership, or corporation, executes this document expressly warranting that he will comply with: (1) the provision of the contract on providing records, Chapter 8.

7. By submission of this bid, the bidder certifies that it now has and will continue to have the financial capability to fully perform the work required for this contract. Any award of this contract will be made in reliance upon such certification. Upon request therefor, the bidder will submit written verification of such financial capability in a form that is acceptable to the department.

8. In accordance with Section 165 of the State Finance Law, the bidder agrees that tropical hardwoods, as defined in Section 165 of the State Finance Law, shall not be utilized in the performance of this Contract, except as the same are permitted by the foregoing provision of law.

9. The bidder has visited and examined the site of the work and has carefully examined the Contract in the form approved by the Corporation Counsel, and will execute the Contract and perform all its items, covenants and conditions, and will provide, furnish and deliver all the work, materials, supplies, tools and appliances for all labor and materials necessary or required for the hereinafter named work, all in strict conformity with the Contract, for the prices set forth in the Bid Schedule:

10. M/WBE UTILIZATION PLAN: By signing its bid, the bidder agrees to the Vendor Certification and Required Affirmations set forth below, unless a full waiver of the Participation Goals is granted. The Vendor Certification and Required Affirmations will be deemed to satisfy the requirement to complete Section V of Part II of Schedule B: M/WBE Utilization Plan.

Section V: Vendor Certification and Required Affirmations:

I hereby:

1) acknowledge my understanding of the M/WBE participation requirements as set forth in this Contract and the pertinent provisions of Section 6-129 of the Administrative Code of the City of New York and the rules promulgated thereunder;

2) affirm that the information supplied in support of the M/WBE Utilization Plan is true and correct;

3) agree, if awarded this Contract, to comply with the M/WBE participation requirements of this Contract, the pertinent provisions of Section 6-129, and the rules promulgated thereunder, all of which shall be deemed to be material terms of this Contract;

4) agree and affirm that it is a material term of this Contract that the Vendor will award the total dollar value of the M/WBE Participation Goals to certified MBEs and/or WBEs, unless a full waiver is obtained or such goals are modified by the Agency; and

5) agree and affirm, if awarded this Contract, to make all reasonable, good faith efforts to meet the M/WBE Participation Goals, or If a partial waiver is obtained or such goals are modified by the Agency, to meet the modified Participation Goals by soliciting and obtaining the participation of certified MBE and/or WBE firms.

BID FORM

PROJECT ID: S136-367

TOTAL BID PRICE: In the space provided below, the Bidder shall indicate the total bid price in figures.

A. LUMP SUM PRICE - Total price for all labor and material for all required work, excluding items (B), (C), (D) and (E) set forth below. Total Price shall include all costs and expenses, i.e., labor and material, including overhead and profit for all the Work, described below and shown in the drawings and specifications.

Total Price For Labor	Total Price for Material Sold and Delivered	
$ 76,469,400 +	$ 50,979,600	Total Price for Item A= $ 127,449,000

B. ALLOWANCE for Petroleum Bulk Storage Tank Removal (Section 020101 of the Specifications) **$200,000.00**

C. ALLOWANCE for Excavation, Handling, Transportation and Disposal of Contaminated Materials (Section 026113 of the Specifications) **$200,000.00**

D. ALLOWANCE for Incidental Asbestos Abatement (Section 028013 of the Specifications) **$30,000.00**

E. AMOUNT for Proprietary Items (pages 2a) **$9,567.00**

TOTAL BID PRICE (Add A + B + C + D + E) (a/k/a BID PROPOSAL) $ 127,888,567

BB
2/21/20

BIDDER'S SIGNATURE AND AFFIDAVIT

* **SUBCONTRACTOR IDENTIFICATION: You MUST complete and submit the form entitled "Bidder's Identification of Subcontractors" (page 17) at the time you submit your bid. You must submit this form in a separate, sealed envelope (BID ENVELOPE #2). In the event an award of contract is not made to the Bidder, the Bidder hereby authorizes the Agency to shred the form entitled "Bidder's Identification of Subcontractors".** X **Yes** _____ **No**

Bidder: Prismatic Development Corporation

By: Michael Diekhaus
Michael Diekhaus, C.F.O. (Signature of Partner or corporate officer)

Michael Diekhaus
Attest: Michael Diekhaus
Secretary of Corporate Bidder
(Corporate Seal)

Affidavit on the following page should be subscribed and sworn to before a Notary Public

BID FORM (TO BE NOTARIZED)

****

AFFIDAVIT WHERE BIDDERS IS AN INDIVIDUAL

STATE OF NEW YORK, COUNTY OF _____ ss:

_____ being duly sworn says:

I am the person described in and who executed the foregoing bid, and the several matters therein stated are in all respects true.

_____

(Signature of the person who signed the Bid)

Subscribed and sworn to before me this

____ day of _____, _____

_____

Notary Public

****

AFFIDAVIT WHERE BIDDERS IS A PARTNERSHIP

STATE OF NEW YORK, COUNTY OF _____ ss:

_____ being duly sworn says:

I am a member of _____ the firm described in and which executed the foregoing bid. subscribed the name of the firm thereto on behalf of the firm, and the several matters therein stated are in all respects true.

_____

(Signature of Partner who signed the Bid)

Subscribed and sworn to before me this

____ day of _____, _____

_____

Notary Public

****

AFFIDAVIT WHERE BIDDERS IS A CORPORATION

STATE OF ~~NEW YORK~~ New Jersey, COUNTY OF Morris ss:

Michael Diekhaus being duly sworn says:

I am the C.F.O. of the above named corporation whose name is subscribed to and which executed the foregoing bid. I reside at 26 Winding Way, Woodland Park, NJ 07424.

I have knowledge of the several matters therein stated, and they are in all respects true.

Michael Diekhaus

(Signature of Corporate Officer who signed the Bid)

Subscribed and sworn to before me this

21ST day of February, 2020

Karen A. Meyer

Notary Public

KAREN A. MEYER
NOTARY PUBLIC OF NEW JERSEY
My Commission Expires April 5, 2024

AFFIRMATION

The undersigned bidder affirms and declares that said bidder is not in arrears to the City of New York upon debt, contract or taxes and is not a defaulter, as surety or otherwise, upon obligation to the City of New York, and has not been declared not responsible, or disqualified, by any agency of the City of New York, nor is there any proceeding pending relating to the responsibility or qualification of the bidder to receive public contracts except None

(If none, the bidder shall insert the word "None" in the space provided above.)

Full Name of Bidder: Prismatic Development Corporation
Address: 60 US Highway 46
City: Fairfield State: NJ Zip Code: 07004

CHECK ONE BOX AND INCLUDE APPROPRIATE NUMBER:

☐ A - Individual or Sole Proprietorship *
SOCIAL SECURITY NUMBER

☐ B - Partnership, Joint Venture or other unincorporated organization
EMPLOYER IDENTIFICATION NUMBER

☒ C - Corporation
EMPLOYER IDENTIFICATION NUMBER

22-2433095

By: Michael Diekhaus
Signature: Michael Diekhaus

Title: Chief Financial Officer

If a corporation, place seal here

This affirmation must be signed by an officer or duly authorized representative.
* Under the Federal Privacy Act the furnishing of Social Security Numbers by bidders on City contracts is voluntary. Failure to provide a Social Security Number will not result in a bidder's disqualification. Social Security Numbers will be used to identify bidders, proposers or vendors to ensure their compliance with laws, to assist the City in enforcement of laws, as well as to provide the City a means of identifying of businesses which seek City contracts.

BIDDER'S IDENTIFICATION OF SUBCONTRACTORS

NOTICE TO BIDDERS

SUBMISSION: The Bidder must, at the time of the bid, submit the completed form on the next page ("BIDDER'S IDENTIFICATION OF SUBCONTRACTORS"). This form must be submitted in a separate, sealed envelope (BID ENVELOPE #2). Failure to do so will result in the disqualification of the bid as non-responsive.

****

Please be advised that pursuant to GML § 101(5) the Bidder is required to submit with its bid the names of subcontractors it intends to use to perform the following work on this contract, as well as the agreed-upon amount to be paid to each:

- plumbing and gas fitting;
- steam heating, hot water heating, ventilating and air conditioning apparatus; and
- electric wiring and standard illuminating fixtures.

NOTE: This project may not involve all of the above listed subcontractors. Please see the form on the next page which indicates the subcontractors required for this Project.

All listed subcontractors must be used to perform the work identified on this form for the amount listed. The listed subcontractors are not alternatives to each other. The list of subcontractors is to be submiited in a separate sealed envelope by completing the form 'Bidders Identification of Subcontractors' for any subcontractors intended to be used in any of the three trades listed above. If bidder intends to use its own forces for any of the above listed work, bidder should complete this form using its own name.

Failure to submit the completed form on the next page ("Bidder's Identification of Subcontractors") that includes the names of subcontractors and the agreed upon amounts to be paid to such subcontractors will render the bid non-responsive.

PLEASE NOTE: for any contract that is subject to M/WBE Participation Goals under Local Law 1 of 2013, if the bidder's intention to use its own forces to do any of the above-referenced work would result in Bidder's failure to attain the Target Subcontracting Percentage identified in Schedule B (Subcontractor Utilization Plan), the bid will be non-responsive unless the bidder requests and obtains a Waiver of Target Subcontracting Percentage (Schedule B, Part III) in advance of bid submission. Failure to submit the completed 'BIDDERS IDENTIFICATION OF SUBCONTRACTORS' form that includes the names of subcontractors and the agreed upon amounts to be paid to such subcontractors will render the bid non-responsive.

After the low bid is announced, the sealed list submitted by the low bidder will be opened and the names of the subcontractors will be announced. The sealed lists of subcontractors submitted by all other bidders shall be maintained by the Agency unopened unless such bidder shall become the low bidder (e.g., the initial low bidder is found non-responsive). All unopened lists of subcontractors shall be returned to the bidders unopened after contract award, unless the bidder has given the agency permission to shred the form.

After bid submission, any change of subcontractor or agreed-upon amount to be paid to each shall require approval of the Agency upon a showing of a legitimate construction need which shall include, but not be limited to, a change in project specifications, a change in project material costs, a change to subcontractor status as determined pursuant to §222 (2)(e) of the Labor Law, or if the subcontractor has become otherwise unwilling, unable or unavailable to perform the subcontract.

BIDDER'S IDENTIFICATION OF SUBCONTRACTORS

Project ID: S136-367

SUBMISSION: In addition to its Bid (Bid Envelope # 1), the Bidder must, at the time of the bid, complete and submit this form in a separate, sealed envelope (Bid Envelope # 2). To complete this form, the Bidder must identify the subcontractors it intends to use for the work listed below, as well as the dollar amount to be paid to each subcontractor. Failure to complete this form and submit it in a separate, sealed envelope will result in the disqualification of the bid as non-responsive.

The Bidder intends to use the following subcontractors. If the Bidder intends to do any of the work referenced below with its own forces, the Bidder should complete this form using its own name. If multiple subcontractors for any trade are proposed, Bidder may submit multiple copies of this form.

1. **PLUMBING CONTRACTOR:**

Welkin Mechanical LLC
(Print Name)

Agreed amont to be paid Subcontractor: $ 6,916,840-

Description of Plumbing Work:

Work shown on Plumbing Related Drawings

2. **HVAC CONTRACTOR:**

Welkin Mechanical LLC
(Print Name)

Agreed amont to be paid Subcontractor: $ 14,768,600-

Description of HVAC Work:

Work shown on Mechanical Related Drawings

3. **ELECTRICAL CONTRACTOR:**

Five Star Electric
(Print Name)

Agreed amont to be paid Subcontractor: $ 14,300,000

Description of Electrical Work:

Work shown on Electrical Related Drawings

BIDDER'S SIGNATURE: The Bidder must sign and complete this form in the spaces provided below:

Michael Diekhaus
(Bidder's Signature)

Michael Diekhaus
(Print Name)

Prismatic Development Corporation, 60 US Highway 46, Fairfield, NJ 07004
(Address)

C.F.O.	973-882-1133	973-882-1132	2/21/20
(Title)	(Phone #)	(Fax#)	(Date)

BID BOND 1
FORM OF BID BOND

KNOW ALL MEN BY THESE PRESENTS. That we, Prismatic Development Corporation
60 U.S. Highway 46, Fairfield, NJ 07004

hereinafter referred to as the "Principal", and Fidelity and Deposit Company of Maryland
1299 Zurich Way, 5th Floor, Schaumburg, IL 60196 - 1056

hereinafter referred to as the "Surety" are held and firmly bound to THE CITY OF NEW YORK, hereinafter referred to as the "CITY", or to its successors and assigns in the penal sum of Ten Percent of the Amount Bid

($ ---10%---), Dollars lawful money of the United States, for the payment of which said sum of money well and truly to be made, we, and each of us, bind ourselves, our heirs, executors, administrators, successors and assigns, jointly and severally, firmly by these presents.

Whereas, the Principal is about to submit (or has submitted) to the City the accompanying proposal, hereby made a part hereof, to enter into a contract in writing for Staten Island 1 & 3 Garage - Phase 2
1000 West Service Road, Staten Island, NY 10314 - DDC PIN: 8502020TR0001C

NOW, THEREFORE, the conditions of this obligation are such that if the Principal shall not withdraw said Proposal without the consent of the City for a period of forty-five (45) days after the opening of bids and in the event of acceptance of the Principal's Proposal by the City, if the Principal shall:

(a) Within ten (10) days after notification by the City, execute in quadruplicate and deliver to the City all the executed counterparts of the Contract in the form set forth in the Contract Documents, in accordance with the proposal as accepted, and

(b) Furnish a performance bond and separate payment bond, as may be required by the City, for the faithful performance and proper fulfullment of such Contract, which bonds shall be satisfactory in all respects to the City and shall be executed by good and sufficient sureties, and

(c) In all respects perform the agreement created by the acceptance of said Proposal as provided in the Information for Bidders, bound herewith and made a part hereof, or if the City shall reject the aforesaid Proposal, then this obligation shall be null and void; otherwise to remain in full force and effect.

BID BOND 2

In the event that the Proposal of the Principal shall be accepted and the Contract be awarded to him the Surety hereunder agrees subject only to the payment by the Principal of the premium therefore, if requested by the City, to write the aforementioned performance and payment bonds in the form set forth in the Contract Documents.

It is expressly understood and agreed that the liability of the Surety for any and all claims hereunder shall in no event exceed the penal amount of this obligation as herein stated.

There shall be no liability under this bond if, in the event of the acceptance of the Principal's Proposal by the City, either a performance bond or payment bond, or both, shall not be required by the City on or before the 30th day after the date on which the City signs the Contract.

The surety, for the value received, hereby stipulates and agrees that the obligations of the Surety and its bond shall in no way be impaired or affected by any postponements of the date upon which the City will receive or open bids, or by any extensions of time within which the City may accept the Principal's Proposal, or by any waiver by the City of any of the requirements of the Information for Bidders, and the Surety hereby waives notice of any such postponements, extensions, or waivers.

IN WITNESS WHEREOF, the Principal and the Surety have hereunto set their hands and seals and such of them as are corporations have caused their corporate seals to be hereto affixed and these presents to be signed by their proper officers the 28th day of January, 2020.

(Seal) Prismatic Development Corporation (L.S.)
Principal

By: Michael Diekhaus
~~Robert V. Camba, President/C.E.O.~~ MD
Michael Diekhaus, C.F.O.

(Seal) Fidelity and Deposit Company of Maryland
Surety

By: C Mark
AnnMarie Keane, Attorney-in-Fact

BID BOND 3

ACKNOWLEDGEMENT OF PRINCIPAL, IF A CORPORATION

State of NJ County of Morris ss:
On this 21ST day of February, 2020, before me personally came Michael Diekhaus to me known, who, being by me duly sworn, did depose and say that he resides at 26 Winding Way, Woodland Park, NJ 07424 that he is the Chief Financial Officer of Prismatic Development Corporation the corporation described in and which executed the foregoing instrument; that he knows the seal of said corporation; that one of the seals affixed to said instrument is such seal; that it was so affixed by order of the directors of said corporation, and that he signed his name thereto by like order.

KAREN A. MEYER
NOTARY PUBLIC OF NEW JERSEY
My Commission Expires April 5, 2024

Karen A. Meyer
Notary Public

ACKNOWLEDGEMENT OF PRINCIPAL, IF A PARTNERSHIP

State of _____ County of _____ ss:
On this _____ day of _____, _____, before me personally appeared _____ to me known and known to me to be one of the members of the firm of _____ described in and who executed the foregoing instrument, and he acknowledged to me that he executed the same as and for the act and deed of said firm.

_____
Notary Public

ACKNOWLEDGEMENT OF PRINCIPAL, IF AN INDIVIDUAL

State of _____ County of _____ ss:
On this _____ day of _____, _____, before me personally appeared _____ to me known and known to me to be the person described in and who executed the foregoing instrument and acknowledged that he executed the same.

_____
Notary Public

AFFIX ACKNOWLEDGEMENTS AND JUSTIFICATION OF SURETIES

ACKNOWLEDGMENT OF SURETY COMPANY

STATE OF NEW JERSEY

COUNTY OF SOMERSET

On this **28th** day of **January 2020**, before me personally came **AnnMarie Keane**, to me known, who, being by me duly sworn, did depose and say; that she is the Attorney-in-Fact of the **Fidelity and Deposit Company of Maryland** the corporation described in which executed the above instrument; that she knows the seal of said corporation; that the seal affixed to said instrument is such corporate seal; that it was so affixed by the Board of Directors of said corporation; and that she signed her name thereto by the authority of the Power of Attorney of said Company, of which a Certified Copy is hereto attached, and that she signed said Instrument as an Attorney-in-Fact of said company by like authority.

.....
Notary Public

ELIZABETH RIGA
NOTARY PUBLIC OF NEW JERSEY
MY COMMISSION EXPIRES ON MARCH 13, 2023

ZURICH AMERICAN INSURANCE COMPANY
COLONIAL AMERICAN CASUALTY AND SURETY COMPANY
FIDELITY AND DEPOSIT COMPANY OF MARYLAND
POWER OF ATTORNEY

KNOW ALL MEN BY THESE PRESENTS: That the ZURICH AMERICAN INSURANCE COMPANY, a corporation of the State of New York, the COLONIAL AMERICAN CASUALTY AND SURETY COMPANY, a corporation of the State of Illinois, and the FIDELITY AND DEPOSIT COMPANY OF MARYLAND a corporation of the State of Illinois (herein collectively called the "Companies"), by Robert D. Murray, Vice President, in pursuance of authority granted by Article V, Section 8, of the By-Laws of said Companies, which are set forth on the reverse side hereof and are hereby certified to be in full force and effect on the date hereof, do hereby nominate, constitute, and appoint **William X. LINNEY, III, Robert B. PITTS, John J. SCIORTINO, JR., Jane L. FEDORCZYK, Frederick E. NICHOLSON, Joseph T. CHARCZENKO, AnnMarie KEANE, Elizabeth RIGA, Joseph J. KENT and Gary V. RISPOLI, all of Branchburg, New Jersey,** EACH, its true and lawful agent and Attorney-in-Fact, to make, execute, seal and deliver, for, and on its behalf as surety, and as its act and deed: any and all bonds and undertakings, and the execution of such bonds or undertakings in pursuance of these presents, shall be as binding upon said Companies, as fully and amply, to all intents and purposes, as if they had been duly executed and acknowledged by the regularly elected officers of the ZURICH AMERICAN INSURANCE COMPANY at its office in New York, New York., the regularly elected officers of the COLONIAL AMERICAN CASUALTY AND SURETY COMPANY at its office in Owings Mills, Maryland., and the regularly elected officers of the FIDELITY AND DEPOSIT COMPANY OF MARYLAND at its office in Owings Mills, Maryland., in their own proper persons.

The said Vice President does hereby certify that the extract set forth on the reverse side hereof is a true copy of Article V, Section 8, of the By-Laws of said Companies, and is now in force.

IN WITNESS WHEREOF, the said Vice-President has hereunto subscribed his/her names and affixed the Corporate Seals of the said **ZURICH AMERICAN INSURANCE COMPANY, COLONIAL AMERICAN CASUALTY AND SURETY COMPANY, and FIDELITY AND DEPOSIT COMPANY OF MARYLAND,** this 22nd day of March, A.D. 2019.

ATTEST:
ZURICH AMERICAN INSURANCE COMPANY
COLONIAL AMERICAN CASUALTY AND SURETY COMPANY
FIDELITY AND DEPOSIT COMPANY OF MARYLAND

By: Robert D. Murray
Vice President

By: Dawn E. Brown
Secretary

State of Maryland
County of Baltimore

On this 22nd day of March, A.D. 2019, before the subscriber, a Notary Public of the State of Maryland, duly commissioned and qualified, **Robert D. Murray, Vice President and Dawn E. Brown, Secretary** of the Companies, to me personally known to be the individuals and officers described in and who executed the preceding instrument, and acknowledged the execution of same, and being by me duly sworn, deposeth and saith, that he/she is the said officer of the Company aforesaid, and that the seals affixed to the preceding instrument are the Corporate Seals of said Companies, and that the said Corporate Seals and the signature as such officer were duly affixed and subscribed to the said instrument by the authority and direction of the said Corporations.

IN TESTIMONY WHEREOF, I have hereunto set my hand and affixed my Official Seal the day and year first above written.

Constance A. Dunn, Notary Public
My Commission Expires: July 9, 2019

EXTRACT FROM BY-LAWS OF THE COMPANIES

"Article V, Section 8, Attorneys-in-Fact. The Chief Executive Officer, the President, or any Executive Vice President or Vice President may, by written instrument under the attested corporate seal, appoint attorneys-in-fact with authority to execute bonds, policies, recognizances, stipulations, undertakings, or other like instruments on behalf of the Company, and may authorize any officer or any such attorney-in-fact to affix the corporate seal thereto; and may with or without cause modify of revoke any such appointment or authority at any time."

CERTIFICATE

I, the undersigned, Secretary of the ZURICH AMERICAN INSURANCE COMPANY, the COLONIAL AMERICAN CASUALTY AND SURETY COMPANY, and the FIDELITY AND DEPOSIT COMPANY OF MARYLAND, do hereby certify that the foregoing Power of Attorney is still in full force and effect on the date of this certificate; and I do further certify that Article V, Section 8, of the By-Laws of the Companies is still in force.

This Power of Attorney and Certificate may be signed by facsimile under and by authority of the following resolution of the Board of Directors of the ZURICH AMERICAN INSURANCE COMPANY at a meeting duly called and held on the 15th day of December 1998.

RESOLVED: "That the signature of the President or a Vice President and the attesting signature of a Secretary or an Assistant Secretary and the Seal of the Company may be affixed by facsimile on any Power of Attorney...Any such Power or any certificate thereof bearing such facsimile signature and seal shall be valid and binding on the Company."

This Power of Attorney and Certificate may be signed by facsimile under and by authority of the following resolution of the Board of Directors of the COLONIAL AMERICAN CASUALTY AND SURETY COMPANY at a meeting duly called and held on the 5th day of May, 1994, and the following resolution of the Board of Directors of the FIDELITY AND DEPOSIT COMPANY OF MARYLAND at a meeting duly called and held on the 10th day of May, 1990.

RESOLVED: "That the facsimile or mechanically reproduced seal of the company and facsimile or mechanically reproduced signature of any Vice-President, Secretary, or Assistant Secretary of the Company, whether made heretofore or hereafter, wherever appearing upon a certified copy of any power of attorney issued by the Company, shall be valid and binding upon the Company with the same force and effect as though manually affixed.

IN TESTIMONY WHEREOF, I have hereunto subscribed my name and affixed the corporate seals of the said Companies, this 28th day of January, 2020.

By: Brian M. Hodges
Vice President

TO REPORT A CLAIM WITH REGARD TO A SURETY BOND, PLEASE SUBMIT A COMPLETE DESCRIPTION OF THE CLAIM INCLUDING THE PRINCIPAL ON THE BOND, THE BOND NUMBER, AND YOUR CONTACT INFORMATION TO:

Zurich Surety Claims
1299 Zurich Way
Schaumburg, IL 60196-1056
www.reportsfclaims@zurichna.com
800-626-4577

THE FIDELITY AND DEPOSIT COMPANY

OF MARYLAND
1299 Zurich Way Schaumburg, IL 60196

Statement of Financial Condition
As Of December 31, 2018

ASSETS

Bonds		$ 245,255,635
Stocks		22,855,569
Cash and Short Term Investments		3,092,872
Reinsurance Recoverable		73,242,781
Federal Income Tax Recoverable		42,258
Other Accounts Receivable		4,801,363
TOTAL ADMITTED ASSETS		$ 349,290,278

LIABILITIES, SURPLUS AND OTHER FUNDS

Reserve for Taxes and Expenses		$ 106,785
Ceded Reinsurance Premiums Payable		46,727,605
Remittances and Items Unallocated		125,000
Payable to parents, subs and affiliates		28,621,373
Securities Lending Collateral Liability		0
TOTAL LIABILITIES		$ 75,580,762
Capital Stock, Paid Up	$ 5,000,000	
Surplus	268,709,716	
Surplus as regards Policyholders		273,709,716
TOTAL		$ 349,290,478

Securities carried at $162,739,508 in the above statement are deposited with various states as required by law.

Securities carried on the basis prescribed by the National Association of Insurance Commissioners. On the basis of market quotations for all bonds and stocks owned, the Company's total admitted assets at December 31, 2018 would be $349,736,423 and surplus as regards policyholders $274,155,661.

I, DENNIS F. KERRIGAN, Corporate Secretary of the FIDELITY AND DEPOSIT COMPANY OF MARYLAND, do hereby certify that the foregoing statement is a correct exhibit of the assets and liabilities of the said Company on the 31st day of December, 2018.

Corporate Secretary

State of Illinois
City of Schaumburg } SS:

Subscribed and sworn to, before me, a Notary Public of the State of Illinois, in the City of Schaumburg, this 20th day of March, 2019.

Notary Public

KATHERINE R SCHULTZ
Official Seal
Notary Public - State of Illinois
My Commission Expires Nov 16, 2019

BID BREAKDOWN

Submission: Bidders are advised that the requirement to submit a Bid Breakdown applies to each contract for which an "X" is indicated before the word "Yes". If required, the bidder must submit, with its bid, a completed Bid Breakdown. Failure to provide a completed Bid Breakdown may result in rejection of the bid as non-responsive.

__X__ YES _____ NO

Limitations on Use of Bid Breakdown:

Bidders are advised that the Bid Breakdown shall be used for bid analysis purposes only and shall not be binding for any other purposes under the Contract, including, without limitation, for payment purposes or in connection with a contractor claim for extra work. If the form for the Bid Breakdown does not include an item of work required by the Contract Documents, such omission shall have no effect whatsoever, nor shall it be used by the contractor in connection with a claim for extra work (i.e., work for which the contractor is entitled to a change order).

Instructions for Preparing Bid Breakdown:

(A) The Bid Breakdown is set forth on the following pages of this Bid Booklet and is in accordance with the Construction Specification Institute (CSI) format. For all items of work listed in the Bid Breakdown, the bidder must indicate the price for labor and the price for material, as well as the estimated quantities required.

(B) In preparing its Bid Breakdown, the bidder shall submit prices that include all costs for overhead and profit. Overhead shall include, without limitation, all costs in connection with the following: administration, management, superintendence, small tools, insurance, bonds, and provision of services or items required by the General Conditions [except for Security/Fire Guard Services and Temporary Heat]. If the Project requires Security/Fire Guard Services and/or Temporary Heat, such service(s) will be included as separate line items in the Bid Breakdown.

(C) If an item is set forth in the Bid Breakdown, but is not included in the Contract Documents (Drawings, Specifications, General Conditions, and/or Addenda), the bidder is advised to leave the item blank and exclude the cost of the item from its grand total. In an attachment to its Bid Breakdown, the bidder shall provide a list of all items left blank.

(D) If an item is not set forth in the Bid Breakdown, but is included in the Contract Documents (Drawings, Specifications, General Conditions, and/or Addenda), the bidder is advised to add the item to its Bid Breakdown and include the cost of the item in its grand total. In an attachment to its Bid Breakdown, the bidder shall provide a list of all items added.

Department of Design and Construction

CONTRACTOR'S BID BREAKDOWN FORM

CONTRACT 1 - GENERAL CONSTRUCTION

Project: Staten Island 1 & 3 Garage - Phase II
Location: 1000 West Service Road, Staten Island, NY 10314
Bidder: PRISMATIC DEVELOPMENT

DDC ID: S136-367
Sponsor Agency: DSNY

CSI Number	Description	Quantity	Unit	Unit Cost of Material	Total Cost of Material	Unit Cost of Labor	Total Cost of Labor	Total Cost: Materials and Labor
	CONTRACT 1 - GENERAL CONSTRUCTION WORK							
01 0000	**GENERAL REQUIREMENTS**							
01 3234	**BUILDING INFORMATION MODELING (BIM) PROTOCOL**							
	Building Information Modeling (BIM) Protocol, (5) BIM draftsman for the trades (Structural, MEP, Elect/FA/LV, Plumbing, FP), BIM Manager/Coordinator.	1	LS	$0.00	$0.00	$86,500.00	$86,500	$86,500
	Subtotal							$86,500
01 4339	**FAÇADE MOCKUP TESTING & SAMPLES**							
	Façade Mock Up Testing and Samples; laboratory testing	1	LS	$0.00	$0.00	$109,200.00	$109,200	$109,200
	Subtotal							$109,200
01 8000	**BUILDING ENCLOSURE CONTRACTOR PERFORMANCE REQUIREMENTS**							
	Building Enclosure Contractor Performance Requirements	1	LS	$0	$0	$1,748,600	$1,748,600	$1,748,600
	Building Enclosure Commissioning Requirements	1	LS	$0	$0	$500,000	$500,000	$500,000
	Building Enclosure Functional Performance Test Protocol, includes all submittals	1	LS	$0	$0	$500,000	$500,000	$500,000
	Temporary Lighting	1	LS	$15,000	$15,000	$10,000	$10,000	$25,000
	Temporary Heat	1	LS	$60,888	$60,888	$91,332	$91,332	$152,220
	Security Guards	1	LS		$0	$522,623	$522,623	$522,623
	Mobilization	1	LS	$5,223,594	$5,223,594	$4,117,435	$4,117,435	$9,341,029
	Subtotal							$12,789,473
02 0000	**EXISTING CONDITIONS**							
02 0102	**VAPOR BARRIER INSTALLATION (included with 072100)**							
02 4119	**SELECTIVE DEMOLITION AND ALTERATION WORK**							
	Existing Building							
	Existing overhead doors (22'W x 16'6"H) to be demolished	6.0	EA	$0.00	$0	$10,400	$10,400	$10,400
	Demo of slab on grade	782.0	SF	$0.00	$0	$6	$4,997	$4,997
	Demo Curb+C38	53.0	SF	$0.00	$0	$10	$530	$530
	Remove Portion of existing beam	200.0	LF	$0.00	$0	$500	$500	$500
	Demo existing floor slab	72.0	SF	$0.00	$0	$8	$576	$576
	Demo existing roof slab	10.0	SF	$0.00	$0	$20	$200	$200
	Demo Interiors - partition, doors, finishes, sink, mirror, mezzanine storag	1.0	LS	$0.00	$0	$80,892	$80,892	$80,892
	Miscellaneous Demo	1.0	LS	$0.00	$0	$21,605	$21,605	$21,605

Department of Design and Construction

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CONTRACT 1 - GENERAL CONSTRUCTION

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Location: 1000 West Service Road, Staten Island, NY 10314
Bidder: PRISMATIC DEVELOPMENT

DDC ID: S136-367
Sponsor Agency: DSNY

CSI Number	Description	Quantity	Unit	Unit Cost of Material	Total Cost of Material	Unit Cost of Labor	Total Cost of Labor	Total Cost: Materials and Labor
	Protect Existing Building	1	LS	$500.00	$500	$800	$800	$1,300
	Subtotal							$121,000
03 0000	**CONCRETE**							
03 3000	New Building							
	Foundations							
	Pile Caps							
	Formwork	9,900.0	SF	$5.88	$58,255	$22.42	$221,924	$280,179
	Reinforcement	85,000.0	LB	$0.78	$66,689	$1.85	$157,196	$223,885
	Concrete - 5000 PSI	625.0	CY	$303.74	$189,840	$156.92	$98,072	$287,913
	Thickened Concrete - 5000 PSI as per 7/FO-204.00 & 13/FO-200.00	N/A	This is part of a pile cap and thus cost cannot be seperated					
	Grade Beams							
	Formwork	4,900.0	SF	$6.16	$30,206	$23.54	$115,333	$145,540
	Reinforced with 7#7 T&B & #4@10" OC Stirrups	63,000.0	LB	$0.78	$49,429	$2.02	$127,102	$176,530
	Concrete - 5000 PSI	270.0	CY	$303.74	$82,011	$169.25	$45,696	$127,707
	Piers (Column Pedestals)							
	Formwork	100.0	SF	$14.57	$1,457	$38.38	$3,838	$5,295
	Concrete - 5000 PSI	5.0	CY	$319.44	$1,597	$181.57	$908	$2,505
	Reinforcement	1,500.0	LB	$0.78	$1,177	$2.41	$3,615	$4,792
	Slab on Grade							
	Formwork	9,800.0	SF	$4.71	$46,205	$19.50	$191,100	$237,305
	Concrete - 5000 PSI	3,487.0	CY	$219.14	$764,154	$143.14	$499,131	$1,263,285
	Reinforcement	750,000.0	LB	$0.68	$340,780	$1.55	$824,061	$1,164,841
	3/4" Crushed Stone	3,600.0	CY	$65.01	$234,029	$0.25	$888	$234,917
	6" topping on 2,571 SF of S2 area as per FO-101B.00	48.0	CY	$300.00	$14,400	$220.00	$10,560	$24,960
	Walls							
	Formwork	12,300.0	SF	$6.16	$75,824	$23.54	$289,510	$365,334
	Concrete - 5000 PSI	218.0	CY	$303.74	$66,216	$169.25	$36,895	$103,112
	Reinforcement	78,000.0	LB	$0.84	$65,568	$2.13	$166,107	$231,675
	Assume Sump pit 2'x2'x2'	2.0	EA	$588.43	$1,177	$560.41	$1,121	$2,298
	Slab Covers for Pits	2.0		$336.25	$672	$168.12	$336	$1,009
	Formwork	100.0	SF	$6.72	$672	$25.78	$2,578	$3,250
	Concrete - 5000 PSI	1.0	CY	$280.21	$280	$145.71	$146	$426
	Reinforced with #6@12" EW T&B	500.0	LB	$0.78	$392	$2.13	$1,065	$1,457
	Structure							
	Suspended Slabs							

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	Concrete - 5000 PSI	670.0	CY	$325.04	$217,777	$240.98	$161,455	$379,232
	Reinforced w/ WWR 6x6-W4.0x4.0	10,000.0	LB	$0.78	$7,800	$1.74	$17,400	$88,265
	Additional #4 reinforcement as per plans	25,000.0	LB	$0.78	$19,500	$1.74	$43,500	$61,000
	Stair							
	Bulkhead Concrete stairs ; comprising 3 risers, overall 1 total flight; overall width 3'10", risers 7" high, treads 11" wide, one no. flight approx. 2'2" long overall; including Stainless steel guardrail 1" dia Ptd. Railing w/ post and stainless steel handrail; 16 LFR	1.0	FLT	$7,000.00	$7,000	$8,000.00	$8,000	$15,000
	Misc. Structure							
	5"W Bond Beam as per 2,3,4/S-300	190.0	LF	$4.00	$760	$4.00	$760	$1,520

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	6" Concrete as per 4/S-300	3.0	CY	$300.00	$900	$250.00	$750	$1,650
	Rebar - 2(#4)	300.0	LBS	$0.80	$240	$2.00	$600	$840
	Step on Slab 6"	50.0	LF	$10.00	$500	$12.00	$600	$1,100
	Equipment Pad @ roof	400.0	SF	$4.00	$1,600	$5.00	$2,000	$3,600
	Existing Building							
	Slab on Grade							
	Formwork	700.0	SF	$5.04	$3,531	$20.17	$14,122	$17,653
	Concrete - 5000 PSI	41.0	CY	$302.62	$12,408	$235.37	$9,650	$22,058
	Reinforcement	7,700.0	LB	$0.78	$6,041	$1.85	$14,240	$20,281
	Waterproofing	325.0	SF	$5.60	$1,821	$5.60	$1,821	$3,643
	Vapor Barrier	800.0	SF	$0.28	$224	$0.56	$448	$672
	3/4" Crushed Stone	26.0	CY	$67.25	$1,748	$67.25	$1,748	$3,497
	Cutting & Patching	1.0	LS	$4,500.00	$4,500	$4,500.00	$4,500	$9,000
	Salt Shed							
	Concrete - 5000 PSI	1,350.0	CY	$291.42	$393,411	$229.77	$310,189	$703,600
	Concrete - 4000 PSI		CY	Not Applicable				
	Reinforcement - #8@12" O.C.	0.0	LB	Not Applicable				
	Reinforcement #6@12" OC T&B	249,000.0	LB	$0.78	$195,360	$1.68	$418,629	$613,990
	Formwork	12,000.0	SF	$5.60	$67,250	$19.05	$228,648	$295,898
	3/4" Crushed Stone	205.0	CY	$69.49	$14,246	$26.90	$5,514	$19,760
	Vapor Barrier	8,140.0	SF	$0.28	$2,281	$0.90	$7,299	$9,580
	Household Goods							
	Concrete wall & footing @ recycling center	0.0	CY	Not Applicable				
	Gravel	0.0	CY	Not Applicable				
	Fence footing							
	Concrete	16.0	CY	$300.00	$4,800	$225.00	$3,600	8,400
	Reinforcement	3,000.0	LBS	$0.80	$2,400	$2.00	$6,000	8,400
	Formwork	1,456.0	SF	$4.00	$5,824	$15.00	$21,840	27,664
	Fuel Station							
	Slabs							

Department of Design and Construction

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	Concrete	47.0	CY	$290.00	$13,630	$220.00	$10,340	23,970
	Reinforcement	11,000.0	LB	$0.75	$8,250	$1.70	$18,700	26,950
	Formwork	265.0	SF	$4.75	$1,259	$19.00	$5,035	6,294
	9" Concrete SOG. @ Top of Fueling Station & 9" Concrete Suspended Slab. @ Top of Fueling Station							
	Concrete	89.0	CY	$296.00	$26,344	$220.00	$19,580	45,924
	Rebar - #5 @ 12" assumed	7,000.0	LB	$0.75	$5,250	$1.70	$11,900	17,150
	Formwork	100.0	SF	$4.75	$475	$1,900.00	$190,000	190,475
	Gas Dispenser Pad	150.0	SF	$17.00	$2,550	$1,300.00	$195,000	197,550
	Column Foundation							Included in Above
	Pier, 2'6"L x 2'6"W x 16'0"L	38.0	CY	$295.00	$11,210	$165.00	$6,270	17,480
	Rebar - 80LBS/CY	15,000.0	LB	$0.78	$11,700	$2.20	$33,000	44,700
	Formwork	1,400.0	SF	$13.50	$18,900	$35.00	$49,000	67,900
	F-14 Spread Footing	72.0	CY	$280.00	$20,160	$145.00	$10,440	30,600
	Rebar - 90LBS/CY	10,000.0	LB	$0.70	$7,000	$1.20	$12,000	19,000
	Formwork	700.0	SF	$5.00	$3,500	$20.00	$14,000	17,500
	Tank Structural Piers							Included in Above
	16" X 16" CMU Pier Grouted w/ 4 Bars of #6 per Pier & Truss type Horr. Reinf @ 16" O.C	56.0	EA	$150.00	$8,400	$800.00	$44,800	950
	Subtotal							$7,910,961
03 3300	**ARCHITECTURAL CAST-IN-PLACE CONCRETE**							
	Existing Building							
	Cast in place concrete stair from repair shop to garage level overall flight length 9'	1	FLT	$3,000.00	$3,000.00	$4,500.00	$4,500	7,500
	Subtotal							7,500
03 4500	**ARCHITECTURAL PRE-CAST CONCRETE**							
	New Building							
	Exterior Partitions							

Department of Design and Construction

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	Rainscreen							
	PCR-01 - 8" Precast Concrete Rainscreen System (Details @ A1-441 & Backup details @ EN1-001)	44000	SF	$38.58	$1,697,520	$58.96	$2,581,380	$4,278,900
	PCR-01 - 8" Precast Concrete Rainscreen System below grade	10000	SF	$38.58	$285,800	$58.96	$386,600	$972,400
	Central Stair							
	Tread finish w/ tread length 17'6"- Precast concrete with integral anti slip rake, metal pan with welded attachments	225	SF	$20.00	$4,500	$20.00	$4,500	$9,000
	Tread finish w/ tread length 6'6"- Precast concrete with integral anti slip rake, metal pan with welded attachments	167	SF	$20.96	$3,500.00	$20.96	$3,500	$7,000
	Subtotal							$5,267,300
04 0000	**MASONRY**							
04 2000	**UNIT MASONRY**							
	New Building							
	Interior Partitions							
	CMU Partitions							
	M4 - 4" CMU (Cores Grouted Solid) With Inverted Angle Deflection Track At Structure Above	128	SF	$5.40	$691	$36.72	$4,700	$5,391
	M4 - 4" CMU (Cores Grouted Solid) With Metal furring/ framing,2-1/2" Metal stud, thin brick one side Inverted Angle Deflection Track At Structure Above	286	SF	$5.40	$1,544	$36.72	$10,502	$12,046
	M4T1 - Nom. 4" CMU (Cores Grouted Solid) With Thinnest Wall Tile As Specified.	1396	SF	$5.40	$7,538	$36.72	$51,261	$58,800
	M4T1 - Provide 3-5/8" Metal Stud And Kickers At 48" OC. For Bracing To Structure Above.	660	SF	$5.40	$3,564	$36.72	$24,235	$27,799
	M6 - Nom. 6" CMU (Cores Hollow) With Inverted Angle Deflection Joint At Structure Above. Fill Deck Flutes Tight With Sound Attenuation Batts.	3410	SF	$7.13	$24,313	$43.20	$147,312	$171,625
	M6(1) - Nom. 6" CMU (Cores Hollow) With Inverted Angle Deflection Joint At Structure Above. Fill Deck Flutes Tight With Sound Attenuation Batts. - 1 - HR Fire rated barrier UL-U906	230	SF	$7.13	$1,640	$43.20	$9,936	$11,576
	M6(2) - Nom. 6" CMU (Cores Hollow) With Inverted Angle Deflection Joint At Structure Above. Fill Deck Flutes Tight With Sound Attenuation Batts. - 2 - HR Fire rated barrier UL-U906	7100	SF	$8.64	$61,344	$47.52	$337,392	$398,736
	M6B1 - Nom. 6" CMU (Cores Hollow) With Inverted Angle Deflection Joint At Structure Above. Also, thin brick on tabs mounting system over (3) layers 15# felt on corridor side. Fill Deck Flutes Tight With Sound Attenuation Batts.	461	SF	$48.60	$22,405	$106.92	$49,290	$71,695

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	M6B1(2) - Nom. 6" CMU (Cores Hollow) With Inverted Angle Deflection Joint At Structure Above. Also, thin brick on tabs mounting system over (3) layers 15# felt on corridor side. Fill Deck Flutes Tight With Sound Attenuation Batts. - 2 - HR Fire rated barrier UL-U906	830	SF	$50.76	$42,131	$109.08	$90,536	$132,667
	M6F0 - Nom. 6" CMU (Cores Hollow) With Inverted Angle Deflection Joint At Structure Above. Fill Deck Flutes Tight With Sound Attenuation Batts. On Room Side Of Partition, 5/8" Gwb On 7/8" Double-Leg Hat Channels (Rc-2) Spaced At 24" Oc. Max.	920	SF	$7.13	$6,560	$43.20	$39,744	$46,304
	M6F01T - Nom. 6" CMU (Cores Hollow) With Inverted Angle Deflection Joint At Structure Above. Fill Deck Flutes Tight With Sound Attenuation Batts. On Room Side Of Partition, 5/8" Gwb On 7/8" Double-Leg Hat Channels (Rc-2) Spaced At 24" Oc. Max. With Thinnest Wall Tile As Specified On One Side. Refer To Floor Plans For Side Of Partition To Receive Wall Tile.	1420	SF	$7.13	$10,125	$43.20	$61,344	$71,469
	M6F0T2 - Nom. 6" CMU (Cores Hollow) With Inverted Angle Deflection Joint At Structure Above. Fill Deck Flutes Tight With Sound Attenuation Batts. On Room Side Of Partition, 5/8" Gwb On 7/8" Double-Leg Hat Channels (Rc-2) Spaced At 24" Oc. Max. W/2-1/2" Metal Studs and tile one side With Full Cavity Sound Attenuation Batts On Room Side Of Partition.	2205	SF	$7.13	$15,722	$43.20	$95,256	$110,978
	M6F2 - Nom. 6" CMU (Cores Hollow) With Inverted Angle Deflection Joint At Structure Above. Fill Deck Flutes Tight With Sound Attenuation Batts. On Room Side Of Partition, 5/8" Gwb On 7/8" Double-Leg Hat Channels (Rc-2) Spaced At 24" Oc. Max. Except 2-1/2" Metal Studs With Full Cavity Sound Attenuation Batts On Room Side Of Partition.	1942	SF	$7.13	$13,846	$43.20	$83,894	$97,741
	M6T1 - Nom. 6" CMU (Cores Hollow) With Inverted Angle Deflection Joint At Structure Above. Fill Deck Flutes Tight With Sound Attenuation Batts.) With Thinnest Wall Tile As Specified On One Side.	8254	SF	$7.13	$58,851	$43.20	$356,573	$415,424
	M6T1(2) - Nom. 6" CMU (Cores Hollow) With Inverted Angle Deflection Joint At Structure Above. Fill Deck Flutes Tight With Sound Attenuation Batts.) With Thinnest Wall Tile As Specified On One Side.) Except Fire stop At Head Condition And All Penetrations And Openings As Required.	1207	SF	$8.64	$10,428	$46.63	$56,282	$66,711

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CONTRACTOR'S BID BREAKDOWN FORM

CONTRACT 1 - GENERAL CONSTRUCTION

Project: Staten Island 1 & 3 Garage - Phase II
Location: 1000 West Service Road, Staten Island, NY 10314
Bidder: PRISMATIC DEVELOPMENT

DDC ID: S136-367
Sponsor Agency: DSNY

CSI Number	Description	Quantity	Unit	Unit Cost of Material	Total Cost of Material	Unit Cost of Labor	Total Cost of Labor	Total Cost: Materials and Labor
	M8 - Nom. 8" CMU (Cores Hollow) With Inverted Angle Deflection Joint At Structure Above. Fill Deck Flutes Tight With Sound Attenuation Batts.	3622	SF	$8.91	$32,272	$46.63	$168,894	$201,166
	M8(1) - Nom. 8" CMU (Cores Hollow) With Inverted Angle Deflection Joint At Structure Above. Fill Deck Flutes Tight With Sound Attenuation Batts - 1 - HR Fire rated barrier UL-U905	4832	SF	$8.91	$43,053	$46.63	$225,316	$268,369
	M8(1) - Nom. 8" CMU (Cores Hollow) With Inverted Angle Deflection Joint At Structure Above. Fill Deck Flutes Tight With Sound Attenuation Batts - 2 - HR Fire rated barrier UL-U905	20570	SF	$8.91	$183,279	$46.63	$959,179	$1,142,458
	M8B1 - Nom. 8" CMU (Cores Hollow) With Inverted Angle Deflection Joint At Structure Above. Also, thin brick on tabs mounting system over (3) layers 15# felt on corridor side. Fill Deck Flutes Tight With Sound Attenuation Batts.	1027	SF	$50.22	$51,576	$106.92	$109,807	$161,383
	M8F0 - Nom. 8" CMU (Cores Hollow) With Inverted Angle Deflection Joint At Structure Above. Fill Deck Flutes Tight With Sound Attenuation Batts. On Room Side Of Partition, 5/8" Gwb On 7/8" Double-Leg Hat Channels (Rc-2) Spaced At 24" Oc. Max.	0	SF	$0.00	$0		$0	$0
	M8F0(2) - Nom. 8" CMU (Cores Hollow) With Inverted Angle Deflection Joint At Structure Above. Fill Deck Flutes Tight With Sound Attenuation Batts. On Room Side Of Partition, 5/8" Gwb On 7/8" Double-Leg Hat Channels (Rc-2) Spaced At 24" Oc. Max. - 2 - HR Fire rated barrier UL-U905	1813	SF	$8.91	$16,154	$46.63	$84,540	$100,694
	M8F2(2) - Nom. 8" CMU (Cores Hollow) With Inverted Angle Deflection Joint At Structure Above. On Room Side Of Partition, 5/8" Gwb On On One Side Of 2 1/2" Metal Studs With Full Cavity Sound Attenuation Batts - 2 - HR Fire rated barrier UL-U905	1070	SF	$8.91	$9,534	$46.63	$49,894	$59,428
	M8F6(2) - Nom. 8" CMU (Cores Hollow) With Inverted Angle Deflection Joint At Structure Above. On Room Side Of Partition, 5/8" Gwb On One Side Of 6" Metal Studs With Full Cavity Sound Attenuation Batts - 2 - HR Fire rated barrier UL-U905	240	SF	$8.91	$2,138	$46.63	$11,191	$13,330
	M8T(2)- 2-Wyth Nom. 8" CMU(Cores Hollow Or Solid) With Inverted Angle Deflection Joint At Structure Above And Thinnest Wall Tile On Both Sides. Grout Solid Between CMU And Provide Masonry Ties At 24" Oc. Vertically Between Courses.	147	SF	$9.72	$1,429	$47.52	$6,985	$8,414
	M8T1 - Nom. 8" CMU (Cores Hollow). With Thinnest Wall Tile As Specified On One Side.	271	SF	$8.91	$2,415	$45.36	$12,293	$14,707

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CSI Number	Description	Quantity	Unit	Unit Cost of Material	Total Cost of Material	Unit Cost of Labor	Total Cost of Labor	Total Cost: Materials and Labor
	M8T1B1(1) - Nom. 8" CMU (Cores Hollow). With Thinnest Wall Tile As Specified On One Side.) With Thin Brick On Tabs Mounting System Over (3) Layers 15# Felt On Corridor Side - 1-HR Fire Barrier UL-U905	1161	SF	$50.22	$58,305	$57.24	$66,456	$124,761
	10" CMU	550	SF	$10.10	$5,555	$48.10	$26,455	$32,010
	M12 - Nom. 12" CMU (Cores Hollow) With Inverted Angle Deflection Joint At Structure Above	3540	SF	$10.21	$36,143	$48.10	$170,274	$206,417
	M12 - Nom. 12" CMU (Cores Hollow) With Inverted Angle Deflection Joint At Structure Above , Fire stop at head condition and all penetrations and opening as required - 1-HR Fire Barrier UL-U905	0	SF	See item below - no differentiation				
	M12 - Nom. 12" CMU (Cores Hollow) With Inverted Angle Deflection Joint At Structure Above , Fire stop at head condition and all penetrations and opening as required - 2-HR Fire Barrier UL-U905	4995	SF	$10.21	$50,999	$48.10	$240,260	$291,258
	4" concrete masonry unit below grade (Details @ A1-425/1)	310	SF	$7.56	$2,344	$39.96	$12,388	$14,731
	Parapet 8" CMU @ Green Roof - 2'6"H (Details @ A1-422/6)	725	LF	$8.21	$5,952	$42.12	$30,537	$36,489
	Existing Building							$0
	Masonry wall - 4"Thick	542	SF	$7.56	$4,098	$36.72	$19,902	$24,000
	Masonry wall - 6"Thick	1,192	SF	$8.21	$9,786	$42.12	$50,207	$59,993
	Masonry wall - 6"Thick @Elevator	995	SF	$8.21	$8,169	$84.24	$83,819	$91,988
	Subtotal							$4,550,558
04 9000	**MASONRY RESTORATION AND CLEANING**							
	Lintel Repair (assumed on all the doors being reinstalled)	164	LF	$12.00	$1,968	$15.00	$2,460	4,428
	Lintel for New Openings (assumed on all the new doors)	164	LF	$15.00	$2,460.00	$20.00	$3,280	5,740
	Subtotal							10,168
05 0000	**METALS**							
05 1200	**STRUCTURAL STEEL**							
	Structural Steel							
	New Building							
	Steel Structure							
	HSS-Beams	105.0	TN	$2,023.00	$212,415	$4,010.00	$421,050	$633,465
	C-Beams	10.0	TN	$1,348.00	$13,480	$4,828.00	$48,280	$61,760
	WT-Beams	4.0	TN	$2,000.00	$10,000	$2,000.00	$10,000	$20,000
	W-Beams	310.0	TN	$1,251.00	$387,881	$3,875.00	$1,201,339	$1,589,220
	Elevator Hoist Beam - S10x25.4	0.75	TN	$2,000.00	$1,500	$2,000.00	$1,500	$3,000

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	Column	167.0	TN	$1,461.00	$243,987	$5,185.00	$865,895	$1,109,882
	Dunnage	584.0	TN	$1,124.00	$656,415	$4,110.00	$2,400,242	$3,056,656
	Moment Connection	50.0	EA	$300.00	$15,000	$300.00	$15,000	$30,000
	Base Plate	50.0	EA	$200.00	$10,000	$200.00	$10,000	$20,000
	Misc. Structure							
	C6x8.2 @ Cantilever of Soffit							
	Steel - 1'6"W	0.0	TN	Not Applicable				
	L-Channel as per 4/S-300							
	Steel - 2'W	10.0	TN	$1,349.00	$13,490	$4,830.00	$48,300	$61,790
	Existing Building							
	Structure							
	Steel Members; W-Beams, WT-Beams, HSS-Beams, Elevator Hoist Beam, HSS-Posts	2.0	TN	$1,686.00	$3,372	$89,900.00	$179,800	$183,172
	Miscellaneous							
	Moment Connections	10.0	EA	$500.00	$5,000	$500.00	$5,000	$10,000
	Salt Shed							
	Structure							
	Slab							
	R-2, 3" Metal Deck 18 GA	6,800.0	SF	$2.86	$19,467	$2.86	$19,467	$38,934
	Concrete		CY	Duplicate of item in concrete				
	Steel Structure; W-Beams, HSS-Beamsl 40LH16 Joist, W-Columns	69.0	TN	$1,800.00	$124,200	$4,493.00	$310,017	$414,217
	Base Plates		EA					$5,000
	Column Base Plates							
	BP-6, 19"x14"x1", w/ 7/8" dia anchor rods, 18" Embedment	9.0	EA	$575.00	$5,180	$575.00	$5,180	$5,000
	BP-7, 14"x19"x1", w/ 7/8" dia anchor rods, 18" Embedment	2.0	EA	$580.00	$1,160	$580.00	$1,160	$5,000
	BP-8, 14"x19"x1", w/ 7/8" dia anchor rods, 18" Embedment	2.0	EA	$580.00	$1,160	$580.00	$1,160	$5,000
	Fuel Station							
	Structure							
	W-Section Beam	80.0	TN	$1,348.00	$107,840	$2,862.00	$228,960	$336,801
	W-Section Column	10	TN	$1,574.10	$15,741	$3,482.00	$34,820	$50,561
	Subtotal							$7,639,457
05 2100	**STEEL JOIST FRAMING**							
	New Building							
	Joist beam							
	18LH05	14	TN	$1,756.44	$24,590	$951.42	$13,320	$37,910
	32LH13	153	TN	$1,756.44	$268,735	$951.42	$145,567	$414,302

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CSI Number	Description	Quantity	Unit	Unit Cost of Material	Total Cost of Material	Unit Cost of Labor	Total Cost of Labor	Total Cost: Materials and Labor
	40LH16	37	TN	$1,756.44	$64,988	$951.42	$35,203	$100,191
	Subtotal							$552,403
05 3100	**STEEL DECKING**							
	Existing Building							
	Roofing							
	3" Metal Deck Roofing 18GA	100.0	SF	$2.25	$225	$4.14	$414	$639
	New Building							
	Floor Structure							
	S3 - 3.25" LWC Slab over 3" Metal Deck (Type 3VLi by vulcraft or approved equivalent) Reinforced w/ WWR 6x6-W4.0xW4.0	31,000.0	SF	$2.05	$63,550	$3.05	$94,550	$158,100
	S4 - 3" Concrete slab over 3" Metal Deck (Type 3N18 by vulcraft or approved equivalent) Reinforced with WWR 6x6-W4.0xW4.0	11,000.0	SF	$2.25	$24,725	$3.37	$37,062	$56,100
	1" Thick Continuous Bent Plates as PourStop W/ 3/4" dia x 4" Headed Stud @ 16" OC. Miter Plate at corners. See detail - 3,4/S1-300	750.0	LF	$10.00	$7,500	$10.00	$7,500	$15,000
	Composite Slab ; 6" Metal Deck @ S-100		SF	Included in 033000				
	Deflection Track w/ Acoustic insulation tight to underside of deck	200.0	LF	$2.00	$400	$2.00	$400	$800
	Roof Structure							
	R1 - 1.5" Metal deck 16 GA. (Type 1.5B by Vulcraft or approved equivalent)	101,000.0	SF	$2.05	$207,050	$3.05	$308,050	$515,100
	Roof Edge bent Plate 3/8" Continuous 8/S1-410	1000	LF	$10.00	$10,000.00	$10.00	$10,000	$20,000
	Subtotal							$765,739
05 4000	**COLD FORMED METAL FRAMING**							
	New Building							
	PV panels							
	6" cold formed metal framing fill cavity with closed cell spray foam insulation	92156	SF	$5.31	$489,600.00	$12.40	$1,142,400	$1,632,000
	Subtotal							$1,632,000
05 5000	**MISCELLANEOUS METALS**							
	Existing Building							
	Misc Metals	1.0	SF	$10,000.00	$10,000	$10,000.00	$10,000	$20,000
	Ramp							
	Stainless steel guardrail 1" dia Ptd. Railing w/ post and stainless steel handrail	20.0	LF	$750.00	$15,000	$750.00	$15,000	$30,000
	New Building							

Department of Design and Construction

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Location: 1000 West Service Road, Staten Island, NY 10314
Bidder: PRISMATIC DEVELOPMENT

DDC ID: S136-367
Sponsor Agency: DSNY

CSI Number	Description	Quantity	Unit	Unit Cost of Material	Total Cost of Material	Unit Cost of Labor	Total Cost of Labor	Total Cost: Materials and Labor
	Misc. Structure							
	HSS Rail @ Opening	1.0	EA	$5,000.00	$5,000	$5,000.00	$5,000	$10,000
	Expansion Joint	100.0	LF	$100.00	$10,000	$100.00	$10,000	$20,000
	Structural Bracing to Storefront	1.0	LS		$2,500		$2,500	$5,000
	Non penetrated elevated walkway as per Note12/A1-103	2,965.0	SF	$0.84	$2,500	$0.84	$2,500	$5,000
	Elevator							
	Elevator Pit Ladder - 8'-0" H	4.0	EA	$1,500.00	$6,000	$1,500.00	$6,000	$12,000
	Miscellaneous metals (Gratings, Wall Protection, Dunnage, etc)	1	LS		$242,000.00		$198,000	$440,000
	Subtotal							$542,000
05 5100	**STEEL PAN STAIRS**							
	Existing Building							
	Stair C - Metal pan stairs w/ cast in place concrete; comprising 9 risers, overall 1 total flight; overall width 4'4", risers 7" high, treads 11" wide, one no. Including Stainless steel guardrail 1" dia Ptd. Railing w/ post and stainless steel handrail dia 1 1/2", w/ stair channel stringer	0.0	FLT	Not Applicable - Stair C is a concrete stair				
	Handrail	20.0	LF	$50.00	$1,000	$50.00	$1,000	$2,000
	Stainless steel handrail dia 1 1/2"	0.0	LF	Not applicable				
	New Building							
	Stairs							
	Central stair Metal pan stairs w/ cast in place concrete; comprising 14 No of. 17' 6"X11" Tread and 28 No. of 6'6"X11' Tread, overall 1 total flight; 30' long overall; including Stainless steel guardrail 1" dia Ptd. Railing w/ post and stainless steel handrail	3.0	FLT	$8,333.33	$25,000	$8,333.33	$25,000	$50,000
	Stainless steel guardrail 1" dia Ptd. Railing w/ post and stainless steel handrail	88.0	LF	$125.00	$11,000	$125.00	$11,000	$22,000.00
	Stainless steel handrail dia 1 1/2"	70.0	LF	$78.57	$5,500	$78.57	$5,500	$11,000.00
	Stair 1 -Metal pan stairs w/ cast in place concrete; comprising 30 risers, 29 treads, overall 1 total flight; overall width 4'4", risers 7" high, treads 11" wide, one no. flight approx. 30' long overall; including Stainless steel guardrail 1" dia Ptd. Railing w/ post and stainless steel handrail dia 1 1/2", w/ stair channel stringer 1' wide painted to match ceiling; 175 LFR	1.0	FLT	$7,500.00	$7,500	$7,500.00	$7,500	$15,000.00
	Stainless steel guardrail 1" dia Ptd. Railing w/ post and stainless steel handrail	57.0	LF	$131.58	$7,500	$131.58	$7,500	$15,000.00

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CSI Number	Description	Quantity	Unit	Unit Cost of Material	Total Cost of Material	Unit Cost of Labor	Total Cost of Labor	Total Cost: Materials and Labor
	Stainless steel handrail dia 1 1/2"	74.0	LF	$74.32	$5,500	$74.32	$5,500	$11,000.00
	Stair-2 Metal pan stairs w/ cast in place concrete; comprising 30 risers, overall 1 total flight; overall width 4'4", risers 7" high, treads 11" wide, one no. flight approx. 29' long overall; including Stainless steel guardrail 1" dia Ptd. Railing w/ post and stainless steel handrail; 175 LFR	1.0	FLT	$7,500.00	$7,500	$7,500.00	$7,500	$15,000.00
	Stainless steel guardrail 1" dia Ptd. Railing w/ post and stainless steel handrail	57.0	LF	$131.58	$7,500	$131.58	$7,500	$15,000.00
	Stainless steel handrail dia 1 1/2"	74.0	LF	$74.32	$5,500	$74.32	$5,500	$11,000.00
	Stair-3 Metal pan stairs w/ cast in place concrete; comprising 30 risers, overall 1 total flight; overall width 3'6", risers 7" high, treads 11" wide, one no. flight approx. 30' long overall; including Stainless steel guardrail 1" dia Ptd. Railing w/ post and stainless steel handrail; 150 LFR	3.0	FLT	$3,000.00	$9,000	$3,000.00	$9,000	$18,000.00
	Stainless steel guardrail 1" dia Ptd. Railing w/ post and stainless steel handrail	67.0	LF	$126.87	$8,500	$126.87	$8,500	$17,000.00
	Stainless steel handrail dia 1 1/2"	66.0	LF	$75.76	$5,000	$75.76	$5,000	$10,000.00
	Stair -4 Metal pan stairs w/ cast in place concrete; comprising 54 risers, overall 1 total flight; overall width 4', risers 7" high, treads 11" wide, one no. flight approx. 52' long overall; including Stainless steel guardrail 1" dia Ptd. Railing w/ post and stainless steel handrail; 297 LFR	6.0	FLT	$2,250.00	$13,500	$2,250.00	$13,500	$27,000.00
	Stainless steel guardrail 1" dia Ptd. Railing w/ post and stainless steel handrail	66.0	LF	$128.79	$8,500	$128.79	$8,500	$17,000.00
	Stainless steel handrail dia 1 1/2"	124.0	LF	$76.61	$9,500	$76.61	$9,500	$19,000.00
	Swing gate under handrail w/ spring hinge to return to closed position	3.0	LF	$166.67	$500	$166.67	$500	$1,000.00
	Stair -5 Metal pan stairs w/ cast in place concrete; comprising 33 risers, overall 1 total flight; overall width 3'10", risers 7" high, treads 11" wide, one no. flight approx. 30' long overall; including Stainless steel guardrail 1" dia Ptd. Railing w/ post and stainless steel handrail; 176 LFR	3.0	FLT	$2,833.33	$8,500	$2,833.33	$8,500	$17,000.00
	Stainless steel guardrail 1" dia Ptd. Railing w/ post and stainless steel handrail	79.0	LF	$126.58	$10,000	$126.58	$10,000	$20,000.00
	Stainless steel handrail dia 1 1/2"	74.0	LF	$74.32	$5,500	$74.32	$5,500	$11,000.00
	Bulkhead Stair							
	Stainless steel guardrail 1" dia Ptd. Railing w/ post and stainless steel handrail	10.0	LF	$200.00	$2,000	$200.00	$2,000	$4,000.00
	Stainless steel handrail dia 1 1/2"	10	LF	$150.00	$1,500.00	$150.00	$1,500	$3,000.00

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	Subtotal							$331,000.00
05 7000	**ORNAMENTAL METALS (included w/ 055000)**							
05 7113	**ORNAMENTAL METAL STAIRS (included w/ 055100)**							
06 0000	**WOOD, PLASTICS AND COMPOSITES**							
06 2000	**CARPENTRY**							
	New Building							
	Rough carpentry	6,958.0	SF	$2.36	$16,425	$4.30	$29,913	$46,338.00
	Wood blocking	1,749.0	LF	$1.55	$2,707	$9.04	$15,804	$18,510.65
	PT Blocking - 1'6"W @ Roof Parapet (Details @ A1-421)	1,673.0	LF	$16.01	$26,782	$37.86	$63,345	$90,126.91
	PT Blocking - 1'6"W @ mech. Tarrace Parapet (Details @ A1-423)	103.0	LF	$16.74	$1,725	$37.74	$3,887	$5,611.56
	Bathroom Counter	0.0	LF		$0		$0	$0.00
	Interior Paritions; Blocking	208.0	SF	$3.80	$790	$13.57	$2,822	$3,612.61
	OSHA Protection	1	LS		$7,500.00		$7,500	$15,000.00
	Subtotal							$179,200
06 4023	**ARCHITECTURAL WOODWORK**							
	New Building							
	Millwork - Locker Room							
	4 Seat Bench	3.0	EA	$150.00	$450	$80.00	$240	$690.00
	5 Seat Bench	54.0	EA	$150.00	$8,100	$80.00	$4,320	$12,420.00
	5 Seat Bench @ ADA	12.0	EA	$150.00	$1,800	$80.00	$960	$2,760.00
	Solid Surface Countertop w/ Fused Apron And Backsplash On 3/4" Marine Grade MDF	125.0	LF	$400.00	$50,000	$135.08	$16,885	$66,885
	Millwork - Lunch Rooms							
	Millwork - Second Floor - Lunch Room 203, 202							
	W/PL-01 - Plastic Laminate, Manuf. Wilsonart, Series - Solicore or approved equivalent, designer white w/ matte finish - Upper Cabinet w/d Double Door - 1'0"W X 1'4"H	18.0	LF	$702.42	$12,643	$183.71	$3,307	$15,950
	W/PL-01 - Plastic Laminate, Manuf. Wilsonart, Series - Solicore or approved equivalent, designer white w/ matte finish - Upper Cabinet w/d Double Door - 1'0"W X 3'0"H	40.0	LF	$1,026.61	$41,064	$313.39	$12,535	$53,600
	W/SSM01 - Solid surface, Manuf. Dupont, series - Corian or approved equivalent, glacier white - Base Cabinet - 2'5"W X 7'3"H	9.0	LF	$3,133.85	$28,205	$324.19	$2,918	$31,122

Department of Design and Construction

CONTRACTOR'S BID BREAKDOWN FORM

CONTRACT 1 - GENERAL CONSTRUCTION

Project: Staten Island 1 & 3 Garage - Phase II
Location: 1000 West Service Road, Staten Island, NY 10314
Bidder: PRISMATIC DEVELOPMENT

DDC ID: S136-367
Sponsor Agency: DSNY

CSI Number	Description	Quantity	Unit	Unit Cost of Material	Total Cost of Material	Unit Cost of Labor	Total Cost of Labor	Total Cost: Materials and Labor
	W/SSM01 - Solid surface, Manuf. Dupont, series - Corian or approved equivalent, glacier white - Base Cabinet Countertop - 2'6"H	40.0	LF	$864.51	$34,580	$97.26	$3,890	$38,471
	W/SSM01 - Solid surface, Manuf. Dupont, series - Corian or approved equivalent, glacier white - Base Cabinet w/d Double Door - 2'5"W X 2'6"H	24.0	LF	$1,026.61	$24,639	$189.11	$4,539	$29,177
	W/SSM01 - Solid surface, Manuf. Dupont, series - Corian or approved equivalent, glacier white - Base Drawers - 1'4"H	15.0	LF	$1,102.25	$16,534	$189.11	$2,837	$19,370
	Millwork - Reception desk @ First Floor - District office suite 116, 109			$0.00	$0	$0.00	$0	$0
	W/SSM01 - Solid surface, Manuf. Dupont, series - Corian or approved equivalent, glacier white - Base Drawers - 7"H	6.0	LF	$1,102.25	$6,614	$183.71	$1,102	$7,716
	W/PL02 - Plastic laminate, Manuf. Formica or approved equivalent, series - colorcore2, fog color w/ matte finish - Base Cabinet w/d double door - 1'8"W X 2'6"H	50.0	LF	$1,566.93	$78,346	$183.71	$9,185	$87,532
	W/PL02 - Plastic laminate, Manuf. Formica or approved equivalent, series - colorcore2, fog color w/ matte finish- Countertop - 1'8"W X 2'6"H	52.0	LF	$513.30	$26,692	$97.26	$5,057	$31,749
	W/PL02 - Plastic laminate, Manuf. Formica or approved equivalent, series - colorcore2, fog color w/ matte finish- Countertop - 1'5"W	38.0	LF	$459.27	$17,452	$81.05	$3,080	$20,532
	W/PT01 - Paint - beneath Countertop - 1'5"H	52.0	LF	$37.82	$1,967	$37.82	$1,967	$3,934
	W/PL02 - Plastic laminate, Manuf. Formica or approved equivalent, series - colorcore2, fog color w/ matte finish - Door - 3'0"L X 2'6"H	2.0	EA	$2,863.69	$5,727	$702.42	$1,405	$7,132
	Millwork - First Floor - District office suite kitchenette							
	W/PL02 - Plastic laminate, Manuf. Formica or approved equivalent, series - colorcore2, fog color w/ matte finish- Base Cabinet w/d double door - 2'5"W X 2'10"H	12.0	LF	$1,026.61	$12,319	$183.71	$2,205	$14,524
	W/PL02 - Plastic laminate, Manuf. Formica or approved equivalent, series - colorcore2, fog color w/ matte finish- Countertop - 2'5"W	24.0	LF	$513.30	$12,319	$162.10	$3,890	$16,210
	W/PL02 - Plastic laminate, Manuf. Formica or approved equivalent, series - colorcore2, fog color w/ matte finish- Drawers - 2'5"W X 1'4"H	12.0	LF	$1,102.25	$13,227	$183.71	$2,205	$15,432
	W/PL02 - Plastic laminate, Manuf. Formica or approved equivalent, series - colorcore2, fog color w/ matte finish- Drawers - 2'5"W X 7"H	12.0	LF	$1,102.25	$13,227	$183.71	$2,205	$15,432

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CONTRACT 1 - GENERAL CONSTRUCTION

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DDC ID: S136-367
Sponsor Agency: DSNY

CSI Number	Description	Quantity	Unit	Unit Cost of Material	Total Cost of Material	Unit Cost of Labor	Total Cost of Labor	Total Cost: Materials and Labor
	W/PL02 - Plastic laminate, Manuf. Formica or approved equivalent, series - colorcore2, fog color w/ matte finish- Upper Cabinet w/d double door - 1'2"W X 3'0"H	24.0	LF	$1,026.61	$24,639	$313.39	$7,521	$32,160
	W/PL02 - Plastic laminate, Manuf. Formica or approved equivalent, series - colorcore2, fog color w/ matte finish- Upper Cabinet w/d double door - 2'5" X 1'5"H	14	LF	$739.09	$10,347	$154.00	$2,156	$12,503
	Subtotal							$535,300
07 0000	**THERMAL AND MOISTURE PROTECTION**							
07 0001	**RAINSCREEN SYSTEM**							
	MP-01A - Corrugated metal panel rainscreen - Metal panel cladding on pcr-01 precast rainscreen system. (Detail @ EN1-001)		SF	duplication - See section 074214				
	GB-01 - Glazed brick rainscreen (Details @ A1-422/1)	750	SF	$34.75	$26,063	$54.32	$40,740	$66,803
	8" CMU wall backup	1600	SF	$8.91	$14,256	$44.28	$70,848	$85,104
	6" CMU wall backup (Details @ A1-422/1)	725	SF	$8.21	$5,950	$42.11	$30,530	$36,480
	GFB-01 - Ground face ACMU rainscreen (Detail @ EN1-001)	1420	SF	$30.58	$43,424	$40.04	$56,857	$100,280
	GFB-01A - Ground face ACMU rainscreen (Detail @ EN1-001)	4110	SF	$33.56	$137,932	$62.94	$258,683	$396,615
	Subtotal							$685,282
07 1326	**SHEET MEMBRANE WATERPROOFING (included w/ 075216)**							
07 1816	**VEHICULAR TRAFFIC COATINGS (included w/ 321216)**							
07 2000	**THERMOPLASTIC MEMBRANE ROOFING (included w/ 075216)**							
07 2100	**THERMAL INSULATION**							
	2" Rigid insulation to slab-on-grade							
	USPI - Underslab perimeter insulation - 2" thick rigid insulation extending horizontally under interior building slab (min. 6" concrete), 4'-0" from interior face of stem wall (Details @ EN1-002)	8,500.0	SF	$1.40	$11,900	$2.40	$20,400	$32,300

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CONTRACT 1 - GENERAL CONSTRUCTION

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DDC ID: S136-367
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CSI Number	Description	Quantity	Unit	Unit Cost of Material	Total Cost of Material	Unit Cost of Labor	Total Cost of Labor	Total Cost: Materials and Labor
	SWPI - Stem-wall perimeter insulation - 2" Thick rigid insulation applied vertically to exterior face of stem wall and continuous on exterior face of all perimeter foundation walls (Details @ EN1-001)	6,400.0	SF	$1.40	$8,960	$2.40	$15,360	$24,320
	Elevator bulkhead							
	Wall Insulation for Elevator Bulkhead							
	Mineral Wool Insulation - 4" thk	0.0	SF	Not Applicable				
	6" Min Tapered Insulation	1,150.0	SF	$3.48	$4,000	$4.35	$5,000	$9,000
	Backup to façade							
	MP-01 - Backup (Details @ EN1-001)							
	Mineral wool insulation	8,800.0	SF	$0.75	$6,600	$1.00	$8,800	$15,400
	MP-02A -Backup (Details @ EN1-001)							
	Mineral wool insulation	2,355.0	SF	$0.75	$1,766	$1.00	$2,355	$4,121
	MP-03 - Backup (Details @ EN1-001)							
	Mineral wool insulation	2,723.0	SF	$0.75	$2,042	$1.00	$2,723	$4,765
	MP-04 - Backup (Details @ EN1-001)							
	Mineral wool insulation	1,718.0	SF	$0.75	$1,289	$1.00	$1,718	$3,007
	MP-06 - Backup (Details @ EN1-001)							
	Mineral wool insulation	2,078.0	SF	$0.75	$1,559	$1.00	$2,078	$3,637
	MP-06 - Flat metal panel fasia & soffit (Detail @ EN1-002)							
	Mineral wool insulation	2,700.0	SF	$0.75	$2,025	$1.00	$2,700	$4,725
	MP-07 - Backup (Details @ EN1-001)							
	Mineral wool insulation	4,482.0	SF	$0.75	$3,362	$1.00	$4,482	$7,844
	LV-01 - Louver system backup (Details @ EN1-001)							
	Mineral wool insulation	0.0	SF	Not Applicable				
	PCR-01 - Backup wall (Details @ EN1-001)							
	Mineral wool insulation	5,400.0	SF	$0.75	$4,050	$1.00	$5,400	$9,450
	Roof Covering							
	8-3/4" Rigid insulation	103,100	SF	$2.67	$275,000.00	$1.21	$125,000.00	$400,000.00
	Parapet to Green roof - Backup (Details @ A1-404)							
	1/2" Cover board	227	SF	$1.80	$408.00	$8.37	$1,900.00	$2,308.00
	4" rigid insulation	227	SF	$2.20	$500.00	$7.71	$1,750.00	$2,250.00
	Insulation	418	LF	$0.00		$4.19	$1,750.00	$1,750.00
	5/8" Glass-mat sheathing	227	SF	$0.50	$114.00	$4.00	$908.00	$1,022.00
	Tapered Insulation - 6" Insulation	1,150	SF	$3.04	$3,500.00	$4.78	$5,500.00	$9,000.00
	Subtotal							$534,898

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CSI Number	Description	Quantity	Unit	Unit Cost of Material	Total Cost of Material	Unit Cost of Labor	Total Cost of Labor	Total Cost: Materials and Labor
07 2129	**SPRAY-APPLIED THERMAL INSULATION**							
	Household Goods							
	Spray foam insulation	700	SF	$1.00	$700.00	$2.00	$1,400	$2,100
	Subtotal							$2,100
07 2701	**WEATHER RESISTIVE BARRIERS**							
	Main Building							
	Vapor Barrier to SOG	107,000.0	SF	$0.25	$26,750	$0.35	$37,450	$64,200
	Vapor Barrier/ Waterproofing to Pit Walls	1.0	LS	$5,000.00	$5,000	$3,200.00	$3,200	$8,200
	Vapor Barrier/Waterproofing to Grade Beams	3,300.0	SF	$4.00	$13,200	$3.00	$9,900	$23,100
	Vapor Barrier/Waterproofing to Pile Caps	0.0	SF	$0.00	$0	$0.00	$0	$0
	Vapor Barrier/Waterproofing to Knee Wall (Stem Wall)	1,300.0	SF	$4.00	$5,200	$3.00	$3,900	$9,100
	Weather Resistive barrier	56,656.0	SF	$2.72	$154,174	$6.34	$359,126	$513,300
	Thermally broken Supportive Framing on backup Wall		SF					
	Insulation includes black vapor permeable facer		SF					
	Back-up to Façade							
	Weather resistive barrier & Sheathing	33,000	SF	$0.40	$13,200	$0.60	$19,800	$33,000.00
	Black, vapor permeable facer	33000	SF	See above(duplication)				
	Subtotal							$650,900
07 4214	**METAL PANELS**							
	Main Building							
	MP-01 - Corrugated Metal Panel (Vertical) (Detail @ EN1-001) on Metal Stud	8800	SF	$26.78	$235,624.60	$48.20	$424,124	$659,749
	Metal Stud backup to Metal Panel	8800	SF	$2.00	$17,600.00	$3.50	$30,800.00	$48,400
	MP-01A - Corrugated metal panel rainscreen	11820	SF	$26.78	$316,486.68	$48.20	$569,676	$886,163
	MP-02 - Perforated corrugated metal panel rainscreen - Metal panel cladding system and support framing (Detail @ EN1-001)	1855	SF	$32.13	$59,602.31	$48.20	$89,403	$149,006
	MP-02A - Perforated corrugated metal panel rainscreen (Detail @ EN1-001) on Metal Stud	500	SF	$32.13	$16,065.31	$48.20	$24,098	$40,163
	Metal Stud backup to Metal Panel		SF					
	MP-03 - Ribbed metal panel rainscreen (Detail @ EN1-001) on Concrete	2723	SF	$26.78	$72,909.75	$48.20	$131,238	$204,147
	MP-04 - Corrugated metal panel (Detail @ EN1-001) on CMU	1718	SF	$26.78	$46,000.35	$48.20	$82,801	$128,801
	MP-05 - Flat metal panel rainscreen (Detail @ EN1-001)	615	SF	$34.27	$21,077.69	$53.55	$32,934	$54,012
	MP-06 - Flat metal panel rainscreen (Detail @ EN1-001)	5778	SF	$34.27	$198,027.48	$53.55	$309,418	$507,445

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	Metal Stud backup to Metal Panel	2355	SF	$2.00	$4,710.00	$3.50	$8,242	$12,952
	MP-06 - Flat metal panel fasia & soffit (Detail @ EN1-002)	inc above	SF					
	MP-07 - Flat metal panel soffit (Detail @ EN1-001)	4482	SF	$34.27	$153,610.10	$53.55	$240,016	$393,626
	Façade- Back-Up steel (z-clips)							
	Supportive Framing (framing)	38291	SF	$4.00	$153,164.00	$6.00	$229,746	$382,910
	Perforated corrugated metal panel Sunshade @ West Elevation 5'9" Wide with exposed steel structure support (Over CW01 system) (Detail @ EN1-001)	1000	SF	$10.00	$10,000.00	$10.00	$10,000	$20,000.00
	Existing Building							
	Façade							
	Existing metal infill panel at corners to remain, protect in place	200.0	SF	$1.00	$200.00	$1.00	$200	$400.00
	Existing metal infill panel to remain, repaint	0.0	SF	Not Applicable				
	Façade to new elevator bulkhead	0.0	SF	Not Applicable				$0.00
	Fuel Station							
	Soffit/Ceiling - 1' Linear plank aluminum ceiling - Hunter Douglas 300C Exterior or approved equivalen t- Sloped as per A5-101 - Assume non-insulated (Details on A5-101)	3480	SF	$11.78	$40,998.68	$40.70	$141,632	$182,630
	Metal Panel Shroud including support	750	SF	$22.00	$16,500.00	$31.00	$23,250	$39,750
	Fascia - Corrugated metal panel - 5/8" Exterior sheathing membrane 6" Cold formed metal framing hat channel w/ exposed fastener (Details on A5-201/2)	914	SF	$29.99	$27,409.57	$40.70	$37,199	$64,608
	Aluminum cladding at columns, as per note at A5-101/1	2	EA	$5,355.10	$10,710.21	$4,819.59	$9,639	$20,349
	Fuel monitor booth @ Fueling Station							
	Fuel monitor booth façade - MP-03 - Corrugated metal panel Centria or approved equivalent - Assume non-insulated	150	SF	$20.00	$3,000.00	$30.00	$4,500	$7,500.00
	Subtotal							$3,802,612
07 4646	**FIBER-CEMENT PANELS**							
	Main Building							
	FCP-01 - Fiber Cement Panel - Manuf. - Cembrit, Series - Solid or approved equivalent	3542	SF	53	$187,726.00	55	$194,810	$382,536
	Subtotal							$382,536
07 5216	**MODIFIED BITUMINOUS MEMBRANE ROOFING**							
	Main Building							
	Roof Covering							

Department of Design and Construction

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CSI Number	Description	Quantity	Unit	Unit Cost of Material	Total Cost of Material	Unit Cost of Labor	Total Cost of Labor	Total Cost: Materials and Labor
	CRS - Conventional roof system - Roof Membrane - Sika Sarnafil PVC (Details @ EN1-002) or approved equivalent	103,100	SF	$6.55	$675,000.00	$9.70	$1,000,000.00	$1,675,000.00
	Protection Board - 1/2" thk	103,100	SF	$0.97	$100,000.00	$0.73	$75,000.00	$175,000.00
	Roof board	103,100	SF	$1.84	$190,000.00	$1.84	$190,000.00	$380,000.00
	Outdoor Terrace @ Level 2							
	PVC roofing system	3,438	SF	$20.36	$70,000.00	$21.82	$75,000.00	$145,000.00
	PVC roof membrane	3,438	SF	$7.27	$25,000.00	$17.45	$60,000.00	$85,000.00
	1/2" Cover board	3,438	SF	$2.04	$7,000.00	$3.49	$12,000.00	$19,000.00
	Waterproofing		SF					
	Roof System at Elevator Bulkhead							
	Roof Membrane - Sika Sarnafil PVC or approved equivalent	1,150	SF	$7.83	$9,000.00	$10.43	$12,000.00	$21,000.00
	Protection Board - 1/2" thk	1,150	SF	$3.04	$3,500.00	$4.78	$5,500.00	$9,000.00
	Cont. Air Barrier		SF	included in 072701 - part of main building				
	PVC roof membrane w/sheathing		SF	Included in roof membrane at eve bulkhead above				
	Modified Bit Roofing		LS					
	Existing Building							
	Roofing system to new bulkhead @ Existing building	100	SF	$50.00	$5,000	$100.00	$10,000	$15,000
	Elevator bulkhead							
	Roof System at Elevator Bulkhead (Details @ A2-502)		SF	Duplicate - see above roofing				
	Salt Shed							
	Roof							
	Roof - Thermoplastic membrane with polyester reinforcing fabric and lacquer coating – Sarnafil by Sika (Details @ A3-302/2,3) or approved equivalent	6,233	SF	$11.00	$68,563.00	$19.00	$118,427.00	$186,990
	Protection Board - 1/2" thk	6233	SF	$0.97	$6,046.01	$1.00	$6,233.00	$12,279
	Fuel Station							
	Fueling Station Canopy - Continous Roofing Membrane	3,611	SF	$11.00	$39,721.00	$19.00	$68,609.00	$108,330
	Protection Board - 1/2"	3,611.0	SF	$0.97	$3,502.67	$1.00	$3,611.00	$7,114
	Fuel monitor booth roof		SF	$25.00	$0	$50.00	$0	$0
	Subtotal							$2,838,713
07 6201	**FAÇADE SHEET METAL FLASHINGS**							
	Main Building							
	Metal counter flashing @ Roof Parapet (Details @ A1-421)		LF					
	Prefabricated metal Coping and Hook strip @ Roof Parapet (Details @ A1-421)	1,532	LF	$16.32	$25,000.00	$26.11	$40,000.00	$65,000.00

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	Prefabricated metal Coping and Hook strip @ mech. Terrace Parapet (Details @ A1-423)	103	LF	$29.13	$3,000.00	$38.83	$4,000.00	$7,000.00
	Prefabricated Metal Coping 1'6"W @ Green Roof Parapet (Details @ A1-404)	227	LF	$17.62	$4,000.00	$22.03	$5,000.00	$9,000.00
	Metal counter flashing @ Roof Parapet (Details @ A1-421)	191	LF	$22.51	$4,300.00	$26.18	$5,000.00	$9,300.00
	Prefabricated Metal Coping @ Roof Parapet (Details @ A1-421)	1635	LF	$15.29	$25,000.00	$23.24	$38,000.00	$63,000.00
	4" x 3" Extruded alum angle w/ drip edge @ Mechanical terrace parapet (Details @ A1-422)	0	LF	Too small of a detail to break out				
	1 1/2" Galvanized hat channel @ Mechanical terrace parapet (Details @ A1-422)	0	LF	Too small of a detail to break out				
	Flashing		LF					
	Existing Building							
	Metal flashing w/ drip edge @ Elevetor bulkhead (Details @ A2-502)	40	LF	$21.25	$850.00	$25.00	$1,000.00	$1,850.00
	Metal gravel stop w/ drip edge @ Elevetor bulkhead (Details @ A2-502)	40	LF	$21.25	$850.00	$25.00	$1,000.00	$1,850.00
	Fuel Station							
	Prefinished Metal flashing @ Underside of canopy - 10" Wide (Details on A5-201/2)	249	LF	$6.00	$1,494	$11.00	$2,739	$4,233
	Prefinished Metal Coping and Blocking - 10" Wide (Details on A5-201/2)	249	LF	$20.00	$4,980	$36.00	$8,964	$13,944
	Subtotal							$175,177
07 7100	**ROOF SPECIALTIES AND ACCESSORIES**							
	Main Building							
	4"x3" extruded alum. angle w/ drip edge @ Corrugated panel to utility band at precast @ (Details @ A1-421/07 & 08)	1,072.0	LF	$1.00	$1,072	$1.00	$1,072	$2,144.00
	4"x8" extruded alum. angle w/ drip edge @ Curtainwall to utility band @ (Details @ A1-422/13)	248.0	LF	$1.00	$248	$1.00	$248	$496.00
	4" x 3" Extruded alum angle w/ drip edge @ Mechanical terrace parapet (Details @ A1-423/07)	100.0	LF	$1.00	$100	$1.00	$100	$200.00
	4" x 9" Extruded alum angle w/ drip edge @ Mechanical terrace (Details @ A1-423/09)	100.0	LF	$1.00	$100	$1.00	$100	$200.00
	1 1/2" Galvanized hat channel @ Roof Parapet (Details @ A1-421)	2,864.0	LF	$1.00	$2,864	$1.00	$2,864	$5,728.00
	1 1/2" Galvanized hat channel @ Mechanical terrace parapet (Details @ A1-423)	600.0	LF	$1.00	$600	$1.00	$600	$1,200.00
	Non-Penetrative Protective Guardrail - 3'6" H (Details @ A1-421)	1,400.0	LF	$1.00	$1,400	$1.00	$1,400	$2,800.00

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CSI Number	Description	Quantity	Unit	Unit Cost of Material	Total Cost of Material	Unit Cost of Labor	Total Cost of Labor	Total Cost: Materials and Labor
	4" x 3" Extruded alum angle w/ drip edge @ Roof Parapet (Details @ A1-421/13 & 14)	250.0	LF	$3.00	$750	$5.00	$1,250	$2,000.00
	Rooftop hatch & ladder	0.0	EA	$1.00	$0	$1.00	$0	$0.00
	4"x3" Extruded Aluminum angle w/ drip edge @ Roof Parapet	1,182.0	LF	$1.00	$1,182	$1.00	$1,182	$2,364.00
	Salt Shed							
	Overflow Scuppers @ Salt shed	0	EA	Not Applicable				$0.00
	Subtotal							$17,132.00
07 8100	**SPRAYED FIRE RESISTIVE MATERIALS**							
	Main Building							
	Fireproofing - Spray	0	LS	Duplicate item - See below				$0.00
	8" closed cell spray foam insulation Fire stopping smoke seal and insulation	32000	SF	$2.50	$80,000	$7.80	$249,600	$329,600.00
	PT-04 - Spray Fireproofing	185000	LS	$0.94	$173,900.00	$1.81	$334,850	$508,750.00
	Subtotal							$838,350
07 8123	**INTUMESCENT FIREPROOFING**							
	Main Building							
	Fireproofing - Instuscement Paint		TN					
	PT-02 - Intumescent Paint on Steel	5500	SF	$16.40	$90,200	$27.82	$153,000	$243,200
	Subtotal							$243,200
07 8413	**FIRESTOPS AND SMOKESEALS**							
	Main Building							
	Min.4 PCF Mineral wool Fire stopping to underside of Deck		LF					
	Fire stopping @ Roof Parapet (Details @ A1-421)		LF					
	Fire Stopping	2956	LS	$16.00	$47,303	$33.35	$98,597	$145,900
	Subtotal							$145,900
07 9200	**INTERIOR JOINT SEALANTS**							
	Main Building							
	Caulking & Sealing	1	LS	$49,156	$49,156	$114,694	$114,694	$163,850
	Subtotal							$163,850

Department of Design and Construction

CONTRACTOR'S BID BREAKDOWN FORM

CONTRACT 1 - GENERAL CONSTRUCTION

Project: Staten Island 1 & 3 Garage - Phase II
Location: 1000 West Service Road, Staten Island, NY 10314
Bidder: PRISMATIC DEVELOPMENT

DDC ID: S136-367
Sponsor Agency: DSNY

CSI Number	Description	Quantity	Unit	Unit Cost of Material	Total Cost of Material	Unit Cost of Labor	Total Cost of Labor	Total Cost: Materials and Labor
07 9201	**EXTERIOR JOINT SEALANTS**							
	Main Building							
	DEMC 7							
	Caulk air barrier		LF	Not Applicable				
	Gasketing upgrade, Multi-point locks for better seal		EA	Not Applicable				
	Heavily thermally broken insulated frames, passive house certified, membrane air barrier		LS	Not Applicable				
	Increased envelope tightness by incorporating additional air sealing measures							
	Exterior blower door testing							
	2 areas per level and to 2 levels		EA	Duplicate - See testing in general conditions				
	multiple levels at one time		EA	Duplicate - See testing in general conditions				
	whole building test		EA	Duplicate - See testing in general conditions				
	mock up		EA	Duplicate - See testing in general conditions				
	third party commissioning		DAY	Duplicate - See testing in general conditions				
	construction administration oversight		DAY	Duplicate - See testing in general conditions				
	Additional caulking / sealing - to seal all penetrations, seams, gaps and holes to whole building		SF	Not Applicable				
	Existing Building							
	Caulking	1	LS		$31,390		$73,243	$104,633
	Subtotal							$104,633
07 9500	**EXTERIOR JOINT SEALANTS**							
	Main Building							
	2" Expansion Joint	180	LF	$105.06	$18,912	$50	$9,006	$27,917
	Subtotal							$27,917
08 0000	**OPENINGS**							
08 1113	**STEEL DOORS AND FRAMES**							
	New Building							
	Exterior Doors							
	Single Flush Door							
	Single Flush Swing Door - 3' - 0" X 8' - 4" - HM , PTD , Frame - HM	1	EA	$1,700.00	$1,700.00	$750.00	$750.00	$2,450.00
	Single Flush Swing Door - 3' - 0" X 7' - 10" - HM , PTD , Frame - HM	3	EA	$1,700.00	$5,100.00	$750.00	$2,250.00	$7,350.00

Department of Design and Construction

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Bidder: PRISMATIC DEVELOPMENT

DDC ID: S136-367
Sponsor Agency: DSNY

CSI Number	Description	Quantity	Unit	Unit Cost of Material	Total Cost of Material	Unit Cost of Labor	Total Cost of Labor	Total Cost: Materials and Labor
	Single Flush Swing Door - 3' - 6" X 8' - 0" - HM , PTD , Frame - HM- 90 MIN.	1	EA	$1,700.00	$1,700	$750.00	$750	$2,450
	Single Flush Swing Door w/ Vision Lite - 3' - 0" X 7' - 0" - HM , PTD , Frame - HM- 90 MIN.	2	EA	$1,700.00	$3,400	$750.00	$1,500	$4,900
	Double Flush Door							
	Double Flush Swing Doors w/ Full Lights - 6' - 0" X 7' - 8 3/4" - Alum , Prefin , Frame - Alum	2	EA	$4,500.00	$9,000	$3,500.00	$7,000	$16,000
	Double Flush Swing Doors w/ Full Lights - 6' - 0" X 8' - 8 1/2" - Alum , Prefin , Frame - Alum	0	EA				$0	$0
	Internal Doors							
	Double Hollow Metal Door							
	Double Flush Swing Doors - 6' - 0" X 7' - 0" - HM , Ptd , w/ HM Frame	3	EA	$1,700.00	$5,100	$750.00	$2,250	$7,350
	Double Flush Swing Doors - 6' - 0" X 8' - 0" - HM , SS , w/ HM Frame	2	EA	$5,000.00	$10,000	$750.00	$1,500	$11,500
	Single Hollow Metal Door							
	Single Flush Swing Door - 3' - 0" X 7' - 0" - HM , PTD ,w/ HM Frame	6	EA	$1,700.00	$10,200	$750.00	$4,500	$14,700
	Single Flush Swing Door - 3' - 0" X 7' - 0" - HM , SS ,w/ HM Frame	1	EA	$4,000.00	$4,000	$750.00	$750	$4,750
	Single Flush Swing Door - 3' - 0" X 7' - 10" - HM , PTD ,w/ HM Frame	6	EA	$1,700.00	$10,200	$750.00	$4,500	$14,700
	Single Flush Swing Door - 3' - 0" X 8' - 6" - HM , SS , w/ HM Frame	1	EA	$4,000.00	$4,000	$750.00	$750	$4,750
	Single Flush Swing Door - 3' - 4" X 7' - 0" - HM , PTD , w/ HM Frame	6	EA	$1,700.00	$10,200	$750.00	$4,500	$14,700
	Single Flush Swing Door - 3' - 6" X 7' - 0" - HM , PTD , w/ HM Frame	6	EA	$1,700.00	$10,200	$750.00	$4,500	$14,700
	Single Flush Swing Door w/ Partial Lite - 3' - 4" X 7' - 0" - HM , PTD ,w/ HM Frame	6	EA	$1,700.00	$10,200	$750.00	$4,500	$14,700
	Single Flush Swing Door w/ Vision Lite - 3' - 0" X 7' - 10" - HM , PTD , w/ HM Frame	6	EA	$1,700.00	$10,200	$750.00	$4,500	$14,700
	Single Flush Swing Door w/ Partial Lite - 3' - 0" X 7' - 0" - HM , PTD ,w/ HM Frame	6	EA	$1,700.00	$10,200	$750.00	$4,500	$14,700
	Aluminum - Double							
	Door - Double							
	Double Flush Swing Doors w/ Full Lights - 6' - 0" X 7' - 8 3/4" - Alum ,Prefin, w/ Alum Frame	4	EA	$4,500.00	$18,000	$3,500.00	$14,000	$32,000
	Aluminum - Single							

Department of Design and Construction

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Bidder: PRISMATIC DEVELOPMENT

DDC ID: S136-367
Sponsor Agency: DSNY

CSI Number	Description	Quantity	Unit	Unit Cost of Material	Total Cost of Material	Unit Cost of Labor	Total Cost of Labor	Total Cost: Materials and Labor
	Single Flush Swing Door w/ Full Lite - 3' - 0" X 7' - 10" - Alum ,Prefin, w/ Alum Frame	14	EA	$4,500	$63,000	$3,500	$49,000	$112,000
	Single Flush Swing Door w/ Full Lite (Medium Stile) - 3' - 0" X 7' - 9 3/4",Alum ,Prefin, w/ Alum Frame	2	EA	$4,500.00	$9,000	$3,500.00	$7,000	$16,000
	Existing Building							
	Interior Doors							
	HM - Double							
	Double Flush Swing Doors - 6' - 0" X 7' - 0" - HM , PTD , w/ HM Frame	1	EA	$1,700.00	$1,700	$750.00	$750	$2,450
	HM - Single							
	Single Flush Swing Door - 3' - 4" X 7' - 0" - HM , PTD ,w/ HM Frame	2	EA	$1,700.00	$3,400	$750.00	$1,500	$4,900
	Single Flush Swing Door - 3' - 4" X 7' - 0" - HM , PTD , w/ HM Frame - 60 Min	1	EA	$1,700.00	$1,700	$750.00	$750	$2,450
	Single Flush Swing Door - 3' - 4" X 7' - 0" - HM , PTD ,w/ HM Frame - 60 Min	1	EA	$1,700.00	$1,700	$750.00	$750	$2,450
	Single Flush Swing Door - 3' - 4" X 7' - 0" - HM , PTD ,w/ HM Frame - 90 Min	1	EA	$1,700.00	$1,700	$750.00	$750	$2,450
	Household Goods							
	HM Door - 3'W x 7'H	6	EA	$1,700.00	$10,200	$750.00	$4,500	$14,700
	Fuel Station				$0			
	HM Door - 2'6"W x 7'H	6	EA	$1,700.00	$10,200.00	$750.00	$4,500	$14,700
	Subtotal							$366,050
08 3113	**ACCESS DOORS**							
	New Building							
	Access Door	1	LS	$3,500.00	$3,500.00	$10,000.00	$10,000	$13,500
	Subtotal							$13,500
08 3323	**OVERHEAD COILING DOORS**							
	New Building							
	HC Insulated Overhead Coiling Door + Rapid Roll							
	28' - 0" X 17' - 0"-Stl / Rub-Prefin-Hc Insulated Overhead Coiling Door + Rapid Roll	2	EA	$72,000.00	$144,000	$10,000.00	$20,000	$164,000
	Overhead Coiling Door							
	Overhead Coiling Door - 10' - 0" X 10' - 0" - STL,Prefin,w/ Stl Frame	1	EA	$3,800.00	$3,800	$2,500.00	$2,500	$6,300
	Overhead Coiling Door - 12' - 0" X 8' - 0" - STL,Prefin,w/ Stl Frame	1	EA	$4,000.00	$4,000	$2,500.00	$2,500	$6,500
	Overhead Coiling Steel Door - Fire Rated							

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Bidder: PRISMATIC DEVELOPMENT

DDC ID: S136-367
Sponsor Agency: DSNY

CSI Number	Description	Quantity	Unit	Unit Cost of Material	Total Cost of Material	Unit Cost of Labor	Total Cost of Labor	Total Cost: Materials and Labor
	Overhead Coiling Door - 28' - 0" X 17' - 0" - STL,Prefin,w/ Stl Frame - STL- 45 Min	1	EA	$17,500.00	$17,500	$9,000.00	$9,000	$26,500
	Overhead Coiling Door - 28' - 0" X 17' - 2" - STL,Prefin,w/ Stl Frame - STL- 45 Min	5	EA	$18,500.00	$92,500	$8,000.00	$40,000	$132,500
	Existing Building							
	Overhead Coiling Door + Rapid Roll							
	Rapid Roll Door Type D - 22'W x 16'9"H - Rubber material - Prefinished @ Vehicle storage garage (Surface mounted rapid roll-up assembly)	4	EA	$37,000.00	$148,000	$8,750.00	$35,000	$183,000
	Overhead Coiling Door							
	HC Insulated Overhead Coiling Door - 22'W x 14'H - Steel material - Painted @ BME Small Vehicle Maintenance Bays	1	EA	$18,500.00	$18,500	$9,000.00	$9,000	$27,500
	Exterior Overhead Doors to remain – Paint/Refinish as required		EA					
	Steel - Overhead Coiling Door							
	Type F - 9'-0" X 10'-0" - 45 Min Fire Rated	1	EA	$6,700.00	$6,700	$2,500.00	$2,500	$9,200
	Subtotal							$555,500.00
08 3324	**ROLL-UP DOORS (included w/ 083323)**							
08 4001	**GLAZED STOREFRONTS AND CURTAIN WALL SYSTEM**							
	New Building							
	CW-01 - Curtainwall (Clear) - Thermally Broken Curtain Wall System, Fully Captured with IGU's. inc. of Entrance Doors (Details @ EN1-001)	3580	SF	$103	$369,722	$126	$451,883	$821,605
	CW-02 - Curtainwall (Tinted) - Thermally Broken Curtain Wall System, Fully Captured with IGU's. inc. of Entrance Doors (Details @ EN1-001)	420	SF	$103	$43,375	$126	$53,014	$96,389
	SF-01 - Storefront system (tinted) - Thermally broken storefront system with ssg butt joint IGU's (Details @ EN1-001)	20	SF	$86	$1,720	$80	$1,600	$3,320
	SF-05 - Storefront system (clear) - Thermally broken storefront system with IGU's (Details @ EN1-001)	16	SF	$86	$1,377	$80	$1,285	$2,662
	CW01 - Interior curtain wall - 7.25" x 2.5" Thermally broken curtain wall system 2-1/2" super wall series, clear anodized 1"IGU, clear (GL-03)	730	SF	$92	$67,014	$126	$92,144	$159,157
	Thermally Broken Curtainwall Door W/ 1" IGU			Duplicate -see doors				
	6' - 0" X 9' - 0"-Alum-Prefin-Thermally Broken Curtainwall Door W/ 1" IGU	6	EA	$45,900	$275,398	$11,475	$68,850	$344,248
	6' - 0" X 8' - 11 1/8"-Alum-Prefin-Thermally Broken Curtainwall Door W/ 1" IGU	4	EA	$45,900	$183,599	$11,475	$45,900	$229,499

Department of Design and Construction

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Location: 1000 West Service Road, Staten Island, NY 10314
Bidder: PRISMATIC DEVELOPMENT

DDC ID: S136-367
Sponsor Agency: DSNY

CSI Number	Description	Quantity	Unit	Unit Cost of Material	Total Cost of Material	Unit Cost of Labor	Total Cost of Labor	Total Cost: Materials and Labor
	Existing Building							
	Façade							
	Protection of Existing Exterior Systems	1	LS	$1,250.00	$1,250.00	$1,250.00	$1,250	$2,500
	Subtotal							$1,659,380
08 4519	**POLYCARBONATE WALL SYSTEM**							
	Salt Shed							
	PC-01 - 40 MM Polycarbonate Panels - w/ z clips provided by manufacturer w/ Continuous horizontal steel framing (Details @ A3-302/2,3)	8800	SF	$40	$353,428	$34	$302,938	$656,366
	Panel sill "U" trim below at the bottom of polycarbonate panel. (Details @ A3-302/8)	325	LF	$3	$975	$5	$1,625	$2,600
	4" high coping cap (Details @ A3-302/13)	325	LF	$25	$8,125	$25	$8,125	$16,250
	Polycarbonate corner reinforcing angle including sealant and backer (Details @ A3-302/7)	100	LF	$3	$300	$5	$500	$800
	1" thick steel protection plate. Panel size 5'-6" W X 10'-0" with fasteners to be spaced evenly at 48" oc. max. horizontally and vertically, held 6" from all sides drill & counterbore panels for 3/4" dia. ST STL buttonhead screws (Details @ A3-302/2)							
	to external face	40.0	SF	$40.00	$1,600	$60.00	$2,400	$4,000
	to internal face	2,400.0	SF	$40.00	$9,600	$60.00	$144,000	$240,000
	Parapet @ Salt shed roof w/ 40mm Polycarbonate panel on interior side - 2'9"H with Top channel and its support (Details @ A3-302/2,3)							
	Subtotal							$920,016
08 4900	**FIRE RATED GLASS AND FRAMING SYSTEM**							
	New Building							
	Single Hollow Metal Door - Fire Rated							
	Single Flush Swing Door - 3' - 0" X 8' - 6" - HM , SS , w/ HM Frame - 45 Min	2	EA	$4,000.00	$8,000	$750.00	$1,500	$9,500.00
	Single Flush Swing Door - 3' - 0" X 7' - 0" - HM , PTD ,w/ HM Frame - 90 Min	5	EA	$1,700.00	$8,500	$750.00	$3,750	$12,250.00
	Single Flush Swing Door - 3' - 0" X 7' - 10" - HM , PTD ,w/ HM Frame - 60 Min	5	EA	$1,700.00	$8,500	$750.00	$3,750	$12,250.00
	Single Flush Swing Door - 3' - 0" X 7' - 10" - HM , PTD w/ HM Frame - 90 Min	5	EA	$1,700.00	$8,500	$750.00	$3,750	$12,250.00

Department of Design and Construction

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DDC ID: S136-367
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CSI Number	Description	Quantity	Unit	Unit Cost of Material	Total Cost of Material	Unit Cost of Labor	Total Cost of Labor	Total Cost: Materials and Labor
	Single Flush Swing Door - 3' - 0" X 6' - 10" - HM , PTD ,w/ HM Frame - 60 Min	5	EA	$1,700.00	$8,500	$750.00	$3,750	$12,250.00
	Single Flush Swing Door - 3' - 6" X 7' - 0" - HM , PTD, Frame - HM- 90 MIN	6	EA	$1,700.00	$10,200	$750.00	$4,500	$14,700.00
	Single Flush Swing Door w/ Vision Lite - 3' - 0" X 7' - 0" - HM , PTD ,w/ HM Frame - 90 Min.	6	EA	$1,700.00	$10,200	$750.00	$4,500	$14,700.00
	Single Flush Swing Door w/ Vision Lite - 3' - 0" X 7' - 10" - HM , PTD ,w/ HM Frame - 45 Min.	6	EA	$1,700.00	$10,200	$750.00	$4,500	$14,700.00
	Single Flush Swing Door w/ Vision Lite - 3' - 4" X 7' - 0" - HM , SS ,w/ HM Frame - 45 Min	1	EA	$4,000.00	$4,000	$750.00	$750	$4,750.00
	Double - Fire Rated							
	Double Flush Swing Doors w/ Full Lights (Medium Stile) - 6' - 0" X 7' - 9 3/4 -Alum, Prefin, w/ Alum Frame - 60 Min	2	EA	$1,700	$3,400	$750	$1,500	$4,900
	Subtotal							$112,250
08 6301	**ALUMINUM-FRAMED SKYLIGHT SYSTEM**							
	New Building							
	Single unit, single slope skylight (+/-) 29'-6" x 10'-0" with laminated IGU's. (Details @ EN1-002)	300	SF	$420	$126,000	$420	$126,000	$252,000.00
	Subtotal							$252,000.00
08 7100	**DOOR HARDWARE (included w/ 081113)**							
08 7101	**DOOR HARDWARE SCHEDULE (included w/ 081113)**							
08 8000	**EXTERIOR GLAZING**							
	Household Goods							
	Fuel monitor booth @ Fueling Station							
	Double Glazed window - 4'x4'	1	EA	$2,582	$2,582	$1,721	$1,721	$4,303
	Double Glazed window - 4'x7'	1	EA	$4,303	$4,303	$2,295	$2,295	$6,598
	Double Glazed window - 2'6"x7'	1	EA	$2,582	$2,582	$1,721	$1,721	$4,303
	Subtotal							$15,204
08 8010	**INTERIOR GLASS AND GLAZING**							
	Household Goods							
	Double Glazed window w/ Aluminum frame - 3'x4'	2	EA	$2,582	$5,164	$1,721	$3,442	$8,606
	Interior Glass and Glazing							
	New Building							

Department of Design and Construction

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CSI Number	Description	Quantity	Unit	Unit Cost of Material	Total Cost of Material	Unit Cost of Labor	Total Cost of Labor	Total Cost: Materials and Labor
	Type SF01; exterior storefront; 6.5" x 2" thermally broken storefront system T14000 series; 1" IGU, tinted (GL-01)	1339	SF	$52	$69,142	$69	$92,190	$161,332
	Type SF02; exterior storefront; 4.5" x 2" thermally broken storefront system 14000 series; 9/16" laminated glass, clear (GL-04)	642	SF	$52	$33,151	$69	$44,201	$77,352
	Type SF-FR	4000	SF	$30	$120,487	$13	$51,637	$172,124
	Subtotal							$419,414
08 9000	**LOUVERS**							
	New Building							
	LV-01 - Louver system with framing and attachments with mineral wool insulation where inactive louvers are specified. insulation includes a black, vapor permeable facer. (Detail @ EN1-001)	1	LS	$10,000	$10,000	$5,000	$5,000	$15,000
	Subtotal							$15,000.00
09 0000	**FINISHES**							
09 2900	**GYPSUM DRYWALL**							
	New Building							
	Ceiling Finishes							
	GWB - Gypsum Wall Board	3,397.0	SF	$1.44	$4,892	$19.73	$67,028	$71,920
	GWB - Soffit	489.0	LS	$44.94	$21,975	$175.28	$85,714	$107,689
	Fascia	92.0	SF	$1.04	$96	$24.26	$2,232	$2,328
	Wall Finishes							
	GB-02 - Glazed Thin Brick (Interior) - Manuf. - Belden, Series - Glazed Smooth A, Color - Mod. Orange or approved equivalent	0.0	SF	Duplicate item - see section 070001				
	GFB-02 - Ground Face Thin ACMU - Manuf. - Kingston Block, Series -Pozzotive Thin Brick, Color - Manhattan Midnight or approved equivalent	0.0	SF	Duplicate item - see section 070001				
	Central Stair							
	Ceiling below landing - assume gypsum	24.0	SF	$1.25	$30	$4.00	$96	$126
	Interior Partitions							
	Gypsum Partitions							
	F0 - One side Furring - (1) Layer 5/8" Gwb On One Side Of 7/8" Double-Leg Hat Channels (Rc-2) Spaced At 24" Oc. Max.	405.0	SF	$0.60	$243	$4.02	$1,628	$1,871
	F1 - One side Furring - (1) Layer 5/8" Gwb On One Side Of 1 5/8" Metal Studs With Full Cavity Sound Attenuation Batts.	1,023.0	SF	$1.23	$1,258	$4.02	$4,112	$5,371

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CSI Number	Description	Quantity	Unit	Unit Cost of Material	Total Cost of Material	Unit Cost of Labor	Total Cost of Labor	Total Cost: Materials and Labor
	F3 - One side Furring - (1) Layer 5/8" Gwb On One Side Of 3 5/8" Metal Studs With Full Cavity Sound Attenuation Batts.	15,174.0	SF	$1.58	$23,975	$4.29	$65,096	$89,071
	F3(2) - One side Furring - (3) Layer 5/8" Gwb On One Side Of 3 5/8" Metal Studs With Full Cavity Sound Attenuation Batts - 2 HR Fire rated	1,000.0	SF	$2.11	$2,110	$6.02	$6,020	$8,130
	F3A - One side Furring - (2) Layers 5/8" Gwb On One Side of 1/2" Single-Leg Resilient Channels (RC-1) Spaced 24" Oc. Max.With Full Cavity Sound Attenuation Batts	503.0	SF	$2.11	$1,061	$6.02	$3,028	$4,089
	F3T1(2) - One side Furring - (1) Layer 5/8" Tile backerboard on each side of 3 5/8" Metal Studs With Full Cavity Sound Attenuation Batts. - 2 HR Fire rated.	354.0	SF	$2.65	$938	$6.78	$2,400	$3,338
	F3T1 - One side Furring - (1) Layer 5/8" Tile backerboard on each side of 3 5/8" Metal Studs With Full Cavity Sound Attenuation Batts.	10,878.0	SF	$2.04	$22,191	$4.47	$48,625	$70,816
	Furring - 5/8" Interior Gypsum	23,654.0	SF	$1.36	$32,169	$4.85	$114,722	$146,891
	S10B1 - (1) Layer 5/8" Gwb On Each Side Of 3 5/8" Metal Studs, thin brick at one side With Full Cavity Sound Attenuation Batts.	1,713.0	SF	$4.00	$6,852	$32.90	$56,358	$63,210
	S3 - (1) Layer 5/8" Gwb On Each Side Of 3 5/8" Metal Studs With Full Cavity Sound Attenuation Batts.	10,486.0	SF	$1.25	$13,108	$4.62	$48,445	$61,553
	S3A - (2) Layers 5/8" Gwb On 1/2" Single-Leg Resilient Channels (Rc-1) Spaced 24" Oc. Max On One Side With Full Cavity Sound Attenuation Batts.	8,159.0	SF	$1.85	$15,094	$5.39	$43,977	$59,071
	S3T1 - (1) Layer 5/8" Tile backerboard On Each Side Of 3 5/8" Metal Studs With Full Cavity Sound Attenuation Batts	3,746.0	SF	$2.21	$8,279	$5.24	$19,629	$27,908
	S3T1P1 - (1) Layer 5/8" Tile backerboard On Each Side Of 3 5/8" Metal Studs With Full Cavity Sound Attenuation Batts With Fiber-Cement Panels (Fc-01) On 1" Metal Furring Channels Spaced Per Fiber-Cement System.	4,102.0	SF	$2.23	$9,147	$5.52	$22,643	$31,791
	S3T2 - (1) Layer 5/8" Tile Backer Board In Lieu On Both Sides On Each Side Of 3 5/8" Metal Studs	2,754.0	SF	$2.57	$7,078	$5.99	$16,496	$23,574
	S6 - (1) Layer 5/8" Gwb On Each Side Of 6" Metal Studs With Full Cavity Sound Attenuation Batts.	4,504.0	SF	$1.60	$7,206	$4.61	$20,763	$27,970
	S6AB1 - (1) Layer 5/8" Tile backerboard On Each Side Of 6"Metal Studs With Full Cavity Sound Attenuation Batts With Thin Brick On Tabs Mounting System Over (3) Layers 15# Felt On Corridor Side. (2) Layers 5/8" Gwb On 1/2" Single-Leg Resilient Channels (Rc-1) Spaced 24" Oc. Max. On Room Side.	624.0	SF	$2.19	$1,367	$5.76	$3,594	$4,961

Department of Design and Construction

CONTRACTOR'S BID BREAKDOWN FORM

CONTRACT 1 - GENERAL CONSTRUCTION

Project: Staten Island 1 & 3 Garage - Phase II
Location: 1000 West Service Road, Staten Island, NY 10314
Bidder: PRISMATIC DEVELOPMENT

DDC ID: S136-367
Sponsor Agency: DSNY

CSI Number	Description	Quantity	Unit	Unit Cost of Material	Total Cost of Material	Unit Cost of Labor	Total Cost of Labor	Total Cost: Materials and Labor
	S6B1- (1) Layer 5/8" Tile backerboard On Each Side Of 6" Metal Studs On Tabs Mounting System Over(3) Layers 15# Felt On Corridor Side With Full Cavity Sound Attenuation Batts.	591.0	SF	$2.04	$1,206	$4.38	$2,589	$3,794
	S7P1T1 - (1) Layer 5/8" Tile backerboard On Each Side Of (2) 3 5/8" Staggered Metal Studs Separated With 1" Airspace, Full Cavity Sound Attenuation Batts Within Both Stud Tracks. Fiber-Cement Panels (Fc-01) On 1" Metal Furring Channels Spaced Per Fiber-Cement System On Garage Side Of Partition	4,881.0	SF	$3.00	$14,643	$7.00	$34,167	$48,810
	S8 - (1) Layer 5/8" Gwb On Each Side Of 8" Metal Studs With Full Cavity Sound Attenuation Batts	765.0	SF	$3.97	$3,037	$4.33	$3,312	$6,350
	S8B1 - (1) Layer 5/8" Tile backerboard Each Side Of 8" Metal Studs With Full Cavity Sound Attenuation Batts On Tabs Mounting System Over(3) Layers 15# Felt On Corridor Side)	3,315.0	SF	$2.00	$6,630	$5.07	$16,796	$23,426
	Corian (or approved equal) Wall Panel	100.0	SF	$10.00	$1,000	$10.00	$1,000	$2,000
	Existing Building				$0		$0	$0
	Drywall Partition				$0		$0	$0
	Furring 1 layer of 5/8" GWB	5,420.0	SF	$1.83	$9,919	$5.23	$28,347	$38,265
	Miscellaneous drywall patching	0.0	LS	Not Applicable				
	Household Goods				$0		$0	$0
	Wall Finishes - Gypsum wall board - 2-1/2" Channel studs	1,071.0	SF	$1.33	$1,424	$4.94	$5,291	$6,715
	Ceiling Finishes - GWB	149	SF	$1.29	$192	$10.29	$1,533	$1,725
	Subtotal							$942,764
09 30000	**TILING**							
	Floor Finishes							
	PCT-02-2"X2" Mosaic Floor Tile - Manuf. - Dal-Tile, Series - Keystones, Color - Suede Grey Speckle D208 or approved equivalent	3950	SF	$5.88	$23,215	$17.87	$70,586	$93,801
	PCT-03-12"X24" Floor Tile - Manuf. - Fahrenheit, Color - 350F Frost or approved equivalent	9410	SF	$5.15	$48,454	$17.87	$168,155	$216,609
	Crack Isolation Membrane	3950	SF	$2.32	$9,150	$6.62	$26,143	$35,293
	Wall Finishes							
	PCT-01 - 4"X16" Wall Tile - Manuf. - Dal-Tile, Series - Elevare, Color - Lunar EL47 or approved equivalent	13850	SF	$6.75	$93,499	$15.88	$219,998	$313,497
	Subtotal							$659,200
09 5113	**ACOUSTICAL PANEL CEILINGS**							
	Ceiling Finishes							

Department of Design and Construction

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DDC ID: S136-367
Sponsor Agency: DSNY

CSI Number	Description	Quantity	Unit	Unit Cost of Material	Total Cost of Material	Unit Cost of Labor	Total Cost of Labor	Total Cost: Materials and Labor
	ACT-01 - 2'X2' Acoustical Ceiling Tile - Manuf. - Armstrong, Series - Grid: Suprafine, Color - White or approved equivalent	14,942.0	SF	$10.65	$122,898	$8.29	$95,587	$218,485
	ACT-02 - 2'X2' Acoustical Ceiling Tile (Washable) - Manuf. - Armstrong, Series -Grid: Suprafine, Color -White or approved equivalent	9,568.0	SF	$12.22	$90,244	$9.14	$67,487	$157,732
	ACT-03 - 2'X8' Acoustical Ceiling Planks - Manuf. - USG, Series - Grid: Identitee DXI, Color - White or approved equivalent	6,228.0	SF	$13.13	$63,119	$9.93	$47,723	$110,842
	Existing Building							
	Ceiling Finishes							
	ACT-01 - 2'X2' Acoustical Ceiling Tile - Manuf. - Armstrong, Series - Grid: Suprafine, Color - White or approved equivalent	589.0	SF	$10.24	$4,658	$14.99	$6,818	$11,476
	GWB - Gypsum Wall Board	105	SF	$3.68	$298	$21.60	$1,751	$2,050
	Subtotal							$500,585
09 5133	**METAL CEILINGS**							
	New Building							
	Ceiling Finishes							
	MCT-01 - 2'X10' Metal Ceiling Panels - Manuf. - Armstrong, Series - Metal Works, Color - Silver Grey (SG) or approved equivalent	3,196.0	SF	$37.89	$121,096	$8.36	$26,719	$147,815.00
	Soffit - MP-07-Flat Composite Metal Panel - Manuf. - Alpolic, Series - FR Color - To Match MCT-01 or approved equivalent	0.0	SF	Duplicate - See 074214				$0.00
	Wall Finishes							
	MP-08-Flat Composite Metal Panel - Manuf. - Alpolic, Series -Brake Metal; Colour- Clear anodized to match storefront or approved equivalent	500.0	SF	$40.00	$20,000	$20.00	$10,000	$30,000
	MP-08-Interior Ribbed Metal Panel - Manuf. - QC Facades, Series - Quadroline; Colour- TBD or approved equivalent	0.0	SF	Duplicate - See above				$0.00
	Base Finishes							
	MB-01 - 4" stainless steel metal wall base	53.0	LF	$10.00	$530	$15.00	$795	$1,325
	Salt Shed							
	Interior Cladding							
	Steel Plate w/Counter Sunken Bolts @ Salt Shed		SF	Dupllicate item - see 084519 Steel plate at salt shed				
	Subtotal							$179,140.00
09 6500	**RESILIENT TILE FLOORING**							
	New Building							
	Floor Finishes							

Department of Design and Construction

CONTRACTOR'S BID BREAKDOWN FORM

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Bidder: PRISMATIC DEVELOPMENT

DDC ID: S136-367
Sponsor Agency: DSNY

CSI Number	Description	Quantity	Unit	Unit Cost of Material	Total Cost of Material	Unit Cost of Labor	Total Cost of Labor	Total Cost: Materials and Labor
	RF-01-Rubber Flooring - Manuf. - FLexco, Series -Flextones, Color - 013 Blue or approved equivalent	9617	SF	$12.67	$121,825	$6.67	$64,112	$185,937.03
	RF-02-Rubber Flooring - Manuf. - Johsonite, Series -Defiant Oil and Grease Resistant, Color - 277 Cold Front or approved equivalent	11394	SF	$12.67	$144,335	$6.67	$75,959	$220,293.91
	Base Finishes							
	RB-01 - 4" Resilient Wall Base; Manuf. - Flexco; Colour- 014 Medium Grey or approved equivalent	2762	LF	$1.61	$4,459	$4.19	$11,572	$16,030.53
	RB-03 - 4" Resilient Wall Base; Manuf. - Flexco; Colour- 013 Blue or approved equivalent	1755	LF	$1.61	$2,833	$4.19	$7,353	$10,185.95
	Existing Building							
	Base Finishes							
	RB-01 - 4" Resilient Wall Base	905	LF	$1.61	$1,461	$4.19	$3,792	$5,252.58
	Subtotal							$437,700
09 9000	**PAINTING AND FINISHING**							
	New Building							
	Floor Finishes							
	ER-01-Epoxy Flooring - Manuf. - DEX-O-TEX, Series -Cheminert K or approved equivalent		SF					
	SC-01-Sealed Concrete - Manuf. - Sherwin Williams, Series -H&C, Color - Clear or approved equivalent	92,000.0	SF	$0.07	$6,000	$0.92	$85,000	$91,000
	Ceiling Finishes							
	Painting Exposed	110,000.0	SF	$0.23	$25,000	$2.18	$240,000	$265,000
	Wall Finishes							
	PT-01 - Interior Paint - Manuf. - Benjamin Moore, Color - White or approved equivalent	120,000.0	SF	$0.18	$22,000	$1.92	$230,000	$252,000
	Stair Finishes	1.0		$4,000.00	$4,000	$63,000.00	$63,000	$67,000
	Stair 1							
	Ceiling-ETS	50.0	SF	$0.50	$25	$1.00	$50	$75
	Wall finish-Interior paint	500.0	SF	$0.50	$250	$1.00	$500	$750
	Stair 2							
	Ceiling-ETS	50.0	SF	$0.50	$25	$1.00	$50	$75
	Wall finish-Interior paint	500.0	SF	$0.50	$250	$1.00	$500	$750
	Stair 3							
	Ceiling-ETS	50.0	SF	$0.50	$25	$1.00	$50	$75
	Wall finish-Interior paint	500.0	SF	$0.50	$250	$1.00	$500	$750
	Stair 4							

Department of Design and Construction

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Bidder: PRISMATIC DEVELOPMENT

DDC ID: S136-367
Sponsor Agency: DSNY

CSI Number	Description	Quantity	Unit	Unit Cost of Material	Total Cost of Material	Unit Cost of Labor	Total Cost of Labor	Total Cost: Materials and Labor
	Ceiling-ETS	50.0	SF	$0.50	$25	$1.00	$50	$75
	Wall finish-Interior paint	500.0	SF	$0.50	$250	$1.00	$500	$750
	Stair 5							
	Ceiling-ETS	50.0	SF	$0.50	$25	$1.00	$50	$75
	Wall finish-Interior paint	500.0	SF	$0.50	$250	$1.00	$500	$750
	Bulkhead							
	Stair Finishes							
	Ceiling-ETS	50.0	SF	$0.50	$25	$1.00	$50	$75
	Wall finish-Interior paint	500.0	SF	$0.50	$250	$1.00	$500	$750
	Existing Building							
	Stairs							
	Stair C - Finishes							
	Landings - Polished Concrete, - Treads- Precast Concrete Treads (1" X 1 1/2") w/ Integral Anti-Slip Rake	100.0	SF	$2.00	$200	$5.00	$500	$700
	Floor Finishes				$0			
	ER-01-Epoxy Flooring - Manuf. - DEX-O-TEX, Series -Cheminert K or approved equivalent	30,000.0	SF	$1.50	$45,000	$4.50	$5,500	$50,500
	SC-01-Sealed Concrete - Manuf. - Sherwin Williams, Series -H&C, Color - Clear or approved equivalent	5,000.0	SF	$0.10	$500	$1.10	$5,500	$6,000
	Paint ramp surface contrasting colour to adjacent floor surface	200.0	SF	$0.50	$500	$1.50	$5,500	$6,000
	Wall Finishes							
	PT-01 - Interior Paint - Manuf. - Benjamin Moore, Color - White or approved equivalent	20,000.0	SF	$0.25	$500	$0.75	$60,000	$60,500
	Miscellaneous painting	1.0	LS	$40,000.00	$40,000	$250,650.00	$250,650	$290,650
	Salt Shed							
	Floor Finishes - Sealer to Concrete Mat Slab	400	SF	$0.01	$500	$0.92	$60,000	$60,500
	Subtotal							$1,154,800
10 0000	**SPECIALTIES**							
10 1400	**SIGNAGE**							
	New Building							
	Signage	1.0	LS	$330,115.50	$330,115.50	$85,684.50	$85,685	$415,800.00
	- for no-smoking							
	- to encourage stair use							
	cost for signage	10.0	SF	$20.00	$200	$50.00	$2,000	$2,200.00
	cost for "NY" Symbol on South facade	1.0	LS	$2,500.00	$2,500	$2,500.00	$2,500	$5,000.00
	Salt Shed							
	Signage - Translucent Acrylic Strip applied to screen	1	LS	$3,000.00	$3,000	$3,000.00	$3,000	$6,000.00

Department of Design and Construction

CONTRACTOR'S BID BREAKDOWN FORM

CONTRACT 1 - GENERAL CONSTRUCTION

Project: Staten Island 1 & 3 Garage - Phase II
Location: 1000 West Service Road, Staten Island, NY 10314
Bidder: PRISMATIC DEVELOPMENT

DDC ID: S136-367
Sponsor Agency: DSNY

CSI Number	Description	Quantity	Unit	Unit Cost of Material	Total Cost of Material	Unit Cost of Labor	Total Cost of Labor	Total Cost: Materials and Labor
	Subtotal							$429,000
10 2113	**TOILET COMPARTMENTS**							
	New Building							
	Toilet Partitions	16	EA	$550.00	$8,800	$750.00	$12,000	$20,800
	Toilet Partitions @ADA	10	EA	$550.00	$5,500	$750.03	$7,500	$13,000
	Urinal Partitions - 1'8"l x 4'H	9	EA	$275.00	$2,475	$380.53	$3,425	$5,900
	Subtotal							$39,700
10 2116	**SHOWER COMPARTMENTS**							
	New Building							
	Partitions @ Shower	16	EA	$550.00	$8,800	$750.00	$12,000	$20,800
	Partitions @ Shower ADA	10	EA	$550.00	$5,500	$750.00	$7,500	$13,000
	Subtotal							$33,800
10 2600	**CORNER GUARDS**							
	New Building							
	Corner Guards	444	LS	$10.36	$4,600.73	$31.08	$13,800	$18,400
	Subtotal							$18,400
10 2813	**TOILET ACCESSORIES**							
	New Building							
	TA-1 - 36"Long Horizontal, surface mount - Grab bar	22.0	EA	$175.00	$3,850	$40.00	$880	$4,730
	TA-1A - 42"Long Horizontal, Surface Mount - Grab Bar	26.0	EA	$200.00	$5,200	$40.00	$1,040	$6,240
	TA-1B - 18"Long Vertical, surface Mount - Grab Bar	22.0	EA	$125.00	$2,750	$40.00	$880	$3,630
	TA3 - Electric Hand Dyerem compact profile	24.0	EA	$250.00	$6,000	$75.00	$1,800	$7,800
	TA4 - Mirror - 2'0"L x 3'4"H	12.0	EA	$125.00	$1,500	$100.00	$1,200	$2,700
	TA4 - Mirror - 5'4"L x 4'2"H	2.0	EA	$200.00	$400	$100.00	$200	$600
	TA4 - Mirror - 8'5"L x 4'2"H	5.0	EA	$300.00	$1,500	$120.00	$600	$2,100
	TA4 - Mirror - 8'8"L x 4'6"H	4.0	EA	$350.00	$1,400	$200.00	$800	$2,200
	TA4 - Mirror - 9'0"L x 4'2"H	1.0	EA	$400.00	$400	$200.06	$200	$600
	TA-5 - Toilet Tissue Dispenser	30.0	EA	$150.00	$4,500	$150.00	$4,500	$9,000
	TA-6 - Paper Towel Dispenser	41.0	EA	$100.00	$4,100	$121.34	$4,975	$9,075
	TA7 - Soap Dispenser	5.0	EA	$125.00	$625	$200.00	$1,000	$1,625
	TA9 - Shower seat	10.0	EA	$125.00	$1,250	$200.00	$2,000	$3,250
	TA9 - Shower seat @ADA	10.0	EA	$125.00	$1,250	$200.00	$2,000	$3,250
	Coat Hook	1	LS	$100.00	$100	$400.00	$400	$500

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CSI Number	Description	Quantity	Unit	Unit Cost of Material	Total Cost of Material	Unit Cost of Labor	Total Cost of Labor	Total Cost: Materials and Labor
	Subtotal							$57,300
10 4416	**FIRE EXTINGUISHER CABINETS**							
	New Building							
	Fire Extinguishers & Cabinets	1	LS	$11,550.00		$5,750.00		$17,300
	Subtotal							$17,300
10 5113	**METAL LOCKERS**							
	New Building							
	Locker Room							
	Lockers - 30" x 18''	1068	EA	$21,751.00	$232,300.00	$187.27	$200,000.00	$432,300
	Subtotal							$432,300
10 7500	**FLAGPOLES**							
	Household Goods							
	LFE-06 - Site flagpoles	2	EA	$3,780.00	$7,560.00	$4,270.00	$8,540	$16,100.00
	Subtotal							$16,100.00
11 0000	**EQUIPMENT**							
11 1136	**VEHICLE CHARGING EQUIPMENT**							
	New Building							
	Electrical Vehicle Supply Equipment EVSE / Electric car charger (dual)	3	EA	$17,788	$53,365.11	$3,201	$9,604.08	$62,969
	Subtotal							$62,969
11 2400	**SUSPENDED MAINTENANCE AND FALL PROTECTION (included w/ 077100)**							
11 9101	**WOODEN PALLETS**							
	New Building							
	Wooded Pallets	1	LS		$24,800.00		$50,000	$74,800
	Subtotal							$74,800
12 0000	**FURNISHINGS**							
12 4823	**ENTRANCE FLOOR GRIDS**							
	New Building							

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CSI Number	Description	Quantity	Unit	Unit Cost of Material	Total Cost of Material	Unit Cost of Labor	Total Cost of Labor	Total Cost: Materials and Labor
	MAT-01-Ss Walk-Off Mat - Manuf. - Johnson Screen, Series -Flat Screen, Color - Stainless Steel or approved equivalent	900	SF	$81.78	$73,600.00	$74.89	$67,400	$141,000
	Subtotal							$141,000
14 0000	**CONVEYING SYSTEMS**							
14 2400	**HYDRAULIC ELEVATORS**							
	New Building							
	Elevator 1 & 2 - 330A Holeless Hydraulic - Dual Jacks 1- Stage - Front RH Side Openings - 3'6" x 7' 0" - 2 EA	1.0	LS	$52,500	$105,000	$72,000	$144,000	$249,000
	Cab Interior Finishes - S.S. Wall and Ceiling Panels w/ LED Lights - (42 SF Celling + 42 SF Floor + 212 SF Wall) EA Cab	2.0	EA	$5,600	$11,200	$0	$0	$11,200
	Elevator 3 - 330A Holeless Hydraulic - Dual Jacks 1- Stage - Front RH Side and Rear LH Side Openings - 3'6" x 7' 0"	1.0	LS	$56,000	$56,000	$75,500	$75,500	$131,500
	Cab Interior Finishes - S.S. Wall and Ceiling Panels w/ LED Lights - (42 SF Celling + 42 SF Floor + 212 SF Wall) EA Cab	1.0	EA	$11,300	$11,300	$0	$0	$11,300
	Existing Building							
	Elevator 4 - 330 A Holeless Hydraulic - Dual Jacks 1-Stage - Front RH Side and Rear LH Side Opening - 8' 4" X 7' 9"; Capacity - 3500 LBS - Travel Speed - 100 FPM	1.0	LS	$56,000	$56,000	$75,500	$75,500	$131,500
	Cab Interior Finishes - S.S. Wall and Ceiling Panels w/ LED Lights - (180 SF Walls + 40SF Floor + 40 SF Ceiling)	1	EA	$11,300	$11,300	$0	$0	$11,300
	Subtotal							$545,800
14 6050	**SINGLE GIRDER CRANE (included w/ 051200)**							
21 0000	**FIRE SUPPRESSION**							
21 0500	**COMMON WORK RESULTS FOR FIRE SUPPRESSION**							
	Existing Building							
	Demolition							
	- 1st floor	1	SF		$0		$3,600	$3,600
	- 2nd floor	1	SF				$1,800	$1,800
	Subtotal							$5,400
21 0513	**COMMON MOTOR REQUIREMENTS FOR FIRE SUPPRESSION EQUIPMENT**							
	New Building							
	Rigging	N/A	LS					
	Subtotal							N/A

Department of Design and Construction

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21 0548	**VIBRATION AND SEISMIC CONTROLS FOR FIRE SUPPRESSION PIPING AND EQUIPMENT**							
	New Building							
	Seismic/Vibration isolation	1	LS		$31,918		$69,369	$101,288
	Subtotal							$101,288
21 0800	**COMMISSIONING OF FIRE SUPPRESSION SYSTEM**							
	New Building							
	Start-up & Testing	1	LS				$61,111	$61,111
	Subtotal							$61,111
21 1100	**FACILITY FIRE-SUPPRESSION WATER-SERVICE PIPING**							
	New Building							
	Incoming Water Service - 6"; 5ft of exterior of building	1.0	LS					$2,900
	Double Check Detector Assembly - 6"	1.0	EA	$2,600.00	$2,600	$1,200.00	$1,200	$3,800
	Check Valve Assembly - 6"	5.0	EA	$466.62	$2,333	$356.20	$1,781	$4,114
	Fire Department Siamese - 3" x 3" x 6"	5.0	EA	$1,307.00	$6,535	$5,696.54	$28,483	$35,018
	3-Way Roof Manifold : 2 1/2" x 2 1/2" x 2 1/2" x 6"	1.0	EA	$441.21	$441	$2,849.39	$2,849	$3,291
	Lobby hose cabinet locked key box	1.0	EA	$1,732.50	$1,733	$0.00	$0	$1,733
	Funnel Drain- 4"	N/A	EA					
	FHR: Fire Hose Rack Assembly - 2 1/2" Hose Length 125 ft	1.0	EA	$446.99	$447	$2,850.54	$2,851	$3,298
	FHV: Fire Hose Valve - 2 1/2"	13.0	EA	$392.17	$5,098	$575.28	$7,479	$12,577
	OS&Y Water Flow Tamper Switch	4.0	EA	$108.28	$433	$178.16	$713	$1,146
	Water Flow Switch	1.0	EA	$600.00	$600	$400.00	$400	$1,000
	Curb Valve - 6"	1.0	EA	$1,200.00	$1,200	$800.00	$800	$2,000
	Isolation Valve - 6"	1.0	EA	$1,200.00	$1,200	$800.00	$800	$2,000
	Sprinkler Inspector Test Valve		EA				See Fire Control Valve Assembly	
	Fuel Station							
	Fire protection systems		LS	In Fuel systems				
	Subtotal							$72,875
21 1200	**FIRE-SUPPRESSION STANDPIPES**							
	New Building							
	FCVA : Floor Control Valve Assembly							
	- 4"	2.0	EA		$2,064		$5,699	$7,763
	- 3"	4.0	EA		$3,571		$11,398	$14,969

Department of Design and Construction

CONTRACTOR'S BID BREAKDOWN FORM

CONTRACT 1 - GENERAL CONSTRUCTION

Project: Staten Island 1 & 3 Garage - Phase II
Location: 1000 West Service Road, Staten Island, NY 10314
Bidder: PRISMATIC DEVELOPMENT

DDC ID: S136-367
Sponsor Agency: DSNY

CSI Number	Description	Quantity	Unit	Unit Cost of Material	Total Cost of Material	Unit Cost of Labor	Total Cost of Labor	Total Cost: Materials and Labor
	Riser Control Valve - RCV	2.0	EA		$726		$1,425	$2,152
	FSP : Fire Standpipe (horizontal)							
	- 6"	1,170.0	LF		$63,794		$140,767	$204,561
	- 4"	230.0	LF		$9,144		$22,540	$31,684
	FSP; Fire Standpipes (vertical)							
	- 6"	198.0	EA		$17,737		$25,641	$43,378
	- 4"	168.0	EA		$8,668		$24,142	$32,810
	Fire Standpipes (FSP) & sprinkler riser - 6"		EA				Included in Vertical Piping	
	Drain Piping - 2"	126	LF		$2,192		$5,699	$7,891
	Subtotal							$345,208
21 1313	**WET PIPE SPRINKLER SYSTEMS**							
	New Building							
	Fire Piping - Mains; 6"		LF	Not in project				
	Sprinkler Piping							
	- 4"	62.0	LF		$1,505		$2,849	$4,354
	- 3"	2,405.0	LF		$25,934		$108,383	$134,317
	- 2 1/2"	990.0	LF		$8,527		$44,779	$53,307
	- 2"	90.0	LF		$648		$4,071	$4,719
	- 1 1/2"	933.0	LF		$16,555		$38,214	$54,769
	- 1 1/4"	4,181.0	LF		$25,693		$171,245	$196,938
	- 1"	7,291.0	LF		$42,503		$298,224	$340,727
	Sprinkler Heads							
	- concealed/pendant	357.0	EA		$26,646		$174,160	$200,806
	- upright/pendant	858.0	EA		$6,685		$76,395	$83,080
	- sidewall - dry	16.0	EA		$1,247		$11,398	$12,645
	- sidewall	4.0	EA		$31		$11,398	$11,429
	Existing Building							
	Cap Existing Piping	11.0	EA		$318		$7,836	$8,153
	Connect to existing piping	24.0	LS		$26,432		$52,355	$78,787
	Sprinkler Heads incl. piping							
	- Concealed	21	EA		$1,819		$25,643	$27,462
	Subtotal							$1,211,494
21 3113	**ELECTRIC-DRIVE, CENTRIFUGAL SPRINKLER BOOSTER PUMPS**							
	New Building							

Department of Design and Construction

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Bidder: PRISMATIC DEVELOPMENT

DDC ID: S136-367
Sponsor Agency: DSNY

CSI Number	Description	Quantity	Unit	Unit Cost of Material	Total Cost of Material	Unit Cost of Labor	Total Cost of Labor	Total Cost: Materials and Labor
	Automatic Sprinkler Booster Pump, 750 GPM, 40 HP, Tigerflow Series FPS-7000 Mod.# FP-750-IL-ELSK-HV-FM-BP or approved equivalent	1	EA		$120,503		$50,922	$171,425
	Subtotal							$171,425
21 3900	**CONTROLLERS FOR SPRINKLER BOOSTER PUMP DRIVERS (included w/ 213113)**							
22 0000	**PLUMBING**							
22 0500	**COMMON WORK RESULTS FOR PLUMBING**							
	New Building							
	Testing & Sanitizing	1	LS	$21,393.00	$21,393	$96,271.00	$96,271	$117,664
	Rigging & Handling	1	LS	$38,187.00	$38,187	$110,177.00	$110,177	$148,364
	Vibration Isolation / Seismic Restraints	1	LS	$6,418.00	$6,418	$8,557.00	$8,557	$14,975
	Temporary Plumbing	1	LS	$2,139.00	$2,139	$5,348.00	$5,348	$7,487
	Existing Building							
	Testing & Sanitizing	1	SF	$2,139.00	$2,139	$21,393.00	$21,393	$23,532
	Demolition	1	LS	$42,787.00	$42,787	$64,180.00	$64,180	$106,967
	Subtotal							$418,989
22 0516	**EXPANSION FITTINGS AND LOOPS FOR PLUMBING PIPING (included w/ 221116)**							
22 0519	**METERS AND GAGES FOR PLUMBING PIPING (included w/ 221116)**							
22 0523	**GENERAL DUTY VALVES FOR PLUMBING PIPING (included w/ 221116)**							
22 0529	**HANGERS AND SUPPORTS FOR PLUMBING PIPING AND EQUIPMENT (included w/ 221116)**							
22 0533	**HEAT TRACING FOR PLUMBING PIPING**							
	New Building							
	Heat tracing on piping, 4"	250	LF	$92.58	$23,144	$101.50	$25,375	$48,519
	Subtotal							$48,519

Department of Design and Construction

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CSI Number	Description	Quantity	Unit	Unit Cost of Material	Total Cost of Material	Unit Cost of Labor	Total Cost of Labor	Total Cost: Materials and Labor
22 0553	**IDENTIFICATION FOR PLUMBING PIPING AND EQUIPMENT (included w/ 221116)**							
22 0700	**PLUMBING INSULATION**							
	New Building							
	Insulation to domestic water piping	9980	LF	$22.00	$219,560.00	$21.00	$209,580.00	$429,140
	Insulation to storm piping	7320	LF	$26.00	$190,320.00	$26.00	$190,320.00	$380,640
	Existing Building							
	- Insulation on piping	10	LF	$34.00	$340.00	$171.00	$1,710.00	$2,050
	Subtotal							$811,830
22 0800	**COMMISSIONING OF PLUMBING**							
	New Building							
	Commissioning assist	1	LS	$62,469.00	$62,469	$90,922.00	$90,922	$153,391
	Subtotal							$153,391
22 1113	**FACILITY WATER DISTRIBUTION PIPING (included w/ 221116)**							
22 1114	**FACILITY NATURAL GAS PIPING**							
	New Building							
	Incoming Gas Service - connection only	1.0	EA	$970.00	$970.00	$2,039.00	$2,039	$3,009
	Boiler Gas Meter - 4"	1.0	EA	$1,725.00	$1,725.00	$1,505.00	$1,505	$3,230
	Boiler Gas Regulator - 4"	1.0	EA	$1,184.00	$1,184.00	$1,505.00	$1,505	$2,689
	EM Generator Gas Meter - 3"	1.0	EA	$1,725.00	$1,725.00	$1,505.00	$1,505	$3,230
	EM Generator Gas Regulator - 3"	1.0	EA	$1,184.00	$1,184.00	$1,505.00	$1,505	$2,689
	Gas meter room venting	1.0	LS	$2,474.00	$2,474.00	$2,709.00	$2,709	$5,183
	Emergency Generator connection	1.0	EA	$749.00	$749.00	$2,139.00	$2,139	$2,888
	Boiler connection	3.0	EA	$2,474.00	$7,422.00	$1,899.00	$5,697	$13,119
	Dryer connection	1.0	EA	$2,066.00	$2,066.00	$2,039.00	$2,039	$4,105
	Plug valves							
	- 8"	2.0	EA	$1,194.00	$2,388.00	$1,070.00	$2,140	$4,528
	- 4"	3.0	EA	$963.00	$2,889.00	$749.00	$2,247	$5,136
	- 3"	2.0	EA	$856.00	$1,712.00	$642.00	$1,284	$2,996
	- 2"	2.0	EA	$428.00	$856.00	$321.00	$642	$1,498
	- 1 1/4"	3.0	EA	$321.00	$963.00	$321.00	$963	$1,926
	Gas Piping							

Department of Design and Construction

CONTRACTOR'S BID BREAKDOWN FORM

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Project: Staten Island 1 & 3 Garage - Phase II
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Bidder: PRISMATIC DEVELOPMENT

DDC ID: S136-367
Sponsor Agency: DSNY

CSI Number	Description	Quantity	Unit	Unit Cost of Material	Total Cost of Material	Unit Cost of Labor	Total Cost of Labor	Total Cost: Materials and Labor
	- 8"	85.0	LF	$56.00	$4,760.00	$318.00	$27,030	$31,790
	- 6"	70.0	LF	$35.00	$2,450.00	$158.00	$11,060	$13,510
	- 3"; underground	80.0	LF	$30.00	$2,400.00	$105.00	$8,400	$10,800
	- 1-1/4	350.0	LF	$20.00	$7,000.00	$78.00	$27,300	$34,300
	Excavation & backfill for underground piping		LF	included in site work				
	Existing Building							
	Gas Meter For Emergency Generator	1.0	EA	$1,725.00	$1,725.00	$1,505.00	$1,505	$3,230
	Connect to existing Gas service	1.0	EA	$970.00	$970.00	$2,039.00	$2,039	$3,009
	Natural Gas Piping up to Emergency Generator - 3"	100	LF	$85.00	$8,500.00	$62.00	$6,200	$14,700
	Subtotal							$167,565
22 1116	**DOMESTIC WATER PIPING**							
	New Building							
	Cold water, Hot water flow and return piping incl. valves & specialties							
	- 4"	200.0	LF	$48.00	$9,600.00	$47.00	$9,400	$19,000
	- 3"	310.0	LF	$48.00	$14,880.00	$47.00	$14,570	$29,450
	- 2-1/2"	640.0	LF	$45.00	$28,800.00	$46.00	$29,440	$58,240
	- 2"	540.0	LF	$41.00	$22,140.00	$43.00	$23,220	$45,360
	- 1-1/2"	820.0	LF	$36.00	$29,520.00	$42.00	$34,440	$63,960
	- 1-1/4"	1,050.0	LF	$32.00	$33,600.00	$42.00	$44,100	$77,700
	- 1"	1,140.0	LF	$31.00	$35,340.00	$41.00	$46,740	$82,080
	- 3/4"	3,350.0	LF	$24.00	$80,400.00	$37.00	$123,950	$204,350
	- branch dropdown connections to fixtures	1,950.0	LF	$24.00	$46,800.00	$37.00	$72,150	$118,950
	Existing Building							
	Cold water piping, Hot water flow and return piping incl. valves & piping specialties							
	- 1 1/2"	0.0	LF	not applicable to project				
	- 1 1/4"	0.0	LF	not applicable to project				
	- 1"	0.0	LF	not applicable to project				
	- 3/4"	0.0	LF	not applicable to project				
	- 1/2"	0.0	LF	not applicable to project				
	- distribution piping to fixtures shown on risers - 25LF per water connection	0.0	LF	not applicable to project				
	- branch connections to fixtures	0.0	LF	not applicable to project				
	Connect to existing piping	0	EA	not applicable to project				
	Subtotal							$699,090

Department of Design and Construction

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Location: 1000 West Service Road, Staten Island, NY 10314
Bidder: PRISMATIC DEVELOPMENT

DDC ID: S136-367
Sponsor Agency: DSNY

CSI Number	Description	Quantity	Unit	Unit Cost of Material	Total Cost of Material	Unit Cost of Labor	Total Cost of Labor	Total Cost: Materials and Labor
22 1119	**DOMESTIC WATER PIPING SPECIALTIES**							
	Water meters							
	- domestic; 4"	1.0	EA	$5,348.00	$5,348	$5,348.00	$5,348	$10,696
	- domestic hot water sub-meter, 4"	1.0	EA	$5,348.00	$5,348	$5,348.00	$5,348	$10,696
	- water submeter for wash machine, 4"	1.0	EA	$5,348.00	$5,348	$5,348.00	$5,348	$10,696
	- water submeter for boiler, 1-1/2""	1.0	EA	$3,209.00	$3,209	$3,209.00	$3,209	$6,418
	RPZ:Reduced pressure zone							
	- domestic - 4"	2.0	EA	$3,102.00	$6,204.00	$2,139.00	$4,278	$10,482
	- boiler: 1 1/2"	1.0	EA	$1,284.00	$1,284.00	$2,139.00	$2,139	$3,423
	Meter outlet control valve - 4"	3.0	EA	$2,139.00	$6,417.00	$1,070.00	$3,210	$9,627
	Water submeters for indoor plumbing fixtures, truck washing and boilers	6.0	EA	$1,284.00	$7,704.00	$963.00	$5,778	$13,482
	Flat plate strainer - 4"	1.0	EA	$2,674.00	$2,674	$2,139.00	$2,139	$4,813
	Electronic Mixing Valve	1.0	EA	$8,557.00	$8,557	$2,674.00	$2,674	$11,231
	Mixing valves for shower room	6.0	EA	$2,139.00	$12,834.00	$1,605.00	$9,630	$22,464
	Existing Building							
	Reduced Pressure Zone Valve, RP2 - 3"		EA	not applicable to project				
	Subtotal							$114,028
22 1316	**SANITARY WASTE AND VENT PIPING**							
	Oil/Water Separators							
	OWS - 1, 2, 1000 GAL, Highland Tank MFG. CO (HTC-G 1000 Cylindrical) or approved equivalent	2.0	EA	$34,230.00	$68,460.00	$5,348.00	$10,696	$79,156
	OWS - 3, 4, 2000 GPM, Highland Tank MFG. CO (HTC-G 2000 Cylindrical) or approved equivalent	2.0	EA	$44,926.00	$89,852.00	$5,348.00	$10,696	$100,548
	Sanitary house trap in concrete pit - 12"	1.0	EA	$5,348.00	$5,348.00	$2,139.00	$2,139	$7,487
	CODP: Clean out deck plates							
	- 8"	12.0	EA	$321.00	$3,852.00	$642.00	$7,704	$11,556
	- 4"	24.0	EA	$193.00	$4,632.00	$642.00	$15,408	$20,040
	Floor drains							
	- 8"	9.0	EA	$1,070.00	$9,630.00	$1,284.00	$11,556	$21,186
	- 4"	26.0	EA	$321.00	$8,346.00	$1,284.00	$33,384	$41,730
	- 3"	20.0	EA	$321.00	$6,420.00	$1,284.00	$25,680	$32,100
	CO: Clean outs	44.0	EA	$321.00	$14,124.00	$1,284.00	$56,496	$70,620
	Trench drains							
	- Length	10.0	LF	$535.00	$5,350.00	$2,139.00	$21,390	$26,740

Department of Design and Construction

CONTRACTOR'S BID BREAKDOWN FORM

CONTRACT 1 - GENERAL CONSTRUCTION

Project: Staten Island 1 & 3 Garage - Phase II
Location: 1000 West Service Road, Staten Island, NY 10314
Bidder: PRISMATIC DEVELOPMENT

DDC ID: S136-367
Sponsor Agency: DSNY

CSI Number	Description	Quantity	Unit	Unit Cost of Material	Total Cost of Material	Unit Cost of Labor	Total Cost of Labor	Total Cost: Materials and Labor
	Funnel Drain - 4"	1.0	EA	$535.00	$535.00	$642.00	$642	$1,177
	Drain for part wash area - 6"	1.0	EA	$535.00	$535.00	$642.00	$642	$1,177
	FAI: Fresh air intake system							
	Fresh air intakes - 4"	1.0	EA	$214.00	$214.00	$642.00	$642	$856
	FAI underground piping - 4"	20.0	LF	$21.40	$428.00	$21.40	$428	$856
	Waste & vent piping incl. valves & specialties							
	Underground							
	- 8"	1,380.0	LF	$80.20	$110,676.00	$90.90	$125,442	$236,118
	- 6"		LF					
	- 4"	1,240.0	LF	$53.50	$66,340.00	$64.20	$79,608	$145,948
	- 3"	120.0	LF	$42.80	$5,136.00	$58.80	$7,056	$12,192
	- 2"	300.0	LF	$42.80	$12,840.00	$53.50	$16,050	$28,890
	- 1-1/2"		LF					
	Excavation for above		LF					
	Above ground							
	- 4"	1,500.0	LF	$37.40	$56,100.00	$58.80	$88,200	$144,300
	- 3"	280.0	LF	$32.10	$8,988.00	$53.50	$14,980	$23,968
	- 2"	1,900.0	LF	$21.40	$40,660.00	$48.10	$91,390	$132,050
	- 1 1/2"	1,180.0	LF	$19.30	$22,774.00	$48.10	$56,758	$79,532
	- branch dropdown connections to the fixtures	900.0	LF	$32.10	$28,890.00	$58.80	$52,920	$81,810
	Sanitary Piping 2" (Pumped Effluent Discharge)	60.0	LF	$26.70	$1,602.00	$48.10	$2,886	$4,488
	Excavation for Effluent Discharge		LF					
	VTR: Vent through roof - 4"	13.0	EA	$2,246.00	$29,198.00	$1,070.00	$13,910	$43,108
	Oil Water Separator mushroom Vent, 4"	6.0	EA	$321.00	$1,926.00	$321.00	$1,926	$3,852
	Existing Building							
	Floor Drains, 4"	4.0	EA	$508.00	$2,032.00	$1,284.00	$5,136	$7,168
	Cleanout Deck Plate	2.0	EA	$401.00	$802.00	$1,284.00	$2,568	$3,370
	Waste & vent piping incl. valves & specialties							
	- 5"		LF					
	- 4"	80.0	LF	$53.50	$4,280.00	$64.20	$5,136	$9,416
	- 3"		LF	Not Applicable				
	- 2"		LF	Not Applicable				
	- 1 1/2"		LF	Not Applicable				
	- distribution piping to fixtures shown on risers	20.0	LF	$53.50	$1,070.00	$64.20	$1,284	$2,354
	- branch connection to fixtures	20.0	LF	$53.50	$1,070.00	$64.20	$1,284	$2,354
	Connect to existing piping	1	EA	$631.00	$631.00	$2,139.00	$2,139	$2,770
	Subtotal							$1,378,917

Department of Design and Construction

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Sponsor Agency: DSNY

CSI Number	Description	Quantity	Unit	Unit Cost of Material	Total Cost of Material	Unit Cost of Labor	Total Cost of Labor	Total Cost: Materials and Labor
22 1413	**FACILITY STORM DRAINAGE PIPING**							
	New Building							
	Underground Storm drainage piping							
	- 12"	10.0	LF	$96.30	$963.00	$69.50	$695	$1,658
	- 10"	30.0	LF	$96.30	$2,889.00	$69.50	$2,085	$4,974
	- 8"	1,160.0	LF	$84.78	$98,344.80	$64.20	$74,470	$172,815
	- 6"	15.0	LF	$74.90	$1,123.50	$64.20	$963	$2,087
	- 5"	40.0	LF	$42.80	$1,712.00	$58.80	$2,352	$4,064
	- 4"	480.0	LF	$37.40	$17,952.00	$53.50	$25,680	$43,632
	- 2"	40.0	LF	$21.40	$856.00	$48.10	$1,924	$2,780
	Excavation for above		LF	included in site work				
	Above ground							
	- 12"	200.0	LF	$96.30	$19,260.00	$69.50	$13,900	$33,160
	- 10"	380.0	LF	$74.90	$28,462.00	$64.20	$24,396	$52,858
	- 8"	1,240.0	LF	$63.20	$78,368.00	$64.20	$79,608	$157,976
	- 6"	1,100.0	LF	$52.50	$57,750.00	$58.80	$64,680	$122,430
	- 5"	1,640.0	LF	$47.10	$77,244.00	$58.80	$96,432	$173,676
	- 4"	1,260.0	LF	$42.80	$53,928.00	$53.50	$67,410	$121,338
	- 3"	2,080.0	LF	$36.40	$75,712.00	$48.10	$100,048	$175,760
	- 2"	60.0	LF	$26.70	$1,602.00	$48.10	$2,886	$4,488
	- branch connections to fixtures		LF	$42.80	$0.00	$53.50	$0	$0
	Salt Shed							
	Piping							
	Above ground							
	- 6"	80.0	LF	$53.50	$4,280.00	$58.80	$4,704	$8,984
	- 5"	80.0	LF	$48.10	$3,848.00	$58.80	$4,704	$8,552
	- branch connections to fixtures	20.0	LF	$42.80	$856.00	$53.50	$1,070	$1,926
	Fuel Station							
	Piping							
	Above ground' 4"	40	LF	$42.80	$1,712.00	$53.50	$2,140	$3,852
	Subtotal							$1,097,009
22 1423	**STORM DRAINAGE PIPING SPECIALTIES**							
	New Building							
	Elevator Sump Pump in 24"x24"x24" concrete pit, 64 GPM, Stancor (SE50), 0.5hp or approved equivalent	1.0	EA	$6,685.00	$6,685.00	$4,279.00	$4,279	$10,964

Department of Design and Construction

CONTRACTOR'S BID BREAKDOWN FORM

CONTRACT 1 - GENERAL CONSTRUCTION

Project: Staten Island 1 & 3 Garage - Phase II
Location: 1000 West Service Road, Staten Island, NY 10314
Bidder: PRISMATIC DEVELOPMENT

DDC ID: S136-367
Sponsor Agency: DSNY

CSI Number	Description	Quantity	Unit	Unit Cost of Material	Total Cost of Material	Unit Cost of Labor	Total Cost of Labor	Total Cost: Materials and Labor
	Floor drains connected to storm line - 8"	47.0	EA	$1,284.00	$60,348.00	$1,605.00	$75,435	$135,783
	RD: Roof Drains - 4"	2.0	EA	$1,070.00	$2,140.00	$16,045.00	$32,090	$34,230
	OD: Overflow Drains							
	- 5"	39.0	EA	$1,177.00	$45,903.00	$1,605.00	$62,595	$108,498
	- 4"	2.0	EA	$1,070.00	$2,140.00	$1,605.00	$3,210	$5,350
	- 3"	10.0	EA	$963.00	$9,630.00	$1,605.00	$16,050	$25,680
	CFRD: Combined Flashing Roof Drains - 3"	39.0	EA	$963.00	$37,557.00	$1,605.00	$62,595	$100,152
	PD: Planting Drains - 3"	10.0	EA	$963.00	$9,630.00	$1,605.00	$16,050	$25,680
	Trench Drain, 14"							
	- Length	60.0	LF	$267.00	$16,020.00	$214.00	$12,840	$28,860
	CO: Cleanouts	69.0	EA	$107.00	$7,383.00	$1,070.00	$73,830	$81,213
	CODP: Cleanout deck plate							
	- 8"	32.0	EA	$1,177.00	$37,664.00	$2,139.00	$68,448	$106,112
	- 4"	12.0	EA	$535.00	$6,420.00	$1,605.00	$19,260	$25,680
	Salt Shed							
	Roof Drains; 5"	2.0	EA	$1,177.00	$2,354.00	$1,605.00	$3,210	$5,564
	Overflow Drains; 5"	2.0	EA	$1,177.00	$2,354.00	$1,605.00	$3,210	$5,564
	Fuel Station							
	Roof Drains; 4"	2.0	EA	$1,070.00	$2,140.00	$1,605.00	$3,210	$5,350
	Overflow Drains; 4"	2	EA	$1,070.00	$2,140.00	$1,605.00	$3,210	$5,350
	Subtotal							$710,030
22 1513	**COMPRESSED AIR EQUIPMENT**							
	New Building							
	Duplex air compressors, 78" x 30" x 63", 200 Gal, 175 PSI, 100 CFM, 30hp, Saylor Beall PL-93020 or approved equivalent	2.0	EA	$32,090.00	$64,180.00	$8,557.00	$17,114	$81,294
	Compressed air dryers - NVC 400 Ingersool Rand or approved equivalent	2.0	EA	$10,697.00	$21,394.00	$8,557.00	$17,114	$38,508
	Regulator; 160PSI	19.0	EA	$535.00	$10,165.00	$588.00	$11,172	$21,337
	Regulator; 90PSI	35.0	EA	$535.00	$18,725.00	$535.00	$18,725	$37,450
	Filter	35.0	EA	$535.00	$18,725.00	$535.00	$18,725	$37,450
	Lubricator	35.0	EA	$428.00	$14,980.00	$535.00	$18,725	$33,705
	Tire air; coupler	19.0	EA	$214.00	$4,066.00	$321.00	$6,099	$10,165
	Tool air; coupler	35.0	EA	$214.00	$7,490.00	$321.00	$11,235	$18,725
	Shut-off valve; 3/4"	35.0	EA	$214.00	$7,490.00	$321.00	$11,235	$18,725
	Shut-off valve; 1"	19.0	EA	$267.00	$5,073.00	$321.00	$6,099	$11,172
	Manual/Automatic Drain Valve	35.0	EA	included in air compressors and dryers				

Department of Design and Construction

CONTRACTOR'S BID BREAKDOWN FORM

CONTRACT 1 - GENERAL CONSTRUCTION

Project: Staten Island 1 & 3 Garage - Phase II
Location: 1000 West Service Road, Staten Island, NY 10314
Bidder: PRISMATIC DEVELOPMENT

DDC ID: S136-367
Sponsor Agency: DSNY

CSI Number	Description	Quantity	Unit	Unit Cost of Material	Total Cost of Material	Unit Cost of Labor	Total Cost of Labor	Total Cost: Materials and Labor
	Pressure relief vent	0.0	EA	included in air compressors				
	Existing Building							
	Air Compressor, Saylor Beall PL-90020, 30Hp or approved equivalent	0.0	EA	not applicable to project				
	Relocate air compressor serving vehicle storage area	1.0	EA	$214.00	$214.00	$2,139.00	$2,139	$2,353
	Compressed air connections for double outlets for tires & tools	3.0	EA	$1,284.00	$3,852.00	$1,284.00	$3,852	$7,704
	Compressed air connections to equipment (pneumatic pumps & air compressors)	1	EA	$3,209.00	$3,209.00	$2,246.00	$2,246	$5,455
	Subtotal							$324,043
22 1513.10	**MOTOR FUEL DISPENSING SYSTEM**							
	New Building							
	Motor oil Pump (Garco 238108 Fire Baall 425) or approved equivalent	1.0	EA	$5,000.00	$5,000.00	$25,000.00	$25,000	$30,000
	Hose reels for motor oil (Garco HSM65B) or approved equivalent	1.0	EA	$5,000.00	$5,000.00	$25,000.00	$25,000	$30,000
	Hose Reel connections	1.0	EA	$2,500.00	$2,500.00	$25,000.00	$25,000	$27,500
	Oil Dispensing nozzle (Garco 256836 SDM15) or approved equivalent	1.0	EA	$2,000.00	$2,000.00	$25,000.00	$25,000	$27,000
	Motor oil piping							
	- Horizontal - 1"	1.0	LF	$5,000.00	$5,000.00	$40,000.00	$40,000	$45,000
	- Dropdown (15' high) to Repair Bay - 1"	1.0	LF	$5,000.00	$5,000.00	$40,000.00	$40,000	$45,000
	Waste oil collection tank, 550 Gal	1.0	EA	$5,000.00	$5,000.00	$30,000.00	$30,000	$35,000
	Waste oil collection tank, 2000 Gal (Site C501)	1.0	EA	$5,000.00	$5,000.00	$30,000.00	$30,000	$35,000
	Motor Oil System							
	Motor Oil Hose Reel connections	1.0	EA	$2,500.00	$2,500.00	$10,000.00	$10,000	$12,500
	Automatic Dispensing Nozzle connections	1.0	EA	$2,000.00	$2,000.00	$20,000.00	$20,000	$22,000
	Motor Oil Piping							
	- mains	1.0	LF	$5,000.00	$5,000.00	$40,000.00	$40,000	$45,000
	- branch connection to hose reels	1.0	LF	$5,000.00	$5,000.00	$40,000.00	$40,000	$45,000
	- final connection and drop down to equipment	1.0	LF	$2,500.00	$2,500.00	$40,000.00	$40,000	$42,500
	Connection to existing piping of existing systems	1	LS	$18,500.00	$18,500.00	$40,000.00	$40,000	$58,500
	Subtotal							$500,000
22 1513.20	**FLUID DISPENSING SYSTEM**							
	New Building							
	Hydraulic oil Pump (Garco 238108 Fire Baall 425) or approved equivalent	1.0	EA	$5,000	$5,000	$25,000	$25,000	$30,000

Department of Design and Construction

CONTRACTOR'S BID BREAKDOWN FORM

CONTRACT 1 - GENERAL CONSTRUCTION

Project: Staten Island 1 & 3 Garage - Phase II
Location: 1000 West Service Road, Staten Island, NY 10314
Bidder: PRISMATIC DEVELOPMENT

DDC ID: S136-367
Sponsor Agency: DSNY

CSI Number	Description	Quantity	Unit	Unit Cost of Material	Total Cost of Material	Unit Cost of Labor	Total Cost of Labor	Total Cost: Materials and Labor
	Hose reels for hydraulic oil (Garco HSM65B) or approved equivalent	1.0	EA	$5,000	$5,000	$25,000	$25,000	$30,000
	Hose reel for hydraulic oil - connections	1.0	EA	$2,500	$2,500	$25,000	$25,000	$27,500
	Oil Dispensing nozzle (Garco 256836 SDM15) or approved equivalent	1.0	EA	$2,000	$2,000	$25,000	$25,000	$27,000
	Hydraulic oil piping							
	- Horizontal - 1"	1.0	LF	$5,000	$5,000	$35,000	$35,000	$40,000
	- Dropdown (15' high) to Repair Bay - 1"	1.0	LF	$5,000	$5,000	$35,000	$35,000	$40,000
	Fill boxes	1.0	EA	$5,000	$5,000	$10,000	$10,000	$15,000
	Entry boot	1.0	EA	$5,000	$5,000	$10,000	$10,000	$15,000
	Transition sump	1.0	EA	$5,000	$5,000	$10,000	$10,000	$15,000
	Atmospheric vent	1.0	EA	$5,000	$5,000	$10,000	$10,000	$15,000
	Pump	1.0	EA	$5,000	$5,000	$10,000	$10,000	$15,000
	Wall mount pump panel	1.0	EA	$5,000	$5,000	$10,000	$10,000	$15,000
	Existing Building							
	550 gal underground tank for Hydraulic and Motor Oil @ Boro Repair Shop - inspect and replace tanks; 2 tanks	1.0	LS	$5,000	$5,000	$20,000	$20,000	$25,000
	Relocated and replaced pneumatic pump serving Hydraulic and Motor Oil system	1.0	EA	$5,000	$5,000	$20,000	$20,000	$25,000
	Hydraulic Oil System							
	Hydraulic Oil Hose Reel connections	1.0	EA	$5,000	$5,000	$20,000	$20,000	$25,000
	Automatic Dispensing Nozzle connections	1.0	EA	$2,500	$2,500	$20,000	$20,000	$22,500
	Hydraulic Oil Piping							
	- mains	1.0	LF	$5,000	$5,000	$35,000	$35,000	$40,000
	- branch connection to hose reels	1.0	LF	$5,000	$5,000	$35,000	$35,000	$40,000
	- final connection and drop down to equipment	1	LF	$3,000	$3,000	$35,000	$35,000	$38,000
	Subtotal							$500,000
22 1513.30	**GENERAL-SERVICE COMPRESSED-AIR PIPING**							
	New Building							
	Compressed air piping (stainless steel) including valve & specialties							
	Distribution							
	- 3"	260.0	LF	$42.80	$11,128.00	$64.20	$16,692	$27,820
	- 2"	900.0	LF	$40.60	$36,540.00	$58.80	$52,920	$89,460
	- 1 1/2"	1,020.0	LF	$53.50	$54,570.00	$53.50	$54,570	$109,140
	- 1"	190.0	LF	$48.10	$9,139.00	$51.30	$9,747	$18,886
	Column branch & dropdowns							

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DDC ID: S136-367
Sponsor Agency: DSNY

CSI Number	Description	Quantity	Unit	Unit Cost of Material	Total Cost of Material	Unit Cost of Labor	Total Cost of Labor	Total Cost: Materials and Labor
	- 1 1/2" - dropdowns to Repair, Wash Bay & parking Areas (assume 15 LF for each outlet)	285.0	LF	$53.50	$15,247.50	$53.50	$15,248	$30,495
	- 1"	120.0	LF	$48.10	$5,772.00	$51.30	$6,156	$11,928
	- 3/4"	120.0	LF	$48.10	$5,772.00	$48.10	$5,772	$11,544
	Existing Building							
	Compressed air piping incl. valves & specialties							
	- 2"	0.0	LF	not applicable to project				
	- 1 1/2"	120.0	LF	$53.50	$6,420.00	$53.50	$6,420	$12,840
	- 1 1/4"	0.0	LF	not applicable to project				
	- 1"	80.0	LF	$48.10	$3,848.00	$51.30	$4,104	$7,952
	- branch connection to double outlets	40.0	LF	$53.50	$2,140.00	$53.50	$2,140	$4,280
	- final connection and drop down to equipment	60.0	LF	$128.00	$7,680.00	$128.00	$7,680	$15,360
	Connect to existing piping	1	EA	$995.00	$995.00	$2,139.00	$2,139	$3,134
	Subtotal							$342,839
22 3500	**DOMESTIC WATER HEAT EXCHANGER**							
	New Building							
	Hot Water Heat Exchangers, 25 GPM, 997,000 Btu/hr, 50" x 13" x 43", 88 Plates, Tigerflow (DHWG-40-IN-3W-DOL) or approved equivalent	2	EA	$53,484.00	$106,968.00	$8,557.00	$17,114	$124,082
	Hot Water Recirculation Pumps, 30 GPM, Bell and Gossett (PL-55), 2/5hp or approved equivalent	1	EA	$4,279.00	$4,279.00	$7,060.00	$7,060	$11,339
	Subtotal							$135,421
22 4000	**PLUMBING FIXTURES**							
	New Building							
	Plumbing Fxitures							
	Waterclosets	28.0	EA	$1,605.00	$44,940.00	$2,139.00	$59,892	$104,832
	Waterclosets, ADA	10.0	EA	$1,605.00	$16,050.00	$2,139.00	$21,390	$37,440
	Urinals	17.0	EA	$1,284.00	$21,828.00	$2,139.00	$36,363	$58,191
	Lavatories	45.0	EA	$856.00	$38,520.00	$2,139.00	$96,255	$134,775
	Showers	29.0	EA	$2,139.00	$62,031.00	$2,674.00	$77,546	$139,577
	Sinks	8.0	EA	$1,284.00	$10,272.00	$1,925.00	$15,400	$25,672
	Break Room Sinks	2.0	EA	$3,473.00	$6,946.00	$1,925.00	$3,850	$10,796
	Office Sinks	1.0	EA	$2,353.00	$2,353.00	$1,925.00	$1,925	$4,278
	Janitor Sinks	2.0	EA	$1,284.00	$2,568.00	$1,925.00	$3,850	$6,418
	Drinking Fountains	6.0	EA	$1,925.00	$11,550.00	$1,925.00	$11,550	$23,100

Department of Design and Construction

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CSI Number	Description	Quantity	Unit	Unit Cost of Material	Total Cost of Material	Unit Cost of Labor	Total Cost of Labor	Total Cost: Materials and Labor
	Electronic flush valve sensors	55.0	EA	$321.00	$17,655.00	$642.00	$35,310	$52,965
	Power wash fountain	1.0	EA	$642.00	$642.00	$642.00	$642	$1,284
	Existing Building							
	Waterclosets		EA	not applicable to project				
	Waterclosets, ADA		EA	not applicable to project				
	Urinals		EA	not applicable to project				
	Lavatories		EA	not applicable to project				
	Showers @ 1st Floor (from riser diagram)		EA	not applicable to project				
	Showers @ 2nd Floor		EA	not applicable to project				
	Service Sink		EA	not applicable to project				
	Kitchen Sink		EA	not applicable to project				
	Mop Sink		EA	not applicable to project				
	Water fountain @ 1st Floor (from riser diagram)		EA	not applicable to project				
	Electric water coolers (from riser diagram)		EA	not applicable to project				
	Electronic flush valves on wc's, ur's & lav's		EA	not applicable to project				
	Subtotal							$599,328
23 0000	**HEATING, VENTILATING AND AIR CONDITIONING (HVAC)**							
23 0500	**COMMON WORK RESULTS FOR HVAC**							
	New Building							
	Building Flush out before occupancy (70 - 80hrs)	1	LS	$26,300.00	$26,300.00	$155,100.00	$155,100.00	$181,400
	Rigging & Handling	1	LS	$69,530.00	$69,530.00	$76,480.00	$76,480.00	$146,010
	Existing Building							
	HVAC demolition	1	LS	$1,070.00	$1,070.00	$2,670.00	$2,670.00	$3,740
	Rigging & Handling	1	LS	$37,440.00	$37,440.00	$40,110.00	$40,110.00	$77,550
	Subtotal				$134,340.00		$274,360.00	$408,700
23 0513	**COMMON MOTOR REQUIREMENTS FOR HVAC EQUIPMENT (included w/ 237200)**							
23 0516	**EXPANSION FITTINGS AND LOOPS FOR HVAC PIPING (included w/ 232113)**							
23 0519	**METERS AND GAGES FOR HVAC PIPING (included w/ 232113)**							
23 0523	**GENERAL DUTY VALVES FOR HVAC PIPING (included w/ 232113)**							

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CSI Number	Description	Quantity	Unit	Unit Cost of Material	Total Cost of Material	Unit Cost of Labor	Total Cost of Labor	Total Cost: Materials and Labor
23 0529	**HANGERS AND SUPPORTS FOR HVAC PIPING AND EQUIPMENT (included w/ 232113)**							
23 0548	**VIBRATION AND SEISMIC CONTROLS FOR HVAC PIPING AND EQUIPMENT**							
	New Building							
	Vibration Isolation	1	LS	$43,322.00	$43,322.00	$32,625.00	$32,625.00	$75,947
	Existing Building							
	Vibration Isolation	1	LS	$4,814.00	$4,814.00	$3,958.00	$3,958.00	$8,772
	Subtotal				$48,136.00		$36,583.00	$84,719
23 0549	**HVAC SEISMIC SPECIFICATION**							
	New Building							
	Expansion Tank, 48" x 87", 475 Gal, Grundfos/Paco (GNTA-2000) or approved equivalent	1	EA	$9,146.00	$9,146.00	$7,113.00	$7,113.00	$16,259
	Subtotal				$9,146.00		$7,113.00	$16,259
23 0593	**TESTING FOR HVAC (included w/ 230594)**							
23 0594	**BALANCING FOR HVAC**							
	New Building							
	Testing & Balancing	1	LS	$50,810.00	$50,810.00	$64,180.00	$64,180.00	$114,990
	Subtotal				$50,810.00		$64,180.00	$114,990
23 0700	**PIPING INSULATION**							
	New Building							
	Piping Insulation - Hot water	7250	LF	$21.00	$152,250.00	$30.00	$217,500.00	$369,750
	Existing Building							
	Piping Insulation - Hot water	340	LF	$21.00	$7,140.00	$30.00	$10,200.00	$17,340
	Insulation on chilled water piping	200	LF	$21.00	$4,200.00	$30.00	$6,000.00	$10,200
	Subtotal				$163,590.00		$233,700.00	$397,290
23 0701	**DUCTWORK INSULATION**							
	New Building							
	Ductwork insulation	90100	SF	$4.28	$385,628.00	$7.49	$674,849.00	$1,060,477
	Existing Building							
	Ductwork insulation	3650	SF	$4.28	$15,622.00	$7.49	$27,338.50	$42,961

Department of Design and Construction

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CSI Number	Description	Quantity	Unit	Unit Cost of Material	Total Cost of Material	Unit Cost of Labor	Total Cost of Labor	Total Cost: Materials and Labor
	Subtotal				$401,250.00		$702,187.50	$1,103,438
23 0800	**COMMISSIONING OF HVAC SYSTEMS (included w/ 230594)**							
23 0900	**INSTRUMENTATION AND CONTROL FOR HVAC**							
	New Building							
	Building Management System							
	Headend Equipment							
	RTU's: @ 30pts each	60.0	PTS	$642.00	$38,520.00	$1,284.00	$77,040.00	$115,560
	HV's's @ 25pts each	200.0	PTS	$642.00	$128,400.00	$1,284.00	$256,800.00	$385,200
	ERV's @ 12pts each	96.0	PTS	$642.00	$61,632.00	$1,284.00	$123,264.00	$184,896
	Fans @ 3pts each	99.0	PTS	$642.00	$63,558.00	$1,284.00	$127,116.00	$190,674
	Boilers @ 17pts each	51.0	PTS	$642.00	$32,742.00	$1,284.00	$65,484.00	$98,226
	Pumps @ 6pts each	72.0	PTS	$642.00	$46,224.00	$1,284.00	$92,448.00	$138,672
	Hot water heat exchanger @ 6pts each	66.0	PTS	$642.00	$42,372.00	$1,284.00	$84,744.00	$127,116
	Solar water system	0.0	PTS					
	Misc plumbing & electrical		PTS					
	Secondary Terminals							
	Condensing units @ 6pts each	348.0	PTS	$642.00	$223,416.00	$1,284.00	$446,832.00	$670,248
	Unit heaters @ 3pts each	84.0	PTS	$642.00	$53,928.00	$1,284.00	$107,856.00	$161,784
	Air curtains @ 3pts each	9.0	PTS	$642.00	$5,778.00	$1,284.00	$11,556.00	$17,334
	Trench heater / Baseboard heaters @ 2pts per control valve	40.0	PTS	$642.00	$25,680.00	$1,284.00	$51,360.00	$77,040
	CO: Carbon monoxide detecting sensor	10.0	EA	$642.00	$6,420.00	$1,284.00	$12,840.00	$19,260
	NOX: Nitrogen monoxide detecting sensor	10.0	EA	$642.00	$6,420.00	$1,284.00	$12,840.00	$19,260
	AC units; T-stat only	28.0	PTS	$642.00	$17,976.00	$1,284.00	$35,952.00	$53,928
	Outside processing units; T-stat only	5.0	PTS	$642.00	$3,210.00	$1,284.00	$6,420.00	$9,630
	Existing Building							
	Headend Equipment							
	Connection to existing headend/reprogramming	1.0	LS	$300,044.00	$300,044.00	$225,701.00	$225,701.00	$525,745
	RTU's: @ 30pts each	30.0	PTS	$642.00	$19,260.00	$1,284.00	$38,520.00	$57,780
	Fans; 3 pts each	3.0	PTS	$642.00	$1,926.00	$1,284.00	$3,852.00	$5,778
	Misc Plumbing & Electrical		PTS					
	Secondary Terminals							
	AC units; 7 pts each	7.0	PTS	$642.00	$4,494.00	$1,284.00	$8,988.00	$13,482
	Hot water duct heating coil; 2 pts each	2	PTS	$642.00	$1,284.00	$1,284.00	$2,568.00	$3,852
	Subtotal				$1,083,284		$1,792,181	$2,875,465
23 0993	**SEQUENCE OF OPERATIONS (included w/ 230900)**							

Department of Design and Construction

CONTRACTOR'S BID BREAKDOWN FORM

CONTRACT 1 - GENERAL CONSTRUCTION

Project: Staten Island 1 & 3 Garage - Phase II
Location: 1000 West Service Road, Staten Island, NY 10314
Bidder: PRISMATIC DEVELOPMENT

DDC ID: S136-367
Sponsor Agency: DSNY

CSI Number	Description	Quantity	Unit	Unit Cost of Material	Total Cost of Material	Unit Cost of Labor	Total Cost of Labor	Total Cost: Materials and Labor
23 1217	**VEHICLE EXHAUST SYSTEM**							
	New Building							
	Hose reel exhaust	3200	LBS	$16.00	$51,200.00	$23.50	$75,200.00	$126,400
	Hose reel exhaust connections	7	EA	$18,184.00	$127,288.00	$6,365.00	$44,555.00	$171,843
	Existing Building							
	TP-4: Tailpipe exhaust, Howden American fan company QBCS series or equal, 3.5hp	1300	CFM	$16,045.00	$16,045	$6,418.00	$6,418.00	$22,463
	VFD; 3.5hp	1	EA	$8,023.00	$8,023.00	$5,241.00	$5,241.00	$13,264
	Truck exhaust hose reels w/ 30lf of hose	2	EA	$18,184.00	$36,368.00	$6,365.00	$12,730.00	$49,098
	Subtotal				$238,924		$144,144.00	$383,068
23 2113	**HYDRONIC PIPING**							
	New Building							
	Hot water piping							
	- 10"	80.0	LF	$117.70	$9,416.00	$164.70	$13,176	$22,592
	- 8"	80.0	LF	$85.60	$6,848.00	$119.80	$9,584	$16,432
	- 6"	350.0	LF	$64.20	$22,470.00	$89.90	$31,465	$53,935
	- 5"	300.0	LF	$53.50	$16,050.00	$74.90	$22,470	$38,520
	- 4"	900.0	LF	$48.10	$43,290.00	$67.40	$60,660	$103,950
	- 3"	280.0	LF	$32.10	$8,988.00	$44.90	$12,572	$21,560
	- 2-1/2"	2,080.0	LF	$26.70	$55,536.00	$37.40	$77,792	$133,328
	- 2"	985.0	LF	$17.10	$16,843.50	$23.50	$23,148	$39,991
	- 1 1/2"	340.0	LF	$11.80	$4,012.00	$19.30	$6,562	$10,574
	- 1 1/4"	3,080.0	LF	$10.70	$32,956.00	$16.00	$49,280	$82,236
	- 1"	1,400.0	LF	$8.56	$11,984.00	$13.91	$19,474	$31,458
	- 3/4"	620.0	LF	$6.42	$3,980.40	$9.63	$5,971	$9,951
	- branch connection to terminals	310.0	LF	$6.42	$1,990.20	$9.63	$2,985	$4,976
	Existing Building							
	Hot water, HWS/R							
	- to AC unitand HotWater duct heating coil	160.0	LF	$21.40	$3,424.00	$30.00	$4,800	$8,224
	Chilled Water, CHWS/R							
	- to AC unit	120.0	LF	$21.40	$2,568.00	$30.00	$3,600	$6,168
	Condensate drainage	160	LF	$21.40	$3,424.00	$30.00	$4,800	$8,224
	Subtotal				$243,780.10		$348,338.40	$592,119
23 2116	**HYDRONIC PIPING SPECIALTIES**							

Department of Design and Construction

CONTRACTOR'S BID BREAKDOWN FORM

CONTRACT 1 - GENERAL CONSTRUCTION

Project: Staten Island 1 & 3 Garage - Phase II
Location: 1000 West Service Road, Staten Island, NY 10314
Bidder: PRISMATIC DEVELOPMENT

DDC ID: S136-367
Sponsor Agency: DSNY

CSI Number	Description	Quantity	Unit	Unit Cost of Material	Total Cost of Material	Unit Cost of Labor	Total Cost of Labor	Total Cost: Materials and Labor
	New Building							
	Control Valve sets (Headend equipment)							
	- RTU's	2.0	EA	$1,605.00	$3,210.00	$3,209.00	$6,418	$9,628
	- HV's	8.0	EA	$1,605.00	$12,840.00	$3,209.00	$25,672	$38,512
	- ERV's	8.0	EA	$1,605.00	$12,840.00	$3,209.00	$25,672	$38,512
	- Boilers	3.0	EA	$1,605.00	$4,815.00	$3,209.00	$9,627	$14,442
	- Pumps	10.0	EA	$1,605.00	$16,050.00	$3,209.00	$32,090	$48,140
	- Hot water heat exchanger	11.0	EA	$1,605.00	$17,655.00	$3,209.00	$35,299	$52,954
	Secondary Valve sets (terminals); including isolation, commissioning and non-return valves	10.0	EA	$1,070.00	$10,700.00	$1,605.00	$16,050	$26,750
	Control Valve Sets for Terminals)							
	- unit heaters / air curtains	31.0	EA	$1,070.00	$33,170.00	$1,605.00	$49,755	$82,925
	- radiators (assumes 5 per control valve)	100.0	EA	$107.00	$10,700.00	$321.00	$32,100	$42,800
	Existing Building							
	Hot water							
	Control Valve sets (Headend equipment) - RTU-BME	1.0	EA	$1,605.00	$1,605.00	$3,209.00	$3,209	$4,814
	Secondary Valve sets (terminals); including isolation, commissioning and non-return valves	2.0	EA	$1,605.00	$3,210.00	$3,209.00	$6,418	$9,628
	Control Valve Sets for Terminals (Assumes individual control)							
	- AC Units	1.0	EA	$1,070.00	$1,070.00	$2,139.00	$2,139	$3,209
	- Hot water duct heating coil	1.0	EA	$1,070.00	$1,070.00	$3,209.00	$3,209	$4,279
	Chilled water							
	Secondary Valve sets (terminals); including isolation, commissioning and non-return valves	2.0	EA	$1,070.00	$2,140.00	$2,139.00	$4,278	$6,418
	Control Valve Sets for Terminals (Assumes individual control)							
	- AC Units	1	EA	$1,070.00	$1,070.00	$2,139.00	$2,139	$3,209
	Subtotal				$132,145.00		$254,075.00	$386,220
23 2123	**HYDRONIC PUMPS**							
	New Building							
	P-5A/5B; Domestic HW Circulator Pump ,0.75hp, 40 GPM, (E-60), (E-80)	2.0	EA	$2,139.00	$4,278.00	$1,498.00	$2,996	$7,274
	HWP-P1/P2; Hot Water pumps serving UH Heat Exchangers, 50hp, 1200 GPM, (E-80SC)	2.0	EA	$32,090.00	$64,180.00	$22,463.00	$44,926	$109,106
	HWP-P3/P4; Hot Water pumps serving radiators, 5hp, 50 GPM, (E-80)	2.0	EA	$16,045.00	$32,090.00	$11,232.00	$22,464	$54,554
	HXWP-1/2/3/4/5/6; Pump serving RTU HV-1 thru HV-6, 2hp, 67 GPM, (Ecocirc XL 70-145) or approved equivalent	6.0	EA	$5,348.00	$32,088.00	$3,744.00	$22,464	$54,552

Department of Design and Construction

CONTRACTOR'S BID BREAKDOWN FORM

CONTRACT 1 - GENERAL CONSTRUCTION

Project: Staten Island 1 & 3 Garage - Phase II
Location: 1000 West Service Road, Staten Island, NY 10314
Bidder: PRISMATIC DEVELOPMENT

DDC ID: S136-367
Sponsor Agency: DSNY

CSI Number	Description	Quantity	Unit	Unit Cost of Material	Total Cost of Material	Unit Cost of Labor	Total Cost of Labor	Total Cost: Materials and Labor
	HXWP-7; Pump serving RTU HV-7, 1hp, 43 GPM, Ecocirc XL 65-130, (Ecocirc XL 70-145) or approved equivalent	1.0	EA	$3,209.00	$3,209.00	$2,246.00	$2,246	$5,455
	HXWP-8; Booster Pump serving RTU HV-8, 1/6hp, 9 GPM, Ecocirc XL 65-130, or approved equivalent	1.0	EA	$3,744.00	$3,744.00	$2,621.00	$2,621	$6,365
	HXWP-9/10; Pump serving RTU-1 or 2, 1hp, 46 GPM,, (Ecocirc XL 65-130) or approved equivalent	2.0	EA	$3,209.00	$6,418.00	$2,246.00	$4,492	$10,910
	VFDs for Pumps							
	- 50hp	2.0	EA	$27,812.00	$55,624.00	$19,468.00	$38,936	$94,560
	- 5hp	2.0	EA	$7,488.00	$14,976.00	$5,241.00	$10,482	$25,458
	- 2hp	4.0	EA	$3,209.00	$12,836.00	$2,246.00	$8,984	$21,820
	- 1hp	2	EA	$2,139.00	$4,278.00	$1,498.00	$2,996	$7,274
	Subtotal				$233,721.00		$163,607.00	$397,328
23 2300	**REFRIGERANT PIPING**							
	New Building							
	Refrigerant piping							
	- return	4,000.0	LF	$12.80	$51,200.00	$24.40	$97,600	$148,800
	- supply	4,000.0	LF	$12.80	$51,200.00	$24.40	$97,600	$148,800
	- branch connection to equipment	1,500.0	LF	$12.80	$19,200.00	$24.40	$36,600	$55,800
	Condensate Drainage							
	- 2"	400.0	LF	$32.10	$12,840.00	$61.00	$24,400	$37,240
	- 1 1/2"	560.0	LF	$21.40	$11,984.00	$40.60	$22,736	$34,720
	- 1 1/4"	1,050.0	LF	$16.00	$16,800.00	$30.50	$32,025	$48,825
	- 1"	300.0	LF	$16.00	$4,800.00	$30.50	$9,150	$13,950
	- 3/4"	500.0	LF	$10.70	$5,350.00	$20.30	$10,150	$15,500
	Control Valve sets (Headend equipment); Outdoor Condensing Units	26.0	EA	$535.00	$13,910.00	$1,016.00	$26,416	$40,326
	Secondary Valve sets (terminals); including isolation, commissioning and non-return valves	26.0	EA	$535.00	$13,910.00	$1,016.00	$26,416	$40,326
	Control Valve Sets for Terminals (Assumes individual control); Heat pump indoor units	58.0	EA	$535.00	$31,030.00	$1,016.00	$58,928	$89,958
	Refrigerant charge, evacuation & start-up	2,810.0	LBS	$10.70	$30,067.00	$20.30	$57,043	$87,110
	Roof trapeze supports	1	LS	$16,526.00	$16,526.00	$31,400.00	$31,400	$47,926
	Subtotal				$278,817.00		$530,464.00	$809,281
23 2500	**HVAC WATER TREATMENT**							
	New Building							

Department of Design and Construction

CONTRACTOR'S BID BREAKDOWN FORM

CONTRACT 1 - GENERAL CONSTRUCTION

Project: Staten Island 1 & 3 Garage - Phase II
Location: 1000 West Service Road, Staten Island, NY 10314
Bidder: PRISMATIC DEVELOPMENT

DDC ID: S136-367
Sponsor Agency: DSNY

CSI Number	Description	Quantity	Unit	Unit Cost of Material	Total Cost of Material	Unit Cost of Labor	Total Cost of Labor	Total Cost: Materials and Labor
	Chemical Treatment	1	LS	$17,275.00	$17,275.00	$30,892.00	$30,892	$48,167
	Subtotal				$17,275.00		$30,892.00	$48,167
23 3113	**METAL DUCTS**							
	New Building							
	Galvanized sheet steel ductwork	107,360.0	LBS	$8.60	$923,296	$11.78	$1,264,546	$2,187,842
	Ductwork - stainless steel							
	- wash bays	5,450.0	LBS	$12.80	$69,760.00	$19.30	$105,185	$174,945
	- double wall exhaust	2,300.0	LBS	$21.40	$49,220.00	$24.60	$56,580	$105,800
	Generator Exhaust flue; 6" dia	60.0	LF	$257.00	$15,420.00	$359.00	$21,540	$36,960
	Noise Isolator for Generator Exhaust, Glass Fibre, 36" x 156" x 120"	1.0	EA	$3,348.00	$3,348.00	$1,671.00	$1,671	$5,019
	Outdoor air intake louvered Penthouse, 74"W x 124"L x 46"H	1.0	EA	$5,985.00	$5,985.00	$2,394.00	$2,394	$8,379
	Smoke hatch	1.0	EA	$2,674.00	$2,674.00	$1,070.00	$1,070	$3,744
	Existing Building							
	Galvanized sheet steel ductwork	3,750.0	LBS	$8.60	$32,250.00	$11.80	$44,250	$76,500
	Double wall stainless steel ductwork - for fume vent	410.0	LBS	$21.40	$8,774.00	$24.60	$10,086	$18,860
	Connect to existing ductwork	2.0	EA	$2,139.00	$4,278.00	$1,284.00	$2,568	$6,846
	Gas Vent Louver connection; 12x8	1.0	EA	$2,139.00	$2,139.00	$1,284.00	$1,284	$3,423
	Pressure washer hood connection; 18 x 18	2	EA	$2,139.00	$4,278.00	$1,284.00	$2,568	$6,846
	Subtotal				$1,121,422		$1,513,742	$2,635,164
23 3300	**AIR DUCT ACCESSORIES (included w/ 233113)**							
23 3301	**DAMPERS**							
	New Building							
	Volume (VD)	160	EA	$160.00	$25,600.00	$112.00	$17,920	$43,520
	Fire (FD)	110	EA	$321.00	$35,310.00	$225.00	$24,750	$60,060
	Motorized (MD)	13	EA	$642.00	$8,346.00	$449.00	$5,837	$14,183
	Volume Dampers	20	EA	$160.00	$3,200.00	$112.00	$2,240	$5,440
	Subtotal				$72,456.00		$50,747.00	$123,203
23 3416	**CENTRIFUGAL HVAC FANS**							
	New Building							
	EF-1/2; Inline Exhaust Fan, 1/4hp, (SQ-97-VG), 100 CFM each or approved equivalent	1.0	CFM	$374.00	$374.00	$337.00	$337	$711
	EF-CR-1; Inline Exhaust Fan, 3/4hp, (SQ-98), 500 CFM each or approved equivalent	1	CFM	$1,070.00	$1,070.00	$963.00	$963	$2,033

Department of Design and Construction

CONTRACTOR'S BID BREAKDOWN FORM

CONTRACT 1 - GENERAL CONSTRUCTION

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DDC ID: S136-367
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CSI Number	Description	Quantity	Unit	Unit Cost of Material	Total Cost of Material	Unit Cost of Labor	Total Cost of Labor	Total Cost: Materials and Labor
	EF-G-1/B-1/BS-1; Inline Exhaust Fan, 1/10hp, (SQ-90-VG), 450 CFM each or approved equivalent	3	CFM	$1,337.00	$4,011.00	$1,203.00	$3,609	$7,620
	GEF-R-1; Generator Exhaust Fan @ Roof, 1/2 hp, Varigreen motor (G-163), 3000 CFM each or approved equivalent	1	CFM	$5,348.00	$5,348.00	$4,814.00	$4,814	$10,162
	GSF-1; Generator Supply Fan @ Roof, 7-1/2 hp, (RBS-3L60-75), 34000 CFM each or approved equivalent	1	CFM	$19,789.00	$19,789.00	$17,810.00	$17,810	$37,599
	KEF-1/2/3/4; Kitchen Exhaust Fan @ Roof, 1/6hp, (GB-081-6), 400 CFM each or approved equivalent	2	CFM	$2,674.00	$5,348.00	$2,407.00	$4,814	$10,162
	KEF-5/6; Kitchen Exhaust Fan @ Roof, 1/2hp, (USFD-108-BI), 400 CFM each or approved equivalent	2	CFM	$3,209.00	$6,418.00	$2,888.00	$5,776	$12,194
	TEF-R1/R2; Toilet Exhaust Fan @ Roof, 1/3 hp, (USF-306-BI), 80CFM each or approved equivalent	2	CFM	$3,209.00	$6,418.00	$2,888.00	$5,776	$12,194
	TPEF-1; Tail Pipe Exhaust Fan @ Repair Bay, 7.5 hp, Nederman (40/25), 24000 CFM each or approved equivalent	1	CFM	$21,393.00	$21,393.00	$19,254.00	$19,254	$40,647
	TPEF-2; Tail Pipe Exhaust Fan @ Repair Bay, 10hp, Nederman (40/25), 3200 CFM each or approved equivalent	1	CFM	$21,393.00	$21,393.00	$19,254.00	$19,254	$40,647
	Subtotal				$91,562.00		$82,407.00	$173,969
23 3433	**AIR CURTAINS**							
	New Building							
	Air Curtain 1-1/1-2/1-3/1-4, IBC30-1168W or approved equivalent	2	EA	$13,371.00	$26,742.00	$8,023.00	$16,046	$42,788
	Air Curtain 2-1/2-2, ARD12-2060W or approved equivalent	2	EA	$13,371.00	$26,742.00	$8,023.00	$16,046	$42,788
	Subtotal				$53,484.00		$32,092.00	$85,576
23 3713	**DIFFUSERS, REGISTERS AND GRILLES**							
	New Building							
	CD: Ceiling Diffusers (Size)							
	- 12" x 12"	6.0	EA	$74.90	$449.40	$119.80	$719	$1,168
	- 8" x 8"	16.0	EA	$69.50	$1,112.00	$111.20	$1,779	$2,891
	- 6" x 6"	18.0	EA	$64.20	$1,155.60	$102.70	$1,849	$3,004
	- unsized	22.0	EA	$85.60	$1,883.20	$136.90	$3,012	$4,895
	CD: Ceiling Diffusers	8.0	EA	$42.80	$342.40	$68.50	$548	$890
	CR: Ceiling Register (Return/Exhaust)							
	- 12" x 12"	12.0	EA	$74.90	$898.80	$119.80	$1,438	$2,336
	- 8" x 8"	8.0	EA	$69.50	$556.00	$111.20	$890	$1,446
	- 8" x 6"	9.0	EA	$64.20	$577.80	$102.70	$924	$1,502
	- 6" x 4"	8.0	EA	$53.50	$428.00	$85.60	$685	$1,113
	- unsized	8.0	EA	$42.80	$342.40	$68.50	$548	$890

Department of Design and Construction

CONTRACTOR'S BID BREAKDOWN FORM

CONTRACT 1 - GENERAL CONSTRUCTION

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Location: 1000 West Service Road, Staten Island, NY 10314
Bidder: PRISMATIC DEVELOPMENT

DDC ID: S136-367
Sponsor Agency: DSNY

CSI Number	Description	Quantity	Unit	Unit Cost of Material	Total Cost of Material	Unit Cost of Labor	Total Cost of Labor	Total Cost: Materials and Labor
	Transfer Grilles TG							
	- 48" x 24"	6.0	EA	$133.70	$802.20	$213.90	$1,283	$2,086
	- 48" x 18"	8.0	EA	$128.40	$1,027.20	$205.40	$1,643	$2,670
	- 38" x 18"	8.0	EA	$123.00	$984.00	$196.80	$1,574	$2,558
	- 36" x 18"	8.0	EA	$107.00	$856.00	$171.10	$1,369	$2,225
	- 24" x 24"	16.0	EA	$96.30	$1,540.80	$154.00	$2,464	$4,005
	- 24" x 16"	18.0	EA	$90.90	$1,636.20	$145.50	$2,619	$4,255
	- 8" x 8"	22.0	EA	$69.50	$1,529.00	$111.20	$2,446	$3,975
	- 6" x 6"	10.0	EA	$64.20	$642.00	$102.70	$1,027	$1,669
	- 6" x 4"	16.0	EA	$53.50	$856.00	$85.60	$1,370	$2,226
	- unsized	10.0	EA	$42.80	$428.00	$68.50	$685	$1,113
	Supply Diffuser, 22" x 18"	15.0	EA	$74.90	$1,123.50	$119.80	$1,797	$2,921
	Supply Grilles							
	- 24" x 18"	8.0	EA	$85.60	$684.80	$136.90	$1,095	$1,780
	- 22" x 18"	4.0	EA	$85.60	$342.40	$136.90	$548	$890
	Return Grilles							
	- 12" x 12"	29.0	EA	$74.90	$2,172.10	$119.80	$3,474	$5,646
	- 8" x 6"	20.0	EA	$64.20	$1,284.00	$102.70	$2,054	$3,338
	- unsized	15.0	EA	$0.00	$0.00	$0.00	$0	$0
	BG, Grilles							
	- 48" x 24"	2.0	EA	$133.70	$267.40	$213.90	$428	$695
	- 36" x 18"	5.0	EA	$107.00	$535.00	$171.10	$856	$1,391
	Linear diffusers							
	- Length	420.0	LF	$37.40	$15,708.00	$69.50	$29,190	$44,898
	Architectural Return opening, 8LF each, 900 CFM	12.0	EA	$320.90	$3,850.80	$513.40	$6,161	$10,012
	Existing Building							
	DL : Supply Diffuser - 71" x 16"	1.0	EA	$251.40	$251.40	$640.70	$641	$892
	Transfer Registers	10	EA	$85.60	$856.00	$320.90	$3,209	$4,065
	Subtotal				$45,122.40		$78,323.30	$123,446
23 5100	**HVAC BREECHING, CHIMNEYS AND STACK**							
	New Building							
	Air intake for boiler - 14"	80	LF	$316.00	$25,280.00	$600.00	$48,000	$73,280
	Flue vent for boiler - 14"	230	LF	$642.00	$147,660.00	$1,219.00	$280,370	$428,030
	Gooseneck - 14" w/ wiremesh screen, for Boiler Exhust		EA					
	Subtotal				$172,940.00		$328,370.00	$501,310

Department of Design and Construction

CONTRACTOR'S BID BREAKDOWN FORM

CONTRACT 1 - GENERAL CONSTRUCTION

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Sponsor Agency: DSNY

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23 5233	**CONDENSING BOILERS**							
	New Building							
	B-1, 2 & 3; Condensing Boilers - 4,793 MBH each, serving domestic water & heat pump system, EDR-5000 or approved equivalent	3	MBH	$91,457.00	$274,371.00	$54,874.00	$164,622	$438,993
	Subtotal				$274,371.00		$164,622.00	$438,993
23 5600	**SOLAR HOT WATER SYSTEM**							
	New Building							
	Solar Hot Water System							
	Solar Thermal Array	1.0	EA	$100,000.00	$100,000	$58,909.09	$58,909	$158,909
	Solar water collector storage tank	1.0	EA	$50,000.00	$50,000	$11,045.45	$11,045	$61,045
	Solar collector glycol pump	2.0	EA	$10,000.00	$20,000	$920.45	$1,841	$21,841
	Isolation valves	2.0	EA	$1,000.00	$2,000	$920.45	$1,841	$3,841
	Check valve	2.0	EA	$2,000.00	$4,000	$920.45	$1,841	$5,841
	Balancing valve	2.0	EA	$1,000.00	$2,000	$3,681.82	$7,364	$9,364
	Thermometer gauge	2.0	EA	$1,000.00	$2,000	$920.45	$1,841	$3,841
	Glycol piping				$0		$0	$0
	- 6"	150.0	LF	$50.00	$7,500	$122.73	$18,410	$25,910
	- 1"	300.0	LF	$25.00	$7,500	$61.36	$18,408	$25,908
	Insulation				$0		$0	$0
	- indoor	150.0	LF	$50.00	$7,500	$25.75	$3,863	$11,363
	- outoor	300.0	LF	$50.00	$15,000	$18.41	$5,523	$20,523
	Roof supports	1.0	EA	$55,000.00	$55,000	$14,727.27	$14,727	$69,727
	Chemical treatment	1.0	EA	$12,500.00	$12,500	$3,861.21	$3,861	$16,361
	Heat exchanger (plate & frame type)	1.0	EA	$5,000.00	$5,000.00	$522.72	$523	$2,523
	Circulation pump	2	EA	$1,000.00	$2,000.00	$920.46	$1,841	$1,841
	Subtotal							$438,837
23 5700	**HEAT EXCHANGERS FOR HVAC**							
	New Building							
	HX-1/2/3/4/5/6; HW to Glycol heat exchangers, 1240.8 MBH, (SL 140-BR25-80-TL) or approved equivalent	6	EA	$10,697.00	$64,182.00	$8,557.00	$51,342	$115,524
	HX-7; HW to Glycol heat exchangers, 790 MBH, (SL 140-BR25-80-TL) or approved equivalent	1	EA	$7,038.00	$7,038.00	$5,631.00	$5,631	$12,669
	HX-8; HW to Glycol heat exchangers, 167 MBH, (SL 70-BR40-30-TL) or approved equivalent	1	EA	$1,487.00	$1,487.00	$1,189.00	$1,189	$2,676

Department of Design and Construction

CONTRACTOR'S BID BREAKDOWN FORM

CONTRACT 1 - GENERAL CONSTRUCTION

Project: Staten Island 1 & 3 Garage - Phase II
Location: 1000 West Service Road, Staten Island, NY 10314
Bidder: PRISMATIC DEVELOPMENT

DDC ID: S136-367
Sponsor Agency: DSNY

CSI Number	Description	Quantity	Unit	Unit Cost of Material	Total Cost of Material	Unit Cost of Labor	Total Cost of Labor	Total Cost: Materials and Labor
	HX-9/10; HW to Glycol heat exchangers, 850 MBH, (SL 140-BR25-60-TL) or approved equivalent	2	EA	$759.00	$1,518.00	$608.00	$1,216	$2,734
	HX-11; Glycol to HW heat exchangers, 1566 MBH, (FG10X20-130) or approved equivalent	1	EA	$1,187.00	$1,187.00	$950.00	$950	$2,137
	Subtotal							$135,740
23 7200	**HEATING AND VENTILATING / ROOFTOP UNITS W/ ENERGY RECOVERY EQUIPMENT**							
	New Building							
	RTU-1 & 2; Packaged Rooftop HVAC Unit @ Roof@ 2nd floor, (2) Supply Fan & (2) Exhaust Fan (15hp each) w/ DX Coil, MERV 13 Filter, (XHS-78-48-RT-BP-CD-HG-HW-FF-AC) - 22500 CFM or approved equivalent	2.0	CFM	$224,632.00	$449,264.00	$89,853.00	$179,706	$628,970
	HV-1/2/3/4/5/6; Rooftop Unit w/ (2) Supply Fans & (2) Return Fans (15 hp each), Xetex (XHS-80-48-RT-BP-HW) - 26,700 CFM or approved equivalent	6.0	CFM	$246,025.00	$1,476,150	$98,410.00	$590,460	$2,066,610
	HV-7; Rooftop Unit w/ (2) Supply Fans & (2) Return Fans) (10 hp each), Xetex (XHS-60-48-RT-BP-HW) - 17,000 CFM or approved equivalent	1.0	CFM	$64,180.00	$64,180.00	$25,672.00	$25,672	$89,852
	HV-8; Rooftop Unit w/ (2) Supply Fans (5hp each) & (2) Return Fans) (3 hp each), Xetex (XHS-40-30-RT-BP-HW) - 3600 CFM or approved equivalent or approved equivalent	1.0	CFM	$26,742.00	$26,742.00	$10,697.00	$10,697	$37,439
	VFDs for ERVs above							
	- 15 hp	2.0	EA	$1,925.00	$3,850.00	$770.00	$1,540	$5,390
	- 10 hp	6.0	EA	$16,045.00	$96,270.00	$6,418.00	$38,508	$134,778
	- 5 hp	1.0	EA	$6,953.00	$6,953.00	$2,781.00	$2,781	$9,734
	- 3 hp	1.0	EA	$3,209.00	$3,209.00	$1,284.00	$1,284	$4,493
	ERV's							$0
	ERV-1-1; Indoor energy recovery unit serving 100, 103 Storage & equipment rooms @ 1st floor, (1) Supply Fan & (1) Exhaust Fan (0.75hp each), MERV 8 Fiter, Reneware (HE-1XJINH-S15HH) - 550 CFM or approved equivalent	1.0	CFM	$10,162.00	$10,162.00	$4,065.00	$4,065	$14,227
	ERV-2-1; Indoor energy recovery unit serving AC-OA-2-2 & AC-OA-2-9@ 2nd floor, (1) Supply Fan & (1) Exhaust Fan (3hp each), MERV 8 Fiter, Reneware (HE-3XJINH-S35WW) - 2000 CFM or approved equivalent	1.0	CFM	$10,162.00	$10,162.00	$4,065.00	$4,065	$14,227

Department of Design and Construction

CONTRACTOR'S BID BREAKDOWN FORM

CONTRACT 1 - GENERAL CONSTRUCTION

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Location: 1000 West Service Road, Staten Island, NY 10314
Bidder: PRISMATIC DEVELOPMENT

DDC ID: S136-367
Sponsor Agency: DSNY

CSI Number	Description	Quantity	Unit	Unit Cost of Material	Total Cost of Material	Unit Cost of Labor	Total Cost of Labor	Total Cost: Materials and Labor
	ERV-2-2; Indoor energy recovery unit serving AC-OA-2-1 & AC-OA-2-6 @ 2nd floor, (1) Supply Fan & (1) Exhaust Fan (3hp each), MERV 8 Fiter, Reneware (HE-3XJINH-S35WW) - 2225 CFM or approved equivalent	1.0	CFM	$10,162.00	$10,162.00	$4,065.00	$4,065	$14,227
	ERV-2-3; Indoor energy recovery unit serving AC-OA-1-1/1-2 & AC-OA-2-7 or approved equivalent	1.0	CFM	$10,162.00	$10,162.00	$4,065.00	$4,065	$14,227
	ERV-2-4; Indoor energy recovery unit serving AC-OA-2-3 & AC-OA-2-10 @ 2nd floor, (1) Supply Fan & (1) Exhaust Fan (3hp each), MERV 8 Fiter, Reneware (HE-3XJINH-S35WW) - 2100 CFM or approved equivalent	1.0	CFM	$10,162.00	$10,162.00	$4,065.00	$4,065	$14,227
	ERV-2-5; Indoor energy recovery unit serving AC-OA-2-4 & AC-OA-2-5 @ 2nd floor, (1) Supply Fan & (1) Exhaust Fan (3hp each), MERV 8 Fiter, Reneware (HE-3XJINH-S35WW) - 2225 CFM or approved equivalent	1.0	CFM	$10,162.00	$10,162.00	$4,065.00	$4,065	$14,227
	ERV-2-6; Indoor energy recovery unit serving AC-OA-2-8 & AC-OA-1-3 @ 2nd floor, (1) Supply Fan & (1) Exhaust Fan (1hp each), MERV 8 Fiter, Reneware (HE-1.5XJINH-S35SS) - 640 CFM or approved equivalent	1.0	CFM	$10,162.00	$10,162.00	$4,065.00	$4,065	$14,227
	ERV-2-7; Indoor energy recovery unit serving office, bbm office, bbm corridoor @ 2nd floor, (1) Supply Fan & (1) Exhaust Fan (3hp each), MERV 8 Fiter, Reneware (HE-3XJINH-S35WW) - 2000 CFM or approved equivalent	1.0	CFM	$10,162.00	$10,162.00	$4,065.00	$4,065	$14,227
	VFDs for ERVs above							
	- 3 hp	3.0	EA	$5,348.00	$16,044.00	$2,139.00	$6,417	$22,461
	- 1 hp	3.0	EA	$3,209.00	$9,627.00	$1,284.00	$3,852	$13,479
	- 0.75 hp	2.0	EA	$1,605.00	$3,210.00	$642.00	$1,284	$4,494
	Existing Building							$0
	RTU-BME; (1) Supply Fan @ 6,150CFM, 6.89hp & (1) Exhaust Fan @ 7,150 CFM @ 4.77hp, 298MBH, Reznor (YDMA-300) or approved equivalent	1.0	CFM	$40,648.00	$40,648.00	$16,259.00	$16,259	$56,907
	VFD's							$0
	- supply fan	1.0	EA	$2,674.00	$2,674.00	$1,070.00	$1,070	$3,744
	- exhaust fan	1.0	EA	$2,674.00	$2,674.00	$1,070.00	$1,070	$3,744
	Salt Shed							$0
	PTAC-A: Packaged terminal air conditioning unit,office ,AMANA, (PTH153G50Q), 360 CFM or approved equivalent	1	EA	$4,814.00	$4,814.00	$1,925.00	$1,925	$6,739
	Subtotal							$3,202,650
23 8126	**SPLIT SYSTEM AIR CONDITIONERS**							

Department of Design and Construction

CONTRACTOR'S BID BREAKDOWN FORM

CONTRACT 1 - GENERAL CONSTRUCTION

Project: Staten Island 1 & 3 Garage - Phase II
Location: 1000 West Service Road, Staten Island, NY 10314
Bidder: PRISMATIC DEVELOPMENT

DDC ID: S136-367
Sponsor Agency: DSNY

CSI Number	Description	Quantity	Unit	Unit Cost of Material	Total Cost of Material	Unit Cost of Labor	Total Cost of Labor	Total Cost: Materials and Labor
	New Building							
	Terminal Units							
	Outdoor Condensing Units:							

Department of Design and Construction

CONTRACTOR'S BID BREAKDOWN FORM

CONTRACT 1 - GENERAL CONSTRUCTION

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Location: 1000 West Service Road, Staten Island, NY 10314
Bidder: PRISMATIC DEVELOPMENT

DDC ID: S136-367
Sponsor Agency: DSNY

CSI Number	Description	Quantity	Unit	Unit Cost of Material	Total Cost of Material	Unit Cost of Labor	Total Cost of Labor	Total Cost: Materials and Labor
	ACCU-1, 3; VRF Unit, 393.8MBH, REYQ72TAYDU - 36TNS or approved equivalent	3.0	EA	$42,787.00	$128,361.00	$34,230.00	$102,690	$231,051
	ACCU-2, VRF Unit, 126MBH, REYQ72TAYDU - 10TNS or approved equivalent	1.0	EA	$12,836.00	$12,836.00	$10,269.00	$10,269	$23,105
	ACCU-4, 5 VRF Unit, 158.3MBH, REYQ168TAYDU - 14TNS or approved equivalent	2.0	EA	$19,254.00	$38,508.00	$15,403.00	$30,806	$69,314
	ACCU VRF Unit, 136MBH, REYQ144TAYDU - 12TNS or approved equivalent	2.0	EA	$16,045.00	$32,090.00	$12,836.00	$25,672	$57,762
	ACCU-7 VRF Unit, 90.3MBH, REYQ96TAYDU - 8TNS or approved equivalent	4.0	EA	$10,697.00	$42,788.00	$8,557.00	$34,228	$77,016
	ACCU VRF Unit, 65.4MBH, REYQ72TAYDU - 6TNS or approved equivalent	2.0	EA	$7,488.00	$14,976.00	$5,990.00	$11,980	$26,956
	ACCU VRF Unit, 24MBH, REYQ24PVJU8 - 2TNS or approved equivalent	4.0	EA	$3,209.00	$12,836.00	$2,567.00	$10,268	$23,104
	Branch selectors, Daikin (BS4Q54TVJ) or approved equivalent	10.0	EA	$1,605.00	$16,050.00	$1,284.00	$12,840	$28,890
	Variable Refrigerant Flow Equipment (AC Units)							$0
	AC units 353CFM, FXZQ12TAVJU or approved equivalent	8.0	EA	$2,674.00	$21,392.00	$2,139.00	$17,112	$38,504
	AC; FXZQ12TAVJU or approved equivalent	8.0	EA	$2,674.00	$21,392.00	$2,139.00	$17,112	$38,504
	AC-1-12; 4 TNS, FXMQ48PBVJU from BS-1-5 & ACCU-9 or approved equivalent	12.0	EA	$3,209.00	$38,508.00	$2,567.00	$30,804	$69,312
	AC; 100CFM, FXMQ48PVJU or approved equivalent	1.0	EA	$2,674.00	$2,674.00	$2,139.00	$2,139	$4,813
	AC-1-15 from BS-1-5 & ACCU-9	15.0	EA	$2,674.00	$40,110.00	$2,139.00	$32,085	$72,195
	AC; 511CFM, FXZQ18TAVJU or approved equivalent	1.0	EA	$2,674.00	$2,674.00	$2,139.00	$2,139	$4,813
	AC-1-8/22; 307CFM, FXZQ07TAVJU or approved equivalent	8.0	EA	$2,674.00	$21,392.00	$2,139.00	$17,112	$38,504
	AC; 635CFM, FAQ24PVJU or approved equivalent	1.0	EA	$2,674.00	$2,674.00	$2,139.00	$2,139	$4,813
	Outside Air Processing Units						$0	$0
	AC-OA-1-1/1-2; 635CFM, FXMQ48MFVJU or approved equivalent	1.0	EA	$2,139.00	$2,139.00	$1,711.00	$1,711	$3,850
	AC-OA-2-1/2-5; 8TNS, 1,236CFM, FXMQ96MFVJU or approved equivalent	1.0	EA	$2,139.00	$2,139.00	$1,711.00	$1,711	$3,850
	AC; 6TNS, 988CFM, FXMQ72MFVJU or approved equivalent	1.0	EA	$2,139.00	$2,139.00	$1,711.00	$1,711	$3,850
	AC-OA-2-7; 4TNS, 1,236CFM, FXMQ96MFVJU or approved equivalent	1.0	EA	$2,139.00	$2,139.00	$1,711.00	$1,711	$3,850
	Existing Building							
	AC-10: 600 CFM, 1.5 Tons w/ 2" pleated MERV 8 filter, (BCHD018), 0.5 hp or approved equivalent	1	EA	$2,139.00	$2,139.00	$1,711.00	$1,711	$3,850
	Subtotal							$827,906

Department of Design and Construction

CONTRACTOR'S BID BREAKDOWN FORM

CONTRACT 1 - GENERAL CONSTRUCTION

Project: Staten Island 1 & 3 Garage - Phase II
Location: 1000 West Service Road, Staten Island, NY 10314
Bidder: PRISMATIC DEVELOPMENT

DDC ID: S136-367
Sponsor Agency: DSNY

CSI Number	Description	Quantity	Unit	Unit Cost of Material	Total Cost of Material	Unit Cost of Labor	Total Cost of Labor	Total Cost: Materials and Labor
23 8129	**VARIABLE REFRIGERANT FLOW HVAC SYSTEMS (included w/ 238129)**							
23 8233	**RADIATORS**							
	New Building							
	RAD-1, Hot Water Heater Radiator, 1530BTU/LF	170	LF	$214.00	$36,380.00	$171.00	$29,070	$65,450
	RAD-2, Hot Water Heater Radiator, 700BTU/LF	220	LF	$214.00	$47,080.00	$171.00	$37,620	$84,700
	RAD-3, Hot Water Heater Radiator, 320BTU/LF	20	LF	$139.00	$2,780.00	$134.00	$2,680	$5,460
	Subtotal							$155,610
23 8239	**UNIT HEATERS**							
	New Building							
	EUH-A, B, R-1; Electric Unit Heaters, 350CFM, Qmark (MUH05-81) or approved equivalent	15	EA	$1,070.00	$16,050.00	$0.00	$0	$16,050
	UH-1 thru 22, 130.9MBH, 92LBS, HSB-165 from BS-1-5 & ACCU-9 or approved equivalent	22	EA	$1,605.00	$35,310.00	$1,230.00	$27,060	$62,370
	UH-R-1 thru 6, HSB-86 or approved equivalent	6	EA	$1,605.00	$9,630.00	$1,177.00	$7,062	$16,692
	Existing Building							
	HWC-1; Hot water duct heating coil serving RTU-BME	1	EA	$2,567.00	$2,567.00	$1,711.00	$1,711	$4,278
	Subtotal							$99,390
26 0000	**ELECTRICAL**							
26 0500	**COMMON WORK RESULTS FOR ELECTRICAL**							
	New Building							
	Sleeves for Raceways and Cables	1	LS	$7,727.41	$7,727	$30,855.54	$30,856	$38,583
	Rigging & Handling	1	LS					
	Temporary Electrical power service to building during construction	1	LS	$247,731	$247,731	$285,759.50	$285,759.50	$718,042
	CM trailer	1	LS					
	Site Security Lighting	1	LS					
	Existing Building	1.0						
	Demolition	1	LS	$0.00	$0	$28,360.99	$28,361	$28,361
	Rigging & Handling	1	LS					
	Temporary Electrical power service to building during construction	1	LS					
	Subtotal							$784,986

Department of Design and Construction

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CSI Number	Description	Quantity	Unit	Unit Cost of Material	Total Cost of Material	Unit Cost of Labor	Total Cost of Labor	Total Cost: Materials and Labor
26 0519	**LOW VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES**							
	New Building							
	Normal Feeders							
	- 1200A	50	LF	$196.34	$9,817	$294.56	$14,728	$24,545
	- 800A	230	LF	$107.40	$24,703	$205.56	$47,280	$71,982
	- 400A; 4#250 MCM in 2-1/2"C	695	LF	$53.25	$37,007	$88.48	$61,493	$98,499
	- 225A	610	LF	$23.51	$14,341	$59.37	$36,218	$50,560
	- 200A	660	LF	$19.01	$12,548	$56.83	$37,511	$50,059
	- 150A; 4#1/0 in 1-1/2"C	120	LF	$13.60	$1,632	$49.32	$5,918	$7,549
	- 100A; 4#2 in 1-1/4"C	4,595	LF	$9.56	$43,951	$38.19	$175,499	$219,450
	- 30A	190	LF	$3.96	$752	$30.09	$5,718	$6,469
	- to transformers	145	LF	$0.00	$0	$0	$0	$0
	- Solar PV System		LF					
	- to future Panel for exterior parking car chargers	100	LF	$3.96	$396	$30.09	$3,009	$3,405
	Elevator Trough		EA	$0.00	$0	$0	$0	$0
	Emergency Feeders			$0.00	$0	$0	$0	$0
	- 1200A	130	LF	$196.34	$25,524	$294.56	$38,293	$63,817
	- 400A; 4#250 MCM in 2-1/2"C	155	LF	$53.25	$8,253	$88.48	$13,714	$21,967
	- 225A	480	LF	$23.51	$11,285	$59.37	$28,500	$39,785
	- 200A	250	LF	$19.01	$4,753	$56.83	$14,209	$18,962
	- 150A; 4#1/0 in 1-1/2"C	255	LF	$13.60	$3,467	$49.32	$12,575	$16,042
	- 100A; 4#2 in 1-1/4"C	2,885	LF	$9.56	$27,595	$38.19	$110,188	$137,783
	- 60A		LF					
	- 30A	150	LF	$3.96	$593	$30.09	$4,514	$5,107
	- to elevator trough	15	LF	$151.45	$2,272	$245.20	$3,678	$5,950
	- FACP	50	LF	$9.56	$478	$38.19	$1,910	$2,388
	- to transformer	N/A	LF					
	Motor Wiring & Control							
	HVAC							
	Energy Recovery Unit							
	- 15hp; 2 supply fans, 2 exhaust fans	4	EA	$618.20	$2,473	$239.07	$956	$3,429
	- 10 hp; 2 supply fans, 2 exhaust fans	4	EA	$442.64	$1,771	$239.07	$956	$2,727
	- 3 hp; 2 supply fans, 2 exhaust fans	4	EA	$204.13	$817	$133.84	$535	$1,352
	Rooftop Air Handling Units RTU 1 & 2	2	EA	$873.95	$1,748	$510.83	$1,022	$2,770
	Fans	22	EA	$873.95	$19,227	$46.44	$1,022	$20,249

Department of Design and Construction

CONTRACTOR'S BID BREAKDOWN FORM

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Bidder: PRISMATIC DEVELOPMENT

DDC ID: S136-367
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CSI Number	Description	Quantity	Unit	Unit Cost of Material	Total Cost of Material	Unit Cost of Labor	Total Cost of Labor	Total Cost: Materials and Labor
	Boiler, B-1,2,3, 3 hp each	3	EA	$204.13	$612	$178.45	$535	$1,148
	Hot Water pumps							
	P-3A/3B	2	EA	$204.13	$408	$535.72	$1,071	$1,480
	P-4A/4B	2	EA	$204.13	$408	$535.72	$1,071	$1,480
	P-5A/5B	2	EA	$204.13	$408	$535.72	$1,071	$1,480
	HWP-P1/P2	2	EA	$204.13	$408	$535.72	$1,071	$1,480
	HWP-P3/P4	2	EA	$204.13	$408	$535.72	$1,071	$1,480
	HXWP-1/2/3/4/5/6	6	EA	$893.22	$5,359	$1,126.07	$6,756	$12,116
	HXWP-7	1	EA	$893.22	$893	$1,126.07	$1,126	$2,019
	HXWP-8	1	EA	$893.22	$893	$1,126.07	$1,126	$2,019
	HXWP-9/10	2	EA	$893.22	$1,786	$1,126.07	$2,252	$4,039
	Terminal Units							
	- Air cooled condensing units	20	EA	$204.13	$4,083	$535.72	$10,714	$14,797
	- Variable Refrigerant Flow Equipment (AC Units)	54	EA	$204.13	$11,023	$535.72	$28,929	$39,952
	- Unit heaters	28	EA	$204.13	$5,716	$535.72	$15,000	$20,716
	- Air curtains	4	EA	$618.20	$2,473	$956.47	$3,826	$6,299
	Plumbing							
	Hot water recirculating pump, 30 GPM, 2/5 hp	2	EA	$204.13	$408	$535.72	$1,071	$1,480
	Elevator sump pump, 0.5 hp	2	EA	$204.13	$408	$535.72	$1,071	$1,480
	Duplex Air compressors, 30 hp	2	EA	$873.95	$1,748	$1,020.99	$2,042	$3,790
	Hydraulic oil Pump	2	EA	$436.97	$874	$510.50	$1,021	$1,895
	Transition sump	2	EA	$436.97	$874	$510.50	$1,021	$1,895
	Motor oil Pump	2	EA	$436.97	$874	$510.50	$1,021	$1,895
	Fire Protection							
	Sprinkler Booster Pump, 50 hp	1	EA	$893.22	$893	$1,126.07	$1,126	$2,019
	Elevators		EA					
	Appliance connections		LS					
	Connection to motorized hose reels		EA					
	Connection to Electronic flush valves		EA					
	Connection to Motorized Dampers	23	EA	$14.31	$329	$127.04	$2,922	$3,251
	Connection to Overhead doors	7	EA	$834.52	$5,842	$944.42	$6,611	$12,453
	Power to repair bay equipment, tools & appliances		LS					
	Miscellaneous motor wiring		LS					
	Existing Building							
	Normal Feeders							
	- 1600A	885	LF	$261.79	$231,682	$392.75	$347,581	$579,263
	- 800A	80	LF	$107.40	$8,592	$205.56	$16,445	$25,037

Department of Design and Construction

CONTRACTOR'S BID BREAKDOWN FORM

CONTRACT 1 - GENERAL CONSTRUCTION

Project: Staten Island 1 & 3 Garage - Phase II
Location: 1000 West Service Road, Staten Island, NY 10314
Bidder: PRISMATIC DEVELOPMENT

DDC ID: S136-367
Sponsor Agency: DSNY

CSI Number	Description	Quantity	Unit	Unit Cost of Material	Total Cost of Material	Unit Cost of Labor	Total Cost of Labor	Total Cost: Materials and Labor
	- 400A	65	LF	$53.25	$3,461	$88.48	$5,751	$9,212
	- 225A	1,780	LF	$23.51	$41,849	$59.37	$105,686	$147,535
	- 225A 4#4 in 1" Conduit		LF					
	- 225A 4#6 in 1" Conduit		LF					
	- 225A 4#1/0 in 1 1/4" Conduit		LF					
	- 225A 4#2 in 1 1/4" Conduit		LF					
	- 225A 4#6 in 1 1/4" Conduit		LF					
	- 225A 4#3/0 in 2" Conduit		LF					
	Emergency Feeders							
	- 800A; (2) Sets of 4#500MCM, (2) 4"C	440	LF	$107.40	$47,257	$205.56	$90,448	$137,705
	- 400A; (2) Sets of 4#350MCM, (2) 4"C	360	LF	$53.25	$19,169	$88.48	$31,852	$51,021
	- 30A; 2 hr fire rated for FA system	360	LF	$9.20	$3,311	$34.18	$12,305	$15,616
	Motor Wiring & Control							
	RTU-BME; (1) Supply Fan 6.89 hp & (1) Exhaust Fan 4.77 hp		EA					
	Fans		EA					
	AC Units		EA					
	Connection to motorized hose reels		EA					
	Connection to electronic flush valves		EA					
	Elevators		EA					
	Fuel Station							
	Motor Wiring & Control							
	Sump dispenser motor connection	1	EA	$1,148.50	$1,148	$7,710.82	$7,711	$8,859
	Subtotal							$1,989,754
26 0526	**GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS**							
	New Building							
	Grounding	110644	SF	$0.21	$23,180.76	$0.55	$61,299	$84,480
	Subtotal							$84,480
26 0529	**HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS (included w/ 260519)**							
26 0533	**RACEWAY AND BOXES FOR ELECTRICAL SYSTEMS (included w/ 262726)**							
26 0543	**UNDERGROUND DUCTS AND RACEWAYS FOR ELECTRICAL SYSTEMS**							
	New Building							

Department of Design and Construction

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	Secondary underground service feeder; 4"C, cable shall not exceed 2-4500 CU	845	LF	$185.45	$156,701.91	$386.90	$326,929	$483,631
	Subtotal							$483,631
26 0548	**VIBRATION AND SEISMIC CONTROLS FOR ELECTRICAL SYSTEMS**							
	New Building							
	Vibration Isolation	1	LS	$77,269.18	$77,269.18	$20,433.06	$20,433	$97,702
	Existing Building							
	Vibration Isolation	1	LS	$7,726.92	$7,726.92	$10,216.53	$10,217	$17,943
	Subtotal							$115,646
26 0553	**IDENTIFICATION FOR ELECTRICAL SYSTEMS (included w/ 262416)**							
26 0573	**OVERCURRENT PROTECTIVE DEVICE COORDINATION STUDY**							
	New Building							
	Electrical Testing	1	LS	$55,115.08	$55,115.08		$0	$55,115
	Subtotal							$55,115
26 0800	**COMMISSIONING OF ELECTRICAL**							
	New Building							
	Electrical Testing		LS					
	Existing Building							
	Electrical Testing	1	LS	$55,115.08	$55,115.08		$0	$55,115
	Subtotal							$55,115
26 0923	**LIGHTING CONTROL DEVICES**							
	New Building							
	Lighting Controls							
	A; Astronomical clock	1	EA	$1,545.38	$1,545.38	$2,043.31	$2,043	$3,589
	B; Astronomical time clock and occupancy sensor	1	EA	$1,545.38	$1,545.38	$2,043.31	$2,043	$3,589
	C; Vacancy sensor & Bi-level dimmer switch	72	EA	$386.35	$27,816.91	$1,736.81	$125,050	$152,867
	D; Dual technology wall mounted vacancy sensor & Bi-level dimmer switch	101	EA	$386.35	$39,020.94	$1,736.81	$175,418	$214,439
	E; Ceiling mounted occupancy sensor & dimmer switch	19	EA	$386.35	$7,340.57	$1,736.81	$32,999	$40,340

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	F; Ceiling mounted occupancy sensor and Bi-level dimmer switch	10	EA	$386.35	$3,863.46	$1,736.81	$17,368	$21,232
	G; Local Bi-level dimming switch	72	EA	$386.35	$27,816.91	$1,736.81	$125,050	$152,867
	Occupancy Sensors	168	EA	$386.35	$64,906.11	$1,736.81	$291,784	$356,690
	Emergency Building			$0.00	$0	$0.00	$0	$0
	Lighting Controls; lighting control panels, occupancy/vacancy/electric photo/daylighting sensors, room controllers, configuration tools/networking & accessories	1	EA	$7,726.92	$7,726.92	$8,173.23	$8,173	$15,900
	Subtotal							$961,513
26 0933	**DISTRIBUTED LIGHTING CONTROL SYSTEM (included w/ 260923)**							
26 2200	**LOW VOLTAGE TRANSFORMERS**							
	New Building							
	Utility pad mounted transformer, 1000KVA, 480/277V, 3ph, 4wire	1	EA	$154,538.37	$154,538.37	$20,433.06	$20,433	$174,971
	Transformer, 480/277V (Normal)							
	- 45 KVA	4	EA	$17,771.91	$71,087.65	$2,043.31	$8,173	$79,261
	- 30 KVA	10	EA	$15,453.84	$154,538.37	$1,838.98	$18,390	$172,928
	Transformer, 480/277V (Emergency)							
	- 75KVA	2	EA	$38,634.59	$77,269.18	$2,451.97	$4,904	$82,173
	- 45KVA	1	EA	$17,771.91	$17,771.91	$2,043.31	$2,043	$19,815
	- 30KVA	2	EA	$15,453.84	$30,907.67	$1,838.98	$3,678	$34,586
	- 5KVA	1	EA	$7,726.92	$7,726.92	$817.32	$817	$8,544
	Subtotal							$572,279
26 2413	**SWITCHBOARDS**							
	New Building							
	Normal Service & Distribution							
	Main Switchgear & Switchboard MSSWB-1 & HDB-1 w/2 electric meter, 2000A, 480/277V	1	A	$310,847.51	$310,847.51	$44,544.14	$44,544	$355,392
	Subtotal							$355,392
26 2414	**ELECTRONIC SUB-METERING SYSTEM**							
	New Building							
	Energy Sub-meters	2	EA	$7,727.41	$15,454.82	$3,270.24	$6,540	$21,995

Department of Design and Construction

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DDC ID: S136-367
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CSI Number	Description	Quantity	Unit	Unit Cost of Material	Total Cost of Material	Unit Cost of Labor	Total Cost of Labor	Total Cost: Materials and Labor
	Subtotal							$21,995
26 2416	**PANELBOARDS**							
	New Building							
	Normal Service & Distribution							
	High Voltage Panelboards, 480/277V							
	- 800A, 42cts	1	EA	$30,909.63	$30,910	$21,456.08	$21,456	$52,366
	- 400A, 30cts	4	EA	$12,363.85	$49,455	$7,356.37	$29,425	$78,881
	- 225A, 42cts	5	EA	$7,727.41	$38,637	$3,269.50	$16,347	$54,985
	- 100A, 18cts	5	EA	$7,727.41	$38,637	$3,269.50	$16,347	$54,985
	Low Voltage Panelboards, 208/120V							
	- 150A, 84cts	4	EA	$7,727.41	$30,910	$3,269.50	$13,078	$43,988
	- 150A, 42cts	5	EA	$7,727.41	$38,637	$3,269.50	$16,347	$54,985
	- 100A, 42cts	7	EA	$7,727.41	$54,092	$3,269.50	$22,886	$76,978
	- 100A, 30cts	8	EA	$7,727.41	$61,819	$3,269.50	$26,156	$87,975
	- Future Panel for exterior parking car chargers	1	EA	$7,727.41	$7,727	$3,269.50	$3,269	$10,997
	Emergency Service & Distribution							
	Distribution Boards, 480/277V							
	- 1200A	1	EA	$30,909.63	$30,910	$21,456.08	$21,456	$52,366
	- 200A	1	EA	$7,727.41	$7,727	$3,269.50	$3,269	$10,997
	High Voltage Panelboards, 480/277V							
	- 400A, 30cts		EA					
	- 200A, 30cts		EA					
	- 150A, 30cts		EA					
	- 100A, 18cts	11	EA	$7,727.41	$85,001	$3,269.50	$35,964	$120,966
	- 60A, 18cts	1	EA	$7,727.41	$7,727	$3,269.50	$3,269	$10,997
	Low Voltage Panelboards, 208/120V							
	- 400A, 84cts	1	EA	$12,363.85	$12,364	$7,356.37	$7,356	$19,720
	- 225A, 84cts		EA					
	- 225A, 42cts	1	EA	$7,727.41	$7,727	$3,269.50	$3,269	$10,997
	- 150A, 126cts		EA					
	- 150A, 84cts		EA					
	- 150A, 30cts		EA					
	- 100A, 60cts		EA					
	- 100A, 42cts		EA					
	- 100A, 30cts		EA					
	Existing Building							

Department of Design and Construction

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DDC ID: S136-367
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CSI Number	Description	Quantity	Unit	Unit Cost of Material	Total Cost of Material	Unit Cost of Labor	Total Cost of Labor	Total Cost: Materials and Labor
	Normal Service & Distribution							
	Panelboards, 208/120 V, 42 cts							
	- 400A	2	EA	$12,363.85	$24,728	$7,356.37	$14,713	$39,440
	- 225A	5	EA	$7,727.41	$38,637	$3,269.50	$16,347	$54,985
	Emergency Service & Distribution							
	Generator distribution board	1	EA	$30,909.63	$30,910	$21,456.08	$21,456	$52,366
	Subtotal							$888,972
26 2726	**WIRING DEVICES**							
	New Building							
	Receptacles & Convenience Power							
	Duplex Receptacle, 20A	486	EA	$154.55	$75,110	$1,021.72	$496,555	$571,665
	Duplex Receptacle, 20A, GFI, WP	59	EA	$154.55	$9,118	$1,021.72	$60,281	$69,400
	Duplex Receptacle, 20A, IG	62	EA	$154.55	$9,582	$1,021.72	$63,347	$72,928
	Duplex Receptacle, 20A, IG, WP		EA					
	Double Duplex Receptacle, 20A	16	EA	$309.10	$4,946	$1,226.06	$19,617	$24,563
	Junction Box		EA					
	Emergency Building							
	Receptacles & Convenience Power							
	Single Receptacle	16	EA	$77.27	$1,236	$1,021.72	$16,347	$17,584
	Duplex Receptacle	33	EA	$77.27	$2,550	$1,021.72	$33,717	$36,267
	Duplex Receptacle, GFI		EA			included in duplex recepticles		
	Pit Light and Receptacle		EA			included in duplex recepticles		
	Double Duplex Receptacle		EA			included in single recepticles		
	Double Duplex Receptecle - NEMA 5-20		EA			included in duplex recepticles		
	Surface Raceway- with Duplex Receptacle		LF			included in duplex recepticles		
	Duplex Receptacle mounted on Raceways		EA			included in duplex recepticles		
	Fuel Station					included in duplex recepticles		
	Receptacles & Convenience Power							
	Quad recepticle	2	EA	$772.74	$1,545	$1,226.06	$2,452	$3,998
	Quad recepticle WP	2	EA	$772.74	$1,545	$1,226.06	$2,452	$3,998
	J1; Junction box for tank iterstitial monitoring port w/ leak sensor and level probe	3	EA	$1,545.48	$4,636	$1,634.75	$4,904	$9,541
	J2; Junction box for tank fill port w/ leak sensor	3	EA	$1,545.48	$4,636	$1,634.75	$4,904	$9,541
	J3; Junction box for dispenser sump discrimating leak sensor and interstitial sensor dispenser	3	EA	$1,545.48	$4,636	$1,634.75	$4,904	$9,541
	Subtotal							$829,024

Department of Design and Construction

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CSI Number	Description	Quantity	Unit	Unit Cost of Material	Total Cost of Material	Unit Cost of Labor	Total Cost of Labor	Total Cost: Materials and Labor
26 2813	**FUSES (included w/ 262816)**							
26 2816	**ENCLOSED SWITCHES AND CIRCUIT BREAKERS**							
	New Building							
	Disconnect Switch, FDS, 30A	7	EA	$772.74	$5,409	$1,634.75	$11,443	$16,852
	FCO	1	EA	$2,318.22	$2,318	$1,634.75	$1,635	$3,953
	Disconnect Switch							
	- FDS, 30A	215	EA	$772.74	$166,139	$1,634.75	$351,471	$517,610
	- Elevator	2	EA	$772.74	$1,545	$1,634.75	$3,269	$4,815
	Existing Building							
	Circuit breakers							
	- 1600A	N/A	EA					
	- 800A	N/A	EA					
	Subtotal							$543,231
26 2913	**ENCLOSED CONTROLLERS (included w/ 262816)**							
26 2923	**VARIABLE FREQUENCY MOTOR CONTROLLERS (included w/ 237200)**							
26 3213	**ENGINE GENERATORS**							
	New Building							
	Emergency Service & Distribution							
	Natural Gas indoor Generator, 500KW, 480/277V, 3phase, 4wire	1	KW	$355,461	$355,461	$30,652	$30,652	$386,112
	Veedor Root Monitoring System	1	EA	$61,819	$61,819	$143,041	$143,041	$204,860
	Existing Building							
	Gas fired, outdoor generator, 500 kW, 208 V, 3 phase w/ circuit breaker mounted on generator enclosure	1	KW	$355,461	$355,461	$30,652	$30,652	$386,112
	Subtotal							$977,084
26 3600	**TRANSFER SWITCHES**							
	New Building							
	Automatic Transfer Switches							
	- 1200A	1	EA	$15,455	$15,455	$10,217	$10,217	$25,672
	- 200A	2	EA	$12,364	$24,728	$4,087	$8,174	$32,901
	- 30A	1	EA	$7,727	$7,727	$2,043	$2,043	$9,771
	Existing Building							
	Automatic Transfer Switches							

Department of Design and Construction

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	- 1600A	2	EA	$30,910	$61,819	$12,261	$24,521	$86,340
	- 800A	1	EA	$15,455	$15,455	$8,174	$8,174	$23,629
	- 400A	1	EA	$12,364	$12,364	$8,174	$8,174	$20,538
	- 30A	1	EA	$7,727	$7,727	$2,861	$2,861	$10,588
	Subtotal							$209,439
26 4113	**LIGHTNING PROTECTION FOR STRUCTURES**							
	New Building							
	Lightning Protection	1	LS	$64,845	$64,845	$10,808	$10,808	$75,653
	Subtotal							$75,653
26 5100	**INTERIOR LIGHTING**							
	New Building							
	Lighting Fixtures							
	F1D; High ceiling suspended LED fixture, Dimensions: 21.22" Diameter x 19.06" Height, 18486 lm, 130 W, Manufacturer - Meteor Lighting or approved equivalent	111	EA	$414	$45,954	$523	$58,053	$104,007
	F1E; High ceiling suspended LED fixture, Dimensions: 21.22" Diameter x 19.06" Height, 31147 lm, 254 W, Manufacturer - Meteor Lighting or approved equivalent	51	EA	$414	$21,114	$523	$26,673	$47,787
	F2; Recessed linear LED fixture, 625lm/ft, 5.75W/ft, Manufacturer - Axis or approved equivalent	844	LF	$106	$89,464	$46	$38,824	$128,288
	F2A; same as F2, 875lm/ft, 8W/ft or approved equivalent	167	LF	$106	$17,702	$46	$7,682	$25,384
	F3; 3.5" square aperture recessed downlight, 726lm, 9 W, Manufacturer - USAI or approved equivalent	181	EA	$464	$83,920	$287	$51,947	$135,867
	F3A; same as F3, 1090lm, 15W or approved equivalent	19	EA	$464	$8,809	$287	$5,453	$14,262
	F5A; Surface mounted linear LED fixture, 375lm/ft, 3.75W/ft, Manufacturer - Axis or approved equivalent	547	LF	$106	$57,982	$46	$25,162	$83,144
	F6; Surface mounted linear high efficiency fixture, Dimensions: 2.5"W x 4'L x 3"H, 5000 lm, 36W, Manufacturer - CREE or approved equivalent	22	EA	$464	$10,200	$287	$6,314	$16,514
	F6A; same as F6, 2500 lm, 19W or approved equivalent	14	EA	$464	$6,491	$287	$4,018	$10,509
	F6C; same as F6, 1000 lm, 72W or approved equivalent	8	EA	$464	$3,709	$287	$2,296	$6,005
	F10; 4" wide recessed linear perimeter LED fixture, Dimension: 4.38"W x L x 4.87"H, 375 lm, 4W/ft or approved equivalent	176	LF	$106	$18,656	$46	$8,096	$26,752
	F13; 3.5" square aperture recessed downlight, 726 lm, 9 W, Manufacturer - USAI or approved equivalent	48	EA	$414	$19,872	$287	$13,776	$33,648

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	F15; 4.5" aperture recessed adjustable LED fixture, 1500 lm, 36 W, Manufacturer - Lucifer or approved equivalent	8	EA	$414	$3,312	$421	$3,368	$6,680
	F16; Wall mounted linear fixture with wrap-sround lens, 5.7W/ft or approved equivalent	41	EA	$414	$16,974	$235	$9,635	$26,609
	F16A; Suspended continous linear light fixture, 5.7W/ft or approved equivalent	44	EA	$414	$18,216	$235	$10,340	$28,556
	F17; Undercabinet linear fixture with easy plug and plug installation, 398 lm, 7.17W/ft , Manufacturer - Axis or approved equivalent	271	LF	$106	$28,726	$46	$12,466	$41,192
	F18; Recessed continous linear LED fixture, 1036lm/ft, 9.25W/ft, Manufacturer - Axis or approved equivalent	100	LF	$106	$10,600	$46	$4,600	$15,200
	F20; 2.5" Wall surface mounted linear LED fixture, 625lm/ft, 8.25W/ft, Manufacturer - Axis or approved equivalent	65	LF	$106	$6,890	$46	$2,990	$9,880
	F20B; same as F20, 625lm/ft, 8.25W/ft or approved equivalent	44	LF	$106	$4,664	$46	$2,024	$6,688
	F22; Surface mounted LED fixture, Dimension: 1.64"W x 21' L x 2.14"H, 482 lm/ft, 6 W/ft, Manufacturer - Lumenpulse or approved equivalent	56	LF	$106	$5,936	$46	$2,576	$8,512
	X5; 4' surface mounted LED linear fixture, Fixture to be surface mounted, Dimensions: 1.64" Width x 4' Length x 2" Height, 302 lm, 4W, Manufacturer - Ecosense or approved equivalent	67	EA	$414	$27,738	$421	$28,207	$55,945
	X10; 2.1" diameter surface mounted cylinder, 565 lm, 8 W, Manufacturer - Lucifer or approved equivalent	41	EA	$414	$16,974	$563	$23,083	$40,057
	X16; 4" square recessed downlight, 1125 lm, 12 W, Manufacturer - USAI or approved equivalent	18	EA	$414	$7,452	$421	$7,578	$15,030
	X16A; same as X16 or approved equivalent	0	EA	$414	$0	$287	$0	$0
	X16B; 4-1/2" aperture recessed downlight, 1750 lm, 33 W, Manufacturer - USAI or approved equivalent	18	EA	$414	$7,452	$421	$7,578	$15,030
	X19; 2.55" continuous linear pendant LED fxiture, 750lm/ft, 9W/ft or approved equivalent	100	LF	$116	$11,591	$46	$4,600	$16,191
	Exit Signs	57	EA	$414	$23,598	$421	$23,997	$47,595
	Wiring							
	Fixture supports / boxes		EA		$0		$0	$0
	MC Cable & Fittings, 50% normal & 50% emergency		EA		$0		$0	$0
	Home run conduit, wiring and fittings	18,000	LF	$2	$34,001	$25	$450,000	$484,001
					$0		$0	$0
	Existing Building				$0		$0	$0
	Lighting Fixtures				$0		$0	$0

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Sponsor Agency: DSNY

CSI Number	Description	Quantity	Unit	Unit Cost of Material	Total Cost of Material	Unit Cost of Labor	Total Cost of Labor	Total Cost: Materials and Labor
	F1A; High ceiling suspended LED fixture, Dimensions: 14.17" Diameter x 3.5" Height, 29076 lm, 40 W, Manufacturer - Meteor Lighting or approved equivalent	12	EA	$414	$4,968	$421	$5,052	$10,020
	F1B; High ceiling suspended LED fixture, Dimensions: 14.17" Diameter x 3.5" Height, 29076 lm, 40 W, Manufacturer - Meteor Lighting or approved equivalent	7	EA	$414	$2,898	$421	$2,947	$5,845
	Exterior Façade Light Fixtures				$0		$0	$0
	X1		EA		$0		$0	$0
	X12		EA		$0		$0	$0
	X13	2	EA	$414	$828	$461	$922	$1,750
	Wiring				$0		$0	$0
	Fixture supports / boxes		EA		$0		$0	$0
	MC Cable & Fittings, 50% normal & 50% emergency		EA		$0		$0	$0
	Home run conduit, wiring and fittings	1,300	LF	$2	$2,451	$25	$32,500	$34,951
	Salt Shed				$0		$0	$0
	Lighting				$0		$0	$0
	X-6; Surface mounted LED floodlight, Dimensions: 11" Width x 14" Length x 3" Height, 9061 lm, 100 W, Manufacturer - Lumenpulse or approved equivalent	14	EA	$414	$5,796	$421	$5,894	$11,690
	X-7; Surface mounted With Low Glare (ESOL) Refractor or approved equivalent Lens, Dimensions: 18" Diameter x 7.25" Height, 6556 lm, 68 W	8	EA	$414	$3,312	$421	$3,368	$6,680
	X-8; Surface mounted LED linear fixture with 30x60 or approved equivalent optics. Fixture to be surface mounted in architectural slot Dimensions: 1" Width x 4' Length x 2" Height, 430 lm/lf, 2 W/lf	251	LF	$106	$26,606	$46	$11,546	$38,152
	Wiring				$0		$0	$0
	Fixture supports / boxes		EA		$0		$0	$0
	MC Cable & Fittings, 50% normal & 50% emergency		EA		$0		$0	$0
	Home run conduit, wiring and fittings	1,000	LF	$2	$1,885	$25	$25,000	$26,885
	Household Goods				$0		$0	$0
	Lighting				$0		$0	$0
	X18B	12	EA	$414	$4,968	$421	$5,052	$10,020
	Fuel Station				$0		$0	$0
	Lighting				$0		$0	$0
	X15; 14" Width x 14" Length, Recessed square LED downlight with aluminum housing and integrated driver; 5147 delivered lm incl. wiring	12	EA	$414	$4,968	$421	$5,052	$10,020

Department of Design and Construction

CONTRACTOR'S BID BREAKDOWN FORM

CONTRACT 1 - GENERAL CONSTRUCTION

Project: Staten Island 1 & 3 Garage - Phase II
Location: 1000 West Service Road, Staten Island, NY 10314
Bidder: PRISMATIC DEVELOPMENT

DDC ID: S136-367
Sponsor Agency: DSNY

CSI Number	Description	Quantity	Unit	Unit Cost of Material	Total Cost of Material	Unit Cost of Labor	Total Cost of Labor	Total Cost: Materials and Labor
	Subtotal							$1,605,347
26 5113	**ARCHITECTURAL, LUMINAIRES, LAMPS, AND BALLASTS (included w/ 265113)**							
27 0000	**COMMUNICATIONS**							
27 0200	**STRUCTURED CABLING FOR VOICE & DATA SYSTEMS**							
	New Building							
	Telecommunication Systems							
	Wire management; cabletray, rings, hooks, conduit sleeves, etc.							
	Cable Tray; 12" x 18"	90	LF	$79	$7,094	$68	$6,130	$13,224
	Conduit sleeves							
	- 4"	12	EA	$77	$927	$409	$4,904	$5,832
	- 3"	9	EA	$77	$695	$409	$3,678	$4,374
	Grounding Busbar	2	EA	$124	$247	$817	$1,635	$1,882
	Intercom Station		EA					
	Wiring For IC From Master Station Panel		LF					
	Outlets; conduit drops out to cabletray							
	Tel/Data/CATV outlets, 1 Port	100	EA	$1,136	$113,600	$2,078	$207,800	$321,400
	Tel/Data/CATV outlets, 2 Port	59	EA	$1,136	$67,024	$2,078	$122,602	$189,626
	Flush Wall Mounted Data Outlets, 2 Port		EA					
	Ceiling/ Wall Data Outlets for Camera		EA					
	Flush Floor Box Data Outlet For Projector, 4 Port		EA					
	Flush Wall Mounted Data Outlets, 4 Port	11	EA	$1,236	$13,600	$2,248	$24,726	$38,326
	Wireless Access Points		EA					
	Wireless Access Points, Weatherproof		EA					
	Existing Building							
	Telecommunication Systems							
	Wire management; cabletray, rings, hooks, conduit sleeves, etc.							

Department of Design and Construction

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CONTRACT 1 - GENERAL CONSTRUCTION

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Sponsor Agency: DSNY

CSI Number	Description	Quantity	Unit	Unit Cost of Material	Total Cost of Material	Unit Cost of Labor	Total Cost of Labor	Total Cost: Materials and Labor
	Cable Tray; 12" x 18"		LF					
	Sleeves; 3"		EA					
	Grounding Busbar		EA					
	Outlets; conduit drops out to cabletray							
	Voice/Data outlet, 2-Port		EA					
	Flush Wall Mounted Voice/Data & Coax Cable		EA					
	Ceiling/ Wall Data Outlets for Camera		EA					
	Wireless Access Points		EA					
	Household Goods							
	Telecommunication Systems							
	Outlets; conduit conduit drop and runout for cabinet							
	Wall mounted outlet, 2 strand single mode fiber optic cable for long distance security camera video transmission		EA					
	Tel/Data Outlets, 1-port		EA					
	Fuel Station							
	Telecommunication Systems	1	LS	$7,727	$7,727	$5,109	$5,109	$12,836
	Subtotal							$587,499
27 0500	**COMMON WORK RESULTS FOR COMMUNICATIONS (included w/ 274000)**							
27 4000	**AUDIO VISUAL COMMUNICATIONS**							
	New Building							
	Audio Visual							
	AV, empty system-conduit containment for devices below	111	EA	$1,798	$199,578	$2,518	$279,498	$479,076
	Music system in stairwells; empty conduit		LS					
	Existing Building							
	Audio Visual							
	AV, empty system-conduit containment for devices	1	EA	$1,980	$1,980	$2,718	$2,718	$4,698
	Subtotal							$483,774
28 0000	**ELECTRONIC SAFETY AND SECURITY**							
28 0800	**COMMISSIONING OF ELECTRONIC SECURITY SYSTEMS (included w/ 281000)**							
28 1000	**ACCESS CONTROL & VIDEO SURVEILLANCE**							
	New Building							

Department of Design and Construction

CONTRACTOR'S BID BREAKDOWN FORM

CONTRACT 1 - GENERAL CONSTRUCTION

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Bidder: PRISMATIC DEVELOPMENT

DDC ID: S136-367
Sponsor Agency: DSNY

CSI Number	Description	Quantity	Unit	Unit Cost of Material	Total Cost of Material	Unit Cost of Labor	Total Cost of Labor	Total Cost: Materials and Labor
	Security Systems							
	Camera, 360 deg w/(1) blue category 6 cable	34	EA	$0	$0	$2,452	$83,372	$83,372
	Card Reader	19	EA	$1,855	$35,237	$1,226	$23,295	$58,532
	Door contact	28	EA	$1,855	$51,928	$1,635	$45,773	$97,701
	Magnetic lock	3	EA	$1,855	$5,564	$1,430	$4,291	$9,855
	Door release		EA					
	Electric strike	23	EA	$1,855	$42,655	$1,839	$42,299	$84,954
	Request to exit "Push button"		EA					
	Request to exit "IR sensor"		EA					
	Electric lock set		EA					
	Wiring & Testing							
	Box / support assembly		EA					
	EMT 3/4" with fittings	1,600	LF	$2	$3,017	$28	$44,510	$47,527
	Security cable	8,300	LF	$1	$6,414	$2	$16,961	$23,374
	Security Device Testing		EA					
	Existing Building							
	Security Systems							
	Camera, 360 deg w/(1) blue category 6 cable		EA					
	Junction box, assumed 1 per Single/Double Door		EA					
	Card Reader		EA					
	Door Contact		EA					
	Electric Lock set		EA					
	Wiring & Testing							
	Box / support assembly		EA					
	EMT 3/4" with fittings		LF					
	Security cable		LF					
	Security Device Testing		EA					
	Household Goods							
	Security							
	Camera, 360 deg w/(1) blue category 6 cable incl. wiring		EA					
	Subtotal							$405,316
28 3111	**DIGITAL, ADDRESSABLE FIRE-ALARM SYSTEM**							
	New Building							
	Fire Alarm							
	FACP- Fire Alarm Control Panel	1	EA	$23,182	$23,182	$16,347	$16,347	$39,530

Department of Design and Construction

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CONTRACT 1 - GENERAL CONSTRUCTION

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Bidder: PRISMATIC DEVELOPMENT

DDC ID: S136-367
Sponsor Agency: DSNY

CSI Number	Description	Quantity	Unit	Unit Cost of Material	Total Cost of Material	Unit Cost of Labor	Total Cost of Labor	Total Cost: Materials and Labor
	Smoke purge panel	1	EA	$23,182	$23,182	$16,347	$16,347	$39,530
	Manual pull station	15	EA	$618	$9,273	$409	$6,130	$15,403
	Remote annunciator	4	EA	$7,727	$30,910	$4,087	$16,347	$47,257
	Combination horn/strobe light	23	EA	$618	$14,218	$409	$9,400	$23,618
	Strobe light	23	EA	$618	$14,218	$409	$9,400	$23,618
	Area smoke detector	23	EA	$618	$14,218	$409	$9,400	$23,618
	Smoke detector elevator lobby	2	EA	$618	$1,236	$409	$817	$2,054
	Smoke detector TOS	2	EA	$618	$1,236	$409	$817	$2,054
	Smoke detector, duct mounted	36	EA	$618	$22,255	$409	$14,713	$36,968
	Carbon monoxide detector-SB	1	EA	$618	$618	$409	$409	$1,027
	Heat detector	2	EA	$618	$1,236	$409	$817	$2,054
	Relay module	1	EA	$100	$100	$100	$100	$200
	Relay module boiler shutdown	1	EA	$100	$100	$100	$100	$200
	Fire smoke damper connection	42	EA	$618	$25,964	$409	$17,165	$43,129
	Fire pump monitoring	1	EA	$100	$100	$100	$100	$200
	Generator Monitoring	1	EA	$100	$100	$100	$100	$200
	Waterflow switch	5	EA	$618	$3,091	$409	$2,043	$5,134
	Tamper switch	14	EA	$618	$8,655	$409	$5,722	$14,376
	Wiring & Testing							
	Box / support assembly	1	EA	$100	$100	$134	$134	$234
	EMT 3/4" with fittings	4,000	LF	$2	$7,542	$27	$106,040	$113,582
	FA cable	30,000	LF	$1	$23,182	$2	$61,303	$84,485
	FA Device Testing	299	EA	$0	$0	$51	$15,275	$15,275
	Fire alarm control panel wiring	10	LF	$4	$40	$10	$100	$140
	Fire Building Department testing	1	LS	$100	$100	$100	$100	$200
	Fuse cut-out & power connections	1	LS	$100	$100	$100	$100	$200
	Tie in FA system with AV/Security/BMS systems	1	LS	$100	$100	$100	$100	$200
	Existing Building							
	Fire Alarm							
	Strobe light	7	EA	$618	$4,327	$409	$2,861	$7,188
	Area Smoke detector	7	EA	$618	$4,327	$409	$2,861	$7,188
	Smoke detector elevator lobby	1	EA	$100	$100	$100	$100	$200
	Smoke detector TOS	1	EA	$100	$100	$100	$100	$200
	Wiring & Testing							
	Box / support assembly	1	EA	$100	$100	$100	$100	$200
	GRS 3/4" with fittings	50	LF	$2	$94	$28	$1,391	$1,485
	FA cable	1,200	LF	$1	$927	$0	$0	$927

Department of Design and Construction

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Location: 1000 West Service Road, Staten Island, NY 10314
Bidder: PRISMATIC DEVELOPMENT

DDC ID: S136-367
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CSI Number	Description	Quantity	Unit	Unit Cost of Material	Total Cost of Material	Unit Cost of Labor	Total Cost of Labor	Total Cost: Materials and Labor
	FA Device Testing	12	EA	$0	$0	$51	$613	$613
	Fire Building Department testing	1	LS	$100	$100	$100	$100	$200
	Fuse cut-out & power connections	1	LS	$100	$100	$100	$100	$200
	Tie in FA system with AV/Security/BMS systems	1	LS	$100	$100	$100	$100	$200
	Fuel Station							
	Fire Alarm							
	Fueling Lane							
	Remote Electric Manual Pull Station	1	EA	$100	$100	$100	$100	$200
	Heat Detector	1	EA	$100	$100	$100	$100	$200
	Pressure Switches	1	EA	$100	$100	$100	$100	$200
	Remote Alarm Horn Strobe	1	EA	$100	$100	$100	$100	$200
	Remote Alarm Horn Strobe Shut Off Switch	1	EA	$100	$100	$100	$100	$200
	Wiring & Testing							
	Box / Support assembly	1	EA	$100	$100	$100	$100	$200
	EMT 3/4" with fittings	10	LF	$8	$80	$8	$80	$160
	FA cable	10	LF	$4	$40	$6	$60	$100
	FA Device Testing	1	EA	$100	$100	$100	$100	$200
	Fire Building Department testing	1	LS	$100	$100	$100	$100	$200
	Fuse cut-out & power connections	1	LS	$100	$100	$100	$100	$200
	Tie in FA system with AV/Security/BMS systems	1	LS	$100	$100	$100	$100	$200
	Subtotal							$555,348
31 0000	**EARTHWORK**							
31 0000	**EARTHWORK**							
	New Building							
	Excavation for Foundation	2,900	CY			$62.00	$180,000	$180,000
	Excavation for SOG	200	CY			$200.00	$40,000	$40,000
	Pit Excavation	100	CY			$50.00	$5,000	$5,000
	Mobilization	1	LS	$300,000.00	$300,000	$300,000.00	$300,000	$300,000
	Dewatering, assume for site in general	8	MNTHS	$40,000.00	$40,000	$40,000.00	$40,000	$80,000
	Existing Building							
	Excavation for Elevator Pit - small tool & hand excavation	110	CY			$291.00	$32,000	$32,000
	Household Goods							
	Excavation	100	CY			$200.00	$20,000	$20,000
	Fuel Station							
	Foundation							
	Excavation for Fuel Tanks as per SOE-104	1,100	CY	$19.09	$10,500	$9.55	$10,500	$21,000.00

Department of Design and Construction

CONTRACTOR'S BID BREAKDOWN FORM

CONTRACT 1 - GENERAL CONSTRUCTION

Project: Staten Island 1 & 3 Garage - Phase II
Location: 1000 West Service Road, Staten Island, NY 10314
Bidder: PRISMATIC DEVELOPMENT

DDC ID: S136-367
Sponsor Agency: DSNY

CSI Number	Description	Quantity	Unit	Unit Cost of Material	Total Cost of Material	Unit Cost of Labor	Total Cost of Labor	Total Cost: Materials and Labor
	Geotextile Fabrics to be non-woven as per F-102	110,000	SF	$0.36	$20,000	$0.18	$20,000	$40,000.00
	Gravel Backfill	550	CY	$147.27	$40,500	$73.64	$40,500	$81,000.00
	Site							
	Total Hardscape Excavation - incl. excavation required for hardscaping- excavation assumed as 0.5" thick		CY		$57,500		$57,500	$115,000.00
	Excavation for Foundation for Retaining Wall	905	CY	$66.30	$30,000	$33.15	$30,000	$60,000.00
	Excavation for Foundation for Recycling Fence	250	CY	$200.00	$25,000	$100.00	$25,000	$50,000.00
	Subtotal							$1,024,000
31 1000	**SITE CLEARING, REMOVALS, AND PREPARATION**							
	Site							
	Clearing & grubbing	88,000	SF	$0.09	$7,500	$0.09	$7,500	$15,000.00
	Grading - Cut (assume all material to be re-used)	4,500	CY	$7.78	$35,000	$7.78	$35,000	$70,000.00
	Grading - Fill (imported) incl. Salt Shed	100	CY	$15.00	$1,500	$15.00	$1,500	$3,000.00
	Demolition							
	Remove concrete pavement @ household recycle area	42,000	SF	$5.37	$225,500	$5.37	$225,500	$451,000.00
	Remove and salvage crushed stone	156,000	SF	$0.30	$47,000	$0.30	$47,000	$94,000.00
	Remove and dispose asphalt pavement	125,000	SF	$1.50	$187,500	$1.50	$187,500	$375,000.00
	Remove and salvage gravel pavement	54,900	SF	$1.09	$60,000	$1.09	$60,000	$120,000.00
	Remove existing utility pole, disconnect site power	1	EA	$4,000.00	$4,000	$4,000.00	$4,000	$8,000.00
	Remove existing sanitary structures and associated piping	3	EA	$1,666.67	$5,000	$1,666.67	$5,000	$10,000.00
	Remove existing drain	3	EA	$666.67	$2,000	$666.67	$2,000	$4,000.00
	Maintain and protect existing gas service and associated structures	1	LOC	$2,500.00	$2,500	$2,500.00	$2,500	$5,000.00
	Maintain and protect existing underground storage tank and tank access	1	EA	$2,500.00	$2,500	$2,500.00	$2,500	$5,000.00
	Existing pole #35796 to be replaced by CON EDISON	1	EA	$0.00	$0	$0.00	$0	
	Remove electric service and equipment, utility pole, bollards and foundations	1	LS	$40,000.00	$40,000	$40,000.00	$40,000	$80,000.00
	Existing concrete barriers to be returned to DSNY	965	LF	$10.36	$10,000	$10.36	$10,000	$20,000.00
	Remove existing gas service within limits shown	233	LF	$20.39	$4,750	$20.39	$4,750	$9,500.00
	Remove existing piping	220	LF	$19.32	$4,250	$19.32	$4,250	$8,500.00
	Remove existing trench drain	60	LF	$29.17	$1,750	$29.17	$1,750	$3,500.00
	Subtotal							$1,281,500.00
31 2116	**SUB-MEMBRANE DEPRESSURIZATION SYSTEM**							
	New Building							
	Depressurization System, as per N-200 and detail as per N-203							

Department of Design and Construction

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	Geotextile Fabric	110,000	SF	$0.18	$20,000.00	$0.18	$20,000.00	$40,000.00
	4" Dia perforated HDPE Vapor Collection pipe wrapped with Polyester Filter Sleeve	5,400	LF	$10.00	$54,000.00	$21.30	$115,000.00	$169,000
	Vapor Collection Pipe Riser	6	EA	$3,209.00	$19,254.00	$2,353.00	$14,118.00	$33,372
	4" Metal Active Vent Branch Pipe as per N-203	180	LF	$134.00	$24,120.00	$80.00	$14,400.00	$38,520
	4" Metal Passive Vent branch Pipe as per N-203	200	LF	$134.00	$26,800.00	$80.00	$16,000.00	$42,800
	Methane Sensor	6	EA	$2,674.00	$16,044.00	$1,070.00	$6,420.00	$22,464
	Vacuum Pump as per 14/N-202	6	EA	$28,757.00	$172,540.00	$2,353.00	$14,118.00	$186,658
	Motorized Solenoid Valve	12	EA	$3,209.00	$38,508.00	$856.00	$10,272.00	$48,780
	Sample Port	3	EA	$535.00	$1,605.00	$856.00	$2,568.00	$4,173
	Check Valve	3	EA	$3,209.00	$9,627.00	$642.00	$1,926.00	$11,553
	Subtotal							$597,320
31 2500	**SOIL EROSION AND SEDIMENT CONTROL**							
	Site							
	Erosion and Sediment Control							
	36" High Silt Fence with 36" wood or steel fence post drive 16" (min) into the ground @ 10 Feet O.C	2,830	LF	$0.35	$1,000	$0.35	$1,000	$2,000.00
	36" High Woven wire fence : Minimum 14 gauge w/ max 6" mesh spacing	8,500	SF	$0.11	$900	$0.11	$900	$1,800.00
	16" High filer fabric	3,775	SF	$0.20	$750	$0.20	$750	$1,500.00
	Compacted backfill - 6" Deep	13	CY	$38.46	$500	$38.46	$500	$1,000.00
	Inlet protection shall be installed and maintained	0	LF	Duplicate of below Item				
	Inlet protection	40	EA		$3,000	$75.00	$3,000	$6,000.00
	Protect existing inlet to remain	10	EA	$75.00	$750	$75.00	$750	$1,500.00
	Install stabilized construction entrance	1	EA	$2,000.00	$2,000	$2,000.00	$2,000	$4,000.00
	Inlet protection shall be installed and maintained until completion of construction	240	LF	$2.50	$600	$2.50	$600	$1,200.00
	Subtotal							$19,000.00
31 5000	**EXCAVATION SUPPORT AND PROTECTION**							
	Fuel Station							
	W14x99 Steel Soldier Piles w/24" Predrilled Casing as per SOE-104 : 40EA & 40'D	1600	LF	$121.00	$192,900	$121.00	$192,900	$385,800
	3" Timber - 10'D as per SOE-104	300	LF	$266.00	$80,000.00	$266.00	$80,000	$160,000
	Subtotal							$545,800

Department of Design and Construction

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31 6219	**TIMBER PILES**							
	New Building							
	Total Piles - 8"Dia Timber Pile	557	EA	$1,390.00	$774,230.00	$744.11	$414,470.38	$1,188,700
	Subtotal							$1,188,700
32 0000	**EXTERIOR IMPROVEMENTS**							
32 1216	**ASPHALTIC PAVING**							
	Site							
	LPA-01 - NYCDOT Asphaltic concrete paving: Heavy duty	79425	SF	$11.50	$913,010	$6.78	$538,502	$1,451,512
	LPA-01 - NYCDOT Asphaltic concrete paving: Heavy duty - 2" Bituminous top course	79425	SF	$11.50	$913,010	$6.78	$538,501	$1,451,511
	1' Aggregate	5885	CY	$50.00	$294,250	$50.00	$294,250	$588,500
	LPA-02 - NYCDOT Asphaltic concrete paving: Employee parking	91130	SF	$15.20	$1,385,176	$6.78	$617,861	$2,003,037
	Subtotal							$5,494,560
32 1315	**CONCRETE CURBS AND PAVEMENT**							
	New Building							
	2'x 2' Rooftop Walkway Pads		SF					
	Site	Rebar						$330,000
	LPA-10 - NYCDOT 9" Reinforced concrete pavement	73,570	SF	$10.13	$745,264	$7.88	$579,732	$1,324,996
	LPA-11 - NYCDOT 4" concrete sidewalk		SF					
	LPA-11 - NYCDOT 4" concrete sidewalk incl. 6" Aggregate base course: Type 01 (6" Gravel, broken stone or sand as per standard specification)	23,940	SF	$7.30	$174,762	$7.38	$176,677	$351,439
	LPA-20 - NYCDOT steel faced concrete curb	10,165	LF	$44.35	$459,688	$60.53	$627,393	$1,074,975
	LPA-21 - NYCDOT Drop curb	100	LF	$44.35	$4,435	$60.53	$6,053	$10,488.00
	LPA-22 - Flush concrete curb	100	LF	$44.35	$4,435	$60.53	$6,053	$10,488.00
	LPA-30/40 - Building face expansion joint w/ sealant backer rod pre-formed joint filler	2,500	LF	$6.00	$15,000	$4.00	$10,000	$25,000.00
	Concrete pad for new 500 Kva 3 phase 265/460 volt pad transformer	70	SF	$20.00	$1,400	$12.00	$840	$2,240.00
	Concrete Stair	0		$0.00	$0	$0.00	$0	$0.00
	Site stair - 1'2"' W Tread (qty only)		LF	Not Applicable				
	Site stair - 1'2"' W Tread - Concrete		CY	Not Applicable				
	Site stair - 1'2"' W Tread - Gravel		CY	Not Applicable				
	2"- 1/2" bar stock metal post, typ - 3' 10" High		EA	Not Applicable				
	1- 1/2" Nominal metal handrail, typ		LF	Not Applicable				

Department of Design and Construction

CONTRACTOR'S BID BREAKDOWN FORM

CONTRACT 1 - GENERAL CONSTRUCTION

Project: Staten Island 1 & 3 Garage - Phase II
Location: 1000 West Service Road, Staten Island, NY 10314
Bidder: PRISMATIC DEVELOPMENT

DDC ID: S136-367
Sponsor Agency: DSNY

CSI Number	Description	Quantity	Unit	Unit Cost of Material	Total Cost of Material	Unit Cost of Labor	Total Cost of Labor	Total Cost: Materials and Labor
	Site stepped seat - 2.5' W Tread (qty only)		LF	Not Applicable				
	Site stepped seat - 2.5' W Tread - Concrete		CY	Not Applicable				
	Site stepped seat - 2.5' W Tread - Gravel		CY	Not Applicable				
	Site Walls							$459,774
	Retaining wall - 6' High (qty only)	50	LF					
	Concrete	12	CY	$210.00	$2,520	$100.00	$1,200	$3,720.00
	Reinforcement	1,800	LB	$0.80	$1,440	$1.75	$3,150	$4,590.00
	Formwork	600	SF	$4.25	$2,550	$16.00	$9,600	$12,150.00
	Footing - 4.25' W X 1' D				$0		$0	$0.00
	Concrete	8	CY	$210.00	$1,680	$100.00	$800	$2,480.00
	Gravel	12.0	CY	$65.00	$780	$20.00	$240	$1,020.00
	Reinforcement	1,000	LB	$0.80	$800	$1.75	$1,750	$2,550.00
	Retaining wall - 5.5' High (qty only)	168	LF		$0		$0	$0.00
	Concrete	23	CY	$210.00	$4,830	$100.00	$2,300	$7,130.00
	Wall Reinforcement	3,300	LB	$0.80	$2,640	$1.75	$5,775	$8,415.00
	Formwork	924	SF	$4.25	$3,927	$16.00	$14,784	$18,711.00
	Footing - 6.5' W X 1' D				$0		$0	$0.00
	Concrete	41	CY	$210.00	$8,610	$100.00	$4,100	$12,710.00
	Gravel	53.0	CY	$65.00	$3,445	$20.00	$1,060	$4,505.00
	Reinforcement	5,500	LB	$0.80	$4,400	$1.75	$9,625	$14,025.00
	Retaining wall - 11' High (qty only)	94	LF		$0		$0	$0.00
	Concrete	40	CY	$210.00	$8,400	$100.00	$4,000	$12,400.00
	Wall Reinforcement	6,000	LB	$0.80	$4,800	$1.75	$10,500	$15,300.00
	Formwork	2,146	SF	$4.50	$9,657	$17.00	$36,482	$46,139.00
	Footing - 4.25' W X 1' D				$0		$0	$0.00
	Concrete	15	CY	$210.00	$3,150	$100.00	$1,500	$4,650.00
	Gravel	22	CY	$65.00	$1,430	$20.00	$440	$1,870.00
	Reinforcement	2,000	LB	$0.80	$1,600	$1.75	$3,500	$5,100.00
	Formwork	190	SF	$3.00	$570	$13.00	$2,470	$3,040.00
	Retaining wall - 10' High (qty only)	49	LF		$0		$0	$0.00
	Concrete	18	CY	$210.00	$3,780	$100.00	$1,800	$5,580.00
	Wall Reinforcement	2,800	LB	$0.80	$2,240	$1.75	$4,900	$7,140.00
	Formwork	980	SF	$4.25	$4,165	$16.00	$15,680	$19,845.00
	Footing - 4.25' W X 1' D				$0		$0	$0.00
	Concrete	8	CY	$210.00	$1,680	$100.00	$800	$2,480.00
	Gravel	12	CY	$65.00	$780	$20.00	$240	$1,020.00
	Reinforcement	1,000	LB	$0.80	$800	$1.75	$1,750	$2,550.00

Department of Design and Construction

CONTRACTOR'S BID BREAKDOWN FORM

CONTRACT 1 - GENERAL CONSTRUCTION

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Location: 1000 West Service Road, Staten Island, NY 10314
Bidder: PRISMATIC DEVELOPMENT

DDC ID: S136-367
Sponsor Agency: DSNY

CSI Number	Description	Quantity	Unit	Unit Cost of Material	Total Cost of Material	Unit Cost of Labor	Total Cost of Labor	Total Cost: Materials and Labor
	Formwork	100	SF	$3.00	$300	$14.00	$1,400	$1,700.00
	Main entrance wall (Northeast Site Wall) - 9' High (qty only)	73	LF		$0		$0	$0.00
	Concrete	24	CY	$210.00	$5,040	$100.00	$2,400	$7,440.00
	Wall Reinforcement	3,500	LB	$0.80	$2,800	$1.75	$6,125	$8,925.00
	Formwork	1,248	SF	$4.25	$5,304	$16.00	$19,968	$25,272.00
	Damproofing along the Back Wall	600	SF		$0		$0	$0.00
	4" Perforated Underdrain w/ 3/4" - 1-1/2" Crushed Stone & Filter Fabric Enclosure	73	LF	$7.00	$511	$12.00	$876	$1,387.00
	Footing - 4.25' W X 1' D				$0		$0	$0.00
	Concrete	12	CY	$210.00	$2,520	$100.00	$1,200	$3,720.00
	Gravel	17	CY	$65.00	$1,105	$20.00	$340	$1,445.00
	Reinforcement	1,500	LB	$0.80	$1,200	$1.75	$2,625	$3,825.00
	Cast in Place Knee wall - 1'T X 4.7' H (qty only)	238	LF		$0		$0	$0.00
	Concrete	47	CY	$210.00	$9,870	$100.00	$4,700	$14,570.00
	Formwork	2,496	SF	$4.25	$10,608	$16.00	$39,936	$50,544.00
	Wall Reinforcement	7,600	LB	$0.80	$6,080	$1.75	$13,300	$19,380.00
	Damproofing along the Back Wall	1,200	SF		$0		$0	$0.00
	4" Perforated Underdrain w/ 3/4" - 1-1/2" Crushed Stone & Filter Fabric Enclosure	238	LF	$7.00	$1,666	$12.00	$2,856	$4,522.00
	Form Joint	238	LF	$6.00	$1,428	$10.00	$2,380	$3,808.00
	Knee wall footing - 2.5' W X 1' D				$0		$0	$0.00
	Concrete	18	CY	$210.00	$3,780	$100.00	$1,800	$5,580.00
	Reinforcement	3,000	LB	$0.80	$2,400	$1.75	$5,250	$7,650.00
	Gravel	40	CY	$65.00	$2,600	$20.00	$800	$3,400.00
	Subtotal							$3,971,687
32 1543	**CRUSHED STONE EDGING (included w/ 321315)**							
32 1723	**PAVEMENT MARKINGS**							
	Site							
	Line marking							
	Pavement marking		LF					$28,450
	Subtotal							$28,450
32 1726	**TACTILE WARNING SURFACING**							
	Site							
	LPA-50 - Tactile (detectable) warning surface plate		SF					

Department of Design and Construction

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	Subtotal							See Section 321216
32 3119	**DECORATIVE METAL FENCE AND GATE**							
	Household Goods							
	Orthogril metal fencing							
	Recycling fence	6,560	SF	$26.22	$172,000	$26.22	$172,000	$344,000
	Fence infill	1,300	SF	$26.15	$34,000	$26.15	$34,000	$68,000.00
	Gate infill	70	SF	$21.43	$1,500	$21.43	$1,500	$3,000.00
	Hinge	10	EA	$50.00	$500	$50.00	$500	$1,000.00
	Support post - 9	9	EA	$277.78	$2,500	$277.78	$2,500	$5,000.00
	Cane bolt	15	EA	$33.33	$500	$33.33	$500	$1,000.00
	Lockable side bolt	5	EA	$150.00	$750	$150.00	$750	$1,500.00
	Support post - 8	8	EA	$250.00	$2,000	$250.00	$2,000	$4,000.00
	Single swing gate - 14.70' W X 8' H @ West Elevation	1	EA	$11,000.00	$11,000	$11,000.00	$11,000	$22,000.00
	Double swing gate - 25' 2" W X 9' H @ West Elevation	1	EA	$22,200.00	$22,200	$22,200.00	$22,200	$44,400.00
	Subtotal							$493,900
32 3300	**SITE FURNISHINGS**							
	New Building							
	Parking Spaces							
	9'-0" X 1'6"Concrete Wheel stop	20	EA	$185.00	$1,700	$180.00	$3,600	$5,300.00
	Steel Snow Plow Rack - 12'0"L X 5'4" W X 8'7"H	24	EA	$7,291.67	$175,000	$7,291.67	$175,000	$350,000.00
	Steel Snow Plow Rack - 8'8"L X 5'4" W X 8'7"H	6	EA	$2,166.67	$13,000	$2,166.67	$13,000	$26,000.00
	Pre-assembled equipment cage, Basis of design: cisco eagle #4W558-C 4-Wall welded wire partition w/ceiling, 5'-4"X 5'-4"X 8'5"	14	EA	$928.57	$13,000	$928.57	$13,000	$26,000.00
	Steel Bollards at Personnel slab @ Parking	50	EA	$1,000.00	$50,000	$1,000.00	$50,000	$100,000.00
	Existing Building							
	Miscellaneous							
	LFE-01 - Bollards w/ 8" Dia steel pipe filled with concrete, painted OSHA Yellow	0	EA	included in misc metals				$0.00
	Salt Shed							
	Bollards	0	EA					$0.00
	Site							
	LFE - 01A - Bollards w/ 12" Dia steel pipe filled with concrete, painted OSHA Yellow	74	EA	$405.41	$30,000	$405.41	$30,000	$60,000.00
	Concrete Infill	22	CY	$204.55	$4,500	$204.55	$4,500	$9,000.00
	Footing Concrete - Class D concrete	110	CY	$181.82	$20,000	$181.82	$20,000	$40,000.00

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	Compacted backfill around footing	50	CY	$20.00	$1,000	$20.00	$1,000	$2,000.00
	Formwork	3,500	SF	$2.86	$10,000	$2.86	$10,000	$20,000.00
	LFE - 01B - Bollards w/ 8" Dia steel pipe filled with concrete, painted OSHA Yellow	49	EA	$275.51	$13,500	$275.51	$13,500	$27,000.00
	Concrete Infill	5	CY	$200.00	$1,000	$200.00	$1,000	$2,000.00
	Footing Concrete - Class D concrete	50	CY	$180.00	$9,000	$180.00	$9,000	$18,000.00
	Compacted backfill around footing	25	CY	$20.00	$500	$20.00	$500	$1,000.00
	Formwork	2,300	SF	$2.83	$6,500	$2.83	$6,500	$13,000.00
	LFE-02 - Site receptacles, basis of design: DSNY standard 32" litter and recycling receptacles	4	EA	$250.00	$1,000	$250.00	$1,000	$2,000.00
	LFE-04 - Site bench - 8.5' L X 2.5' W	5	EA	$1,000.00	$5,000	$1,000.00	$5,000	$10,000
	LFE-06 - Site flagpoles	0	EA			Duplicate of flagpole spec 107500		$0.00
	PLOW Racks - 2' W	57	EA	$6,050.00	$344,850	$6,050.00	$344,850	$689,700.00
	V-PLOW Storage area - 30 Each	0	SF					
	Pylon	4	EA	$750.00	$3,000	$750.00	$3,000	$6,000.00
	CACL Tank as per 6/L-706							
	Subtotal							$1,407,000
32 9300	**TREES, SHRUBS, AND GROUNDCOVERS**							
	New Building							
	Outdoor Terrace @ Level 2-Not Accessible - Extensive green roof with 1'-5" deep minimum planting area over filter fabric, drainage board, protection membrane, 4" rigid insulation and PVC roofing system over 6-1/4" composite deck (Details @ EN1-002)	3141	SF	$29.47	$92,565	$29.47	$92,565	$185,131
	Site							
	Softscape	250		$19.57	$4,893	$19.57	$4,893	$9,785
	Planting - as per schedule on L-411	2,715		$47.54	$129,071	$47.54	$129,079	$258,150
	Black-Eyed Susan -2" Plug Plug @ 24" O.C.	1,053	EA	$4.84	$5,097	$7.25	$7,634	$12,731
	Bluestar -#1 Container Potted @ 36" O.C.	2,140	EA	$24.18	$51,745	$36.27	$77,618	$129,363
	Little Bluestem -2" Plug Plug @ 30" O.C.	5,266	EA	$4.84	$25,487	$7.25	$38,179	$63,666
	Grassland mix - as per schedule on L-411	15,724	SF	$2.48	$38,996	$3.72	$58,493	$97,489
	Enter wet meadow mix - as per schedule on L-411	15302	SF	$2.48	$37,949	$3.72	$56,923	$94,872
	Green fence planting pallette - as per schedule on L-411			$0.00	$0	$0.00		
	Virginia creeper-# 1 Container potted @ 36" O.C	88	EA	$43.53	$3,831	$65.29	$5,746	$9,576
	Trees and Shrubs - as per L-411		EA	$0.00	$0	$0.00		
	Swamp White Oak - 2"-3" Caliper	30	EA	$1,113.34	$33,400	$1,670.52	$50,116	$83,516
	Black Gum - 2"-3" Caliper	23	EA	$1,113.34	$25,607	$1,670.52	$38,422	$64,029

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	Red Maple - 2"-3" Caliper	13	EA	$1,113.34	$14,473	$1,670.52	$21,717	$36,190
	London Planetree - 2"-3" Caliper	8	EA	$1,113.34	$8,907	$1,670.52	$13,364	$22,271
	Common Serviceberry - 1"-2" Caliper	25	EA	$531.99	$13,300	$797.99	$19,950	$33,250
	Winged Sumac - 1"-2" Caliper	9	EA	$531.99	$4,788	$797.99	$7,182	$11,970
	Virginia Rose - #1 Container	59	EA	$33.85	$1,997	$50.78	$2,996	$4,993
	Lo-Grow Aromatic Sumac - #3 Container	786	EA	$33.85	$26,606	$50.78	$39,913	$66,519
	Subtotal							$1,183,500
33 0000	**UTILITIES**							
33 0200	**PROTECTION OF EXISTING UTILITIES (included w/ 331000)**							
33 1000	**WATER UTILITIES**							
	Site							
	Domestic Service							
	10" DIP water pipe	1507	LF	$145	$218,037	$162	$244,309	$462,346
	4" pipe	0	LF	Not Applicable				
	Curb valve		EA					
	Fire Water Service							
	6" fire water service	127	LF	$148	$18,734	$216	$27,452	$46,186
	Hydrant, fenders, and valve assemblies, typ	6	EA	$8,243	$49,461	$9,664	$57,986	$107,447
	Siamese connection, typ		EA					
	TEE connection		EA					
	TEE connection to existing 12' main	4	EA	$33,183	$132,730	$40,529	$162,116	$294,846
	10" Water main wet connection		EA					
	Subtotal							$910,824
33 3100	**SANITARY SEWER SYSTEM**							
	Sanitary Sewer System							
	Site							
	Sanitary Service							
	8" DIP (Ductile iron pipe)	720	LF	$198	$142,434	$292	$210,102	$352,536
	6" Trench Drain	118		$511	$60,331	$627	$73,968	$134,299
	Sanitary trench drain end outlet to SAN MH-7, see C-501		EA					
	Sanitary manhole - unsized	1	EA	$5,981	$5,981	$6,133	$6,133	$12,114
	Connection to cleanout for 'S136-367 - Phase 1 contract'	1	EA	$500.00		$1,000.00		$1,500
	Subtotal							$500,449

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33 4000	**STORM DRAINAGE UTILITIES**							
	Site							
	Storm & Site Drainage	359.0		$155	$55,647	$190	$68,288	$123,934
	30" HDPE	517	LF	$216	$111,841	$324	$167,628	$279,469
	24" HDPE	501	LF	$177	$88,882	$259	$129,952	$218,834
	18" HDPE	453	LF	$141	$64,092	$200	$90,574	$154,666
	15" HDPE	310	LF	$108	$33,584	$158	$48,916	$82,500
	12" HDPE	1,360	LF	$99	$134,506	$151	$205,779	$340,285
	8" HDPE	19	LF	$80	$1,513	$119	$2,259	$3,772
	6" HDPE		LF					
	Subtotal							$1,203,460
33 4900	**STORM AND SANITARY STRUCTURES**							
	Site							
	12" Trench drain	120	LF	$335	$40,248	$486	$58,362	$98,609
	6" Trench drain	80	LF	$272	$21,738	$422	$33,720	$55,458
	Storm manhole							
	- 5' dia	11	EA	$6,928	$76,207	$5,404	$59,442	$135,649
	- 4' dia	14	EA	$5,968	$83,545	$4,755	$66,576	$150,121
	- STMH-25; unsized	0	EA		Not Applicable			$0
	6" X 8" Dip Tee	0	EA		Not Applicable			$0
	Cleanouts	0	EA		Not Applicable			$0
	Area drain - 5.5'L X 4.5'W	0	EA		Not Applicable			$0
	12'' Bottom outlet	0	EA		Not Applicable			$0
	Drainage Inlet	36	EA	$4,925	$177,289	$3,675	$132,287	$309,576
	6" Bottom outlet		EA					
	Subtotal							$749,414
33 4910	**OTHER UTILITIES**							
	Site							
	Gas service							
	Proposed gas line around fueling station	0	LF	by national	grid per RFI			
	3" Gas service	0	LF	by national	grid per RFI			
	Gas service curb valves	Trench	EA					
	Connection to existing gas line		EA					
	Electric service	1		$107,530	$107,530	$131,422	$131,422	$238,952

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	New 500 kVA 3 phase 265/460 volt transformer; rough-in & grounding only	1	EA	$77,274	$77,274	$20,434	$20,434	$97,708
	M11-6 - ConED cable manhole	0	EA	by Con Ed				
	New underground electrical service by CON EDISON	0	LS	by Con Ed				
	New (8) 5" concrete encased CON EDISON approved primary cable	215	LF	$62	$13,291	$140	$30,038	$43,329
	New 4" , conduit or CON EDISON approved cable from secondary side	140	LF	$62	$8,655	$139	$19,473	$28,128
	Site lighting incl. wiring							
	Light poles		EA					
	X9; 3" diameter adjustable floodlight, 780 lm, 12 W, Manufacturer - Axis or approved equivalent	8	EA	$3,091	$24,728	$3,269	$26,156	$50,884
	X13; 5 1/2" diameter x 12 1/16" height, 45 degree cap with weep hole, 34W/heads, Manufacturer BK lighting or approved equivalent	2	EA	$3,093	$6,185	$3,269	$6,539	$12,724
	X17A; 27' high pole w/ LED 2 heads mounted 180 deg, 16482lm/head, 220W/head, Manufacturer - Beacon or approved equivalent	4	EA	$3,094	$12,376	$3,269	$13,078	$25,454
	X17B; same as X17A, three heads mounted 90 deg, 16482lm/head, 220W/head or approved equivalent	10	EA	$3,096	$30,956	$3,269	$32,695	$63,651
	X17C; same as X17A, except four heads 90 deg, 16482lm/head, 220W/head or approved equivalent	1	EA	$3,097	$3,097	$3,269	$3,269	$6,367
	X18A; 27' high pole with LED single head mounted on top of pole, 18874lm/head, 220W/head or approved equivalent	2	EA	$3,099	$6,197	$3,269	$6,539	$12,736
	X18B; same as X18A, 18874lm/head, 220W/head or approved equivalent	2	EA	$3,100	$6,200	$3,269	$6,539	$12,739
	X20; 7.3" diameter LED bollard with 360 degree lighting distribution. 27W/head, Manufacturer Ligman or approved equivalent	10	EA	$3,102	$31,018	$3,269	$32,695	$63,713
	X21; 2.75" recessed LED step light with asymmetrical forward throw distribution, 301lm, 6W or approved equivalent	21	EA	$3,103	$65,170	$3,269	$68,659	$133,829
	Security							
	Camera, 360 deg w/(1) blue category 6 cable incl. wiring	1	EA	$0	$0	$3,769	$3,769	$4,904
	4" DIP (Ductile iron pipe)		LF	Not Applicable				
	Subtotal							$795,119
33 5213.13	**FIBERGLASS DOUBLE CONTAINMENT PIPING (included w/ 334910)**							

Department of Design and Construction

CONTRACTOR'S BID BREAKDOWN FORM

CONTRACT 1 - GENERAL CONSTRUCTION

Project: Staten Island 1 & 3 Garage - Phase II
Location: 1000 West Service Road, Staten Island, NY 10314
Bidder: PRISMATIC DEVELOPMENT

DDC ID: S136-367
Sponsor Agency: DSNY

CSI Number	Description	Quantity	Unit	Unit Cost of Material	Total Cost of Material	Unit Cost of Labor	Total Cost of Labor	Total Cost: Materials and Labor
33 5213.16	**STAINLESS STEEL DOUBLE CONTAINMENT PIPING (included w/ 334910)**							
33 5614	**UNDERGROUND STORAGE TANKS**							
	New Building							
	Hydraulic Oil System							
	Underground storage tank - 550 Gallons	1	EA	$20,000	$20,000	$105,000	$105,000	$125,000
	Motor Oil System							
	Underground storage tank - 550 Gallons	1	EA	$20,000	$20,000	$105,000	$105,000	$125,000
	Existing Building							
	Hydraulic Oil System							
	550 gal underground tank for Hydraulic Oil - relocated & replaced in kind	1	EA	$20,000	$20,000	$105,000	$105,000	$125,000
	Motor Oil System							
	550 gal underground tank for Motor Oil - relocated & replaced in kind	1	EA	$20,000	$20,000	$105,000	$105,000	$125,000
	Subtotal							$500,000.00
43 0000	**PROCESS GAS AND LIQUID HANDLING, PURIFICATION, AND STORAGE EQUIPMENT**							
43 4116	**PETROLEUM BULK STORAGE (PBS) TANK SYSTEMS**							
	Site							
	Fuel System / Pump Station	1	LS	$300,000.00	$300,000	$479,700.00	$479,700	$779,700.00
	Subtotal							$779,700
43 4117	**PETROLEUM BULK STORAGE (PBS) PRODUCT PIPING (included w/ 434116)**							
43 4118	**PETROLEUM BULK STORAGE (PBS) INSTRUMENTATION AND CONTROL (included w/ 434116)**							
48 0000	**ELECTRICAL POWER GENERATION**							
48 1400	**SOLAR ENERGY ELECTRICAL POWER GENERATION SYSTEM**							
	New Building							
	Solar PV disconnect switch	20	EA	$5,404	$108,076	$2,286	$45,727	$153,803
	Solar PV System							
	Installed capacity, 1103497 kwh electric energy generation, approx. 50,000 SF/N	1	W	$757,093	$757,093	$980,563	$980,563	$1,737,656

Department of Design and Construction

CONTRACTOR'S BID BREAKDOWN FORM

CONTRACT 1 - GENERAL CONSTRUCTION

Project: Staten Island 1 & 3 Garage - Phase II
Location: 1000 West Service Road, Staten Island, NY 10314
Bidder: PRISMATIC DEVELOPMENT

DDC ID: S136-367
Sponsor Agency: DSNY

CSI Number	Description	Quantity	Unit	Unit Cost of Material	Total Cost of Material	Unit Cost of Labor	Total Cost of Labor	Total Cost: Materials and Labor
	Subtotal							$1,891,459
	TOTAL CONTRACT 1 - GENERAL CONSTRUCTION WORK							***$127,449,000.00***

ATTACHMENT 1 – BID INFORMATION
PROJECT ID: S136-367

DESCRIPTION AND LOCATION OF WORK:

Staten Island 1 & 3 Garage - Phase 2
1000 West Service Road
Staten Island, NY 10314
DDC PIN: 8502020TR0001C **EPIN: 85020B0038**

DOCUMENTS AVAILABLE AT:

Department of Design and Construction, Contract Section
30-30 Thomson Avenue - First Floor, Long Island City, NY 11101

SUBMISSION OF BIDS BEFORE BID OPENING:

TIME TO SUBMIT:

On or Before:	January 21, 2020

BIDS MUST BE CLOCKED IN PRIOR TO BID OPENING

PLACE TO SUBMIT:

Department of Design and Construction, Contract Section
30-30 Thomson Avenue - First Floor, Long Island City, NY 11101

PRE BID QUESTIONS (PBQs):

Please be advised that PBQs must be submitted to the Agency Contact Person at least five (5) business days (by 5:00 P.M. EST) prior to the bid opening date. Email PBQ(s) - CSB_projectinquiries@ddc.nyc.gov

BID OPENING:

PLACE OF BID OPENING:	Department of Design and Construction, Contract Section
	30-30 Thomson Avenue - First Floor
	Long Island City, NY 11101
DATE AND HOUR:	January 21, 2020 @ 2:00 PM

LATE BIDS WILL NOT BE ACCEPTED

PRE-BID CONFERENCE:

PLACE:	**Staten Island 1 & 3 Garage** **1000 West Service Road, Staten Island, NY 10314**
DATE AND HOUR:	**January 7, 2020 @ 11:00 AM**
MANDATORY OR OPTIONAL:	**Optional**

BID SECURITY:

Bid Security is required in the amount set forth below; provided, however, bid security is not required if the TOTAL BID PRICE set forth on the Bid Form is less than $1,000,000.00.

(1) Bond in an amount not less than 10% of the TOTAL BID PRICE set forth on the Bid Form, OR
(2) Certified Check in an amount not less than 2% of the TOTAL BID PRICE set forth on the Bid Form.

PERFORMANCE AND PAYMENT SECURITY:

Required for Contracts in the amount of $1,000,000.00 or more. Performance and Payment Security shall each be in amount equal to 100% of the Contract Price.

AGENCY CONTACT PERSON:

Lorraine Holley, 30-30 Thomson Avenue - First Floor, Long Island City, Queens, 11101
Telephone (718) 391-1041 Email: CSB_projectinquiries@ddc.nyc.gov

For questions about site accessibility, please contact our disability services facilitator at (718) 391-2815 or via email at accessibility@ddc.nyc.gov.

BID BOOKLET
PART B

SAFETY QUESTIONNAIRE

The Bidder must include, with its bid, all information requested on this Safety Questionnaire. Failure to provide a completed and signed Safety Questionnaire at the time of bid opening may result in disqualification of the bid as non-responsive. This Safety Questionnaire will be reviewed as per Section V of the Safety Requirements for Construction Contracts, found in Volume 2 of the Contract.

1. Bidder Information:

Company Name: PRISMATIC DEVELOPMENT CORPORATION

DDC Project Number: S136-367

Company Size: ☐ Ten (10) employees or less

☒ Greater than ten (10) employees

Company has previously worked for DDC: ☒ YES ☐ NO

2. Type(s) of Construction Work:

Identify the types of work that the Bidder has performed in the last three years, and the types of work that are part of this Contract.

TYPE OF WORK	LAST 3 YEARS	THIS PROJECT
General Building Construction	☒	☒
Residential Building Construction	☐	☐
Nonresidential Building Construction	☐	☐
Heavy Construction, except building	☐	☐
Highway and Street Construction	☐	☐
Heavy Construction, except highways	☐	☐
Plumbing, Heating, HVAC	☐	☐
Painting and Paper Hanging	☐	☐
Electrical Work	☐	☐
Masonry, Stonework and Plastering	☐	☐
Carpentry and Floor Work	☐	☐
Roofing, Siding, and Sheet Metal	☐	☐
Concrete Work	☐	☐
Specialty Trade Contracting	☐	☐
Asbestos Abatement		
Other (specify) _____	☐	☐

3. Experience Modification Rate:

The Experience Modification Rate (EMR) is a rating generated by the National Council of Compensation Insurance (NCCI). This rating is used to determine the contractor's premium for worker's compensation insurance. The Bidder / Contractor may obtain its EMR by contacting its insurance broker or the NCCI. If the Bidder cannot obtain its EMR, it must submit a written explanation as to why.

The Bidder must indicate its Intrastate and Interstate EMR for the past three years. [Note: For contractors with less than three years of experience, the EMR will be considered to be 1.00].

YEAR	INTRASTATE RATE	INTERSTATE RATE
2019	N/A	0.86
2018	N/A	0.89
2017	N/A	1.12

If the Intrastate and/or Interstate EMR for any of the past three years is greater than 1.00, the Bidder / Contractor must attach, to this questionnaire, a written explanation for the rating and identify what corrective action was taken to correct the situation resulting in that rating.

4. OSHA Information:

☐ **YES** ☒ **NO** **Contractor has received a willful violation issued by OSHA or a New York City Department of Buildings (NYCDOB) construction-related violation within the last three years.**

☐ **YES** ☒ **NO** **Contractor has had an incident requiring OSHA notification within 8 hours (all work-related fatalities) or an incident requiring OSHA notification within 24 hours (work-related in-patient hospitalization, amputation and all loss of an eye).**

The OSHA Form 300 "Log of Work-Related Injuries and Illnesses" and OSHA Form 300A "Summary of Work-Related Injuries and Illnesses" must be submitted for the last three years for Contractors with more than ten employees.

The Bidder / Contractor must indicate the total number of hours worked by its employees, as reflected in payroll records for the past three (3) years.

The Bidder / Contractor must submit the Incident Rate for Lost Time Injuries (the Incident Rate) for the past three (3) years. The Incident Rate is calculated in accordance with the formula set forth below. For each given year, the total number of incidents is the total number of non-fatal injuries and illnesses reported on the OSHA Form 300 and OSHA Form 300A. The 200,000 hours represents the equivalent of 100 employees working forty hours a week, fifty (50) weeks per year.

$$\text{Incident Rate} = \frac{\text{Total Number of Incidents X 200,000}}{\text{Total Number of Hours Worked by Employees}}$$

YEAR	TOTAL NUMBERS OF HOURS WORKED BY EMPLOYEES	INCIDENT RATE
2018	138,992	4.31
2017	176,202	4.54
2016	125,495	4.78

If the Bidder's / Contractor's Incident Rate for any of the past three years is one point higher than the Incident Rate for the type of construction it performs (listed below), the Bidder / Contractor must attach, to this questionnaire, a written explanation for the relatively high rate.

General Building Construction	8.5
Residential Building Construction	7.0
Nonresidential Building Construction	10.2
Heavy Construction, except building	8.7
Highway and Street Construction	9.7
Heavy Construction, except highways	8.3
Plumbing, Heating, HVAC	11.3
Painting and Paper Hanging	6.9
Electrical Work	9.5
Masonry, Stonework and Plastering	10.5
Carpentry and Floor Work	12.2
Roofing, Siding, and Sheet Metal	10.3
Concrete Work	8.6
Specialty Trade Contracting	8.6

5. Safety Performance on Previous DDC Project(s)

☐ YES ☒ NO Fatality or an incident requiring OSHA notification within 24 hours (work-related in-patient hospitalization, amputation and all loss of an eye) on DDC Project(s) within the last three (3) years.

DDC Project Number(s): _____, _____, _____

The Bidder hereby affirms that all the information provided in this Safety Questionnaire and all additional pages and/or attachments, if applicable, consist of accurate representations.

Date: 2/21/20 By: Michael Diekhaus

(Signature of Bidder: Owner, Partner, Corporate Officer)

Michael Diekhaus

Title: Chief Financial Officer

Pre-Award Process

The bidder is advised that as part of the pre-award review of its bid, it may be required to submit the information described in Sections (A) through (D) below. If required, the bidder must submit such information within five (5) business days following receipt of notification from DDC that it is among the low bidders. Such notification from DDC will be by facsimile or in writing and will specify the types of information which must be submitted.

In the event the bidder fails to submit the required information within the specified time frame, its bid may be rejected as nonresponsive.

****

(A) **Project Reference Form**: If required, the bidder must complete and submit the Project Reference Form set forth on pages 28 through 30 of this Bid Booklet. The Project Reference Form consists of 3 parts: (1) Contracts Completed by the Bidder, (2) Contracts Currently Under Construction by the Bidder, and (3) Pending Contracts Not Yet Started by the Bidder.

(B) **Copy of License**: If required, the bidder must submit a copy of the license under which the bidder will be performing the work. Such license must clearly show the following: (1) Name of the Licensee, (2) License Number, and (3) Expiration date of the License. A copy of the license will be required from bidders for the following contracts: Plumbing Work, Electrical Work and Asbestos Abatement.

(C) **Financial Information**: If required, the bidder must submit the financial information described below:

(1) Audited Financial Statements: Financial statements (Balance Sheet and Income Statement) of the entity submitting the bid, as audited by an independent auditor licensed to practice as a certified public accountant (CPA). Audited financial statements for the three most recent fiscal years must be submitted. Each such financial statement must include the auditor's standard report.

If the bidder does not have audited financial statements, it must submit an affidavit attesting to the fact that the bidder does not have such statements. In addition, the bidder must submit the following documentation covering the three most recent fiscal years: signed federal tax returns, unaudited financial statements, and a "certified review letter" from a certified public accountant (CPA) verifying the unaudited financial statements.

Unless the most recent audited or unaudited financial statement was issued within ninety (90) days, the bidder must submit interim financial information that includes data on financial position and results of operation (income data) for the current fiscal year. Such information may be summarized on a monthly or quarterly basis or at other intervals.

(2) Schedule of Aged Accounts Receivable, including portion due within ninety (90) days.

(D) **Project Specific Information**: If required, the bidder must submit the project specific information described below:

(1) Statement indicating the number of years of experience the bidder has had and in what type of construction.
(2) Resumes of all key personnel to be involved in the project, including the proposed project superintendent.
(3) List of significant pieces of equipment expected to be used for the contract, and whether such equipment is owned or leased.

(4) Description of work expected to be subcontracted, and to what firms, if known.
(5) List of key material suppliers.
(6) Preliminary bar chart time schedule
(7) Contractor's expected means of financing the project. This should be based on the assumption that the contractor is required to finance 2X average monthly billings throughout the contract period.
(8) Any other issues the contractor sees as impacting his ability to complete the project according to the contract.

In addition to the information described in Sections (A) through (D) above, the bidder shall submit such additional information as the Commissioner may require, including without limitation, an explanation or justification for specific unit price items.

The bidder is further advised that it may be required to attend a pre-award meeting with DDC representatives. If such a meeting is convened, the bidder will be advised as to any additional material to be provided.

A. PROJECT REFERENCES – CONTRACTS COMPLETED BY THE BIDDER

List all contracts substantially completed within the last 4 years, up to a maximum of 10, in descending order of date of substantial completion.

Project & Location	Contract Type	Contract Amount ($000)	Date Completed	Owner Reference & Tel. No.	Architect/Engineer Reference & Tel. No. if different from owner
Major Building Renovations for the Manhattan Psychiatric Center Wards Island, New York City, NY	LS	$167,000,000.	March 2020	Frank Peris, DASNY 518-473-8285	John McCullough TDX, 212-655-8483
New York State Insurance Fund Comprehensive Building Renovations and Sprinkler Installation 199 Church Street, New York, NY	LS	$93,000,000.	February 2020	John Murdaugh, NYSIF 347-723-1800	CSA, Richard Thomas 212-677-0777
Southwest Brooklyn Marine Transfer Station Brooklyn, New York	LS	$140,000,000.	May 2018	Glenn Brue, NYCDDC 718-391-2648	Same
South Beach Psychiatric Center New Adult Patient Residential Building BP-3, Structural Steel and Stairs Staten Island, New York	LS	$13,424,000.	August 2017	Dominick Tucciarone, TDX 917-830-1930	Same
South Beach Psychiatric Center New Adult Patient Residential Building BP-2, Piles and Foundations Staten Island, New York	LS	$12,965,000.	February 2017	Dominick Tucciarone, TDX 917-830-1930	Same

B. PROJECT REFERENCES – CONTRACTS CURRENTLY UNDER CONSTRUCTION BY THE BIDDER

List all contracts currently under construction even if they are not similar to the contract being awarded.

Project & Location	Contract Type	Contract Amount ($000)	Subcontracted to Others ($000)	Uncompleted Portion ($000)	Date Scheduled to Complete	Owner Reference & Tel. No.	Architect/Engineer Reference & Tel. No. if different from owner
Design and Construction of the Clifton Rail Shop Staten Island, New York	LS	$165,200,000	$113,000,000.	$90,371,000.	June 2021	Demetrios Milanos, NYCT 646-252-4127	

C. PROJECT REFERENCES – PENDING CONTRACTS NOT YET STARTED BY THE BIDDER

List all contracts awarded to or won by the bidder but not yet started.

Project & Location	Contract Type	Contract Amount ($000)	Date Scheduled to Start	Owner Reference & Tel. No.	Architect/Engineer Reference & Tel. No. if different from owner
NONE					

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PASSPort COMPLIANCE

All vendors that intend to do business with the City of New York must complete a disclosure process in order to be considered for a contract. This disclosure process was formerly completed using Vendor Information Exchange System (VENDEX) paper-based forms. The City of New York has moved collection of vendor disclosure information online. In early August 2017, the New York City Mayor's Office of Contract Services (MOCS) launched the **Procurement and Sourcing Solutions Portal (PASSPort)**, a new online procurement system that replaced the paper-VENDEX process. In anticipation of awards, all bidders must create online accounts in the new PASSPort system, and file all disclosure information using PASSPort. **Paper submissions, including certifications of no changes to existing VENDEX packages, will not be accepted in lieu of complete online filings using PASSPort.**

All vendors that intend to do business with the City, but specifically those that fall into any of the following categories, are required to enroll:

- Have a pending award with a City Agency; or
- Hold a current contract with a City Agency and have either an expiring VENDEX or expiring Certificate of No Change.

The Department of Design and Construction (DDC) and MOCS hereby notifies all proposers that the PASSPort system is available, and that disclosure filing completion is required prior to any award through this competitive bid.

To enroll in PASSPort and to access the PASSPort website (including online training), please visit www.nyc.gov/passport. Contact MOCS at passport@mocs.nyc.gov for additional information and technical support.

CONSTRUCTION EMPLOYMENT REPORT

All bidders will be required to submit a Construction Employment Report (CER) if the bid amount is $1,000,000 or greater.

The CER template form is available online at:
https://www1.nyc.gov/assets/sbs/downloads/pdf/businesses/DLS_Constru_Employ_Rpt.pdf

Instructions for completing the Construction Employment Report are available online at:
https://www1.nyc.gov/assets/sbs/downloads/pdf/businesses/DLS_Cons_Employ_Rpt_Inst.pdf

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IRAN DIVESTMENT ACT COMPLIANCE RIDER

FOR NEW YORK CITY CONTRACTORS

The Iran Divestment Act of 2012, effective as of April 12, 2012, is codified at State Finance Law ("SFL") §165-a and General Municipal Law ("GML") §103-g. The Iran Divestment Act, with certain exceptions, prohibits municipalities, including the City, from entering into contracts with persons engaged in investment activities in the energy sector of Iran. Pursuant to the terms set forth in SFL §165-a and GML §103-g, a person engages in investment activities in the energy sector of Iran if:

(a) The person provides goods or services of twenty million dollars or more in the energy sector of Iran, including a person that provides oil or liquefied natural gas tankers, or products used to construct or maintain pipelines used to transport oil or liquefied natural gas, for the energy sector of Iran; or

(b) The person is a financial institution that extends twenty million dollars or more in credit to another person, for forty-five days or more, if that person will use the credit to provide goods or services in the energy sector in Iran and is identified on a list created pursuant to paragraph (b) of subdivision three of Section 165-a of the State Finance Law and maintained by the Commissioner of the Office of General Services.

A bid or proposal shall not be considered for award nor shall any award be made where the bidder or proposer fails to submit a signed and verified bidder's certification.

Each bidder or proposer must certify that it is not on the list of entities engaged in investment activities in Iran created pursuant to paragraph (b) of subdivision 3 of Section 165-a of the State Finance Law. In any case where the bidder or proposer cannot certify that they are not on such list, the bidder or proposer shall so state and shall furnish with the bid or proposal a signed statement which sets forth in detail the reasons why such statement cannot be made. The City of New York may award a bid to a bidder who cannot make the certification on a case by case basis if:

(1) The investment activities in Iran were made before the effective date of this section (i.e., April 12, 2012), the investment activities in Iran have not been expanded or renewed after the effective date of this section and the person has adopted, publicized and is implementing a formal plan to cease the investment activities in Iran and to refrain from engaging in any new investments in Iran: or

(2) The City makes a determination that the goods or services are necessary for the City to perform its functions and that, absent such an exemption, the City would be unable to obtain the goods or services for which the contract is offered. Such determination shall be made in writing and shall be a public document.

BIDDER'S CERTIFICATION OF COMPLIANCE WITH IRAN DIVESTMENT ACT

Pursuant to General Municipal Law Section 103-g, which generally prohibits the City from entering into contracts with persons engaged in investment activities in the energy sector of Iran, the bidder/proposer submits the following certification:

[*Please Check One*]

BIDDER'S CERTIFICATION

☒ By submission of this bid or proposal, each bidder/proposer and each person signing on behalf of any bidder/proposer certifies, and in the case of a joint bid each party thereto certifies as to its own organization, under penalty of perjury, that to the best of its knowledge and belief, that each bidder/proposer is not on the list created pursuant to paragraph (b) of subdivision 3 of Section 165-a of the State Finance Law.

☐ I am unable to certify that my name and the name of the bidder/proposer does not appear on the list created pursuant to paragraph (b) of subdivision 3 of Section 165-a of the State Finance Law. I have attached a signed statement setting forth in detail why I cannot so certify.

Michael Diekhaus
SIGNATURE

Michael Diekhaus
PRINTED NAME

Chief Financial Officer
TITLE

Sworn to before me this
21st day of Feb., 2020

Karen A. Meyer
Notary Public

KAREN A. MEYER
NOTARY PUBLIC OF NEW JERSEY
My Commission Expires April 5, 2024

Dated: 2/21/2020

THE CITY OF NEW YORK
DEPARTMENT OF DESIGN AND CONSTRUCTION
DIVISION OF PUBLIC BUILDINGS

January 16, 2020

ADDENDUM No. # 1

FOR FURNISHING ALL LABOR AND MATERIAL NECESSARY AND REQUIRED FOR:

S136-367
Staten Island 1 & 3 Garage – Phase 2

This addendum is issued for the purpose of amending the requirements of the Bid and Contract Documents and is hereby made a part of said Bid and Contract Documents to the same extent as though it were originally included therein.

The bidder is advised that the items listed below apply to the project:

1. **The Bid Opening for the contract described below scheduled for January 21, 2020, at 2:00 pm is rescheduled to January 28, 2020 at 2:00 pm.**

   Contract #1 – General Construction Work

2. **Bidders Questions and Responses to Questions:**
   See Attachment A.

3. **Revisions to the Bid Booklet:**
   See Attachment B.

4. **Revisions to Volume 2:**
   See Attachment C.

5. **Revisions to the Specifications:**
   See Attachment D.

6. **Revisions to the Drawings:**
   See Attachment E.

THIS ADDENDUM MUST BE SIGNED BY ALL BIDDERS AND ATTACHED TO THEIR BIDS.

If additional information is required, please contact the Department of Design and Construction, Contract Section at (718) 391-1041, by email at CSB_projectinquiries@ddc.nyc.gov or by fax at (718) 391-2627.

Glenn Brue FOR B.P.
Bogdan Pestka, FAIA
Assistant Commissioner
DEP / Sanitation / Transportation /
Tanks Programs

Prismatic Development Corporation
Name of Bidder

By: Michael Dickhaus, CFO

THE CITY OF NEW YORK
DEPARTMENT OF DESIGN AND CONSTRUCTION
DIVISION OF PUBLIC BUILDINGS

January 29, 2020

ADDENDUM No. # 2

FOR FURNISHING ALL LABOR AND MATERIAL NECESSARY AND REQUIRED FOR:

S136-367
Staten Island 1 & 3 Garage – Phase 2

This addendum is issued for the purpose of amending the requirements of the Bid and Contract Documents and is hereby made a part of said Bid and Contract Documents to the same extent as though it were originally included therein.

The bidder is advised that the items listed below apply to the project:

1. **The Bid Opening for the contract described below scheduled for February 4, 2020, at 2:00 pm is rescheduled to February 11, 2020 at 2:00 pm.**

   Contract #1 – General Construction Work

2. **Bidders Questions and Responses to Questions:**
   See Attachment A.

3. **Revisions to the Specifications:**
   See Attachment B.

4. **Revisions to the Drawings:**
   See Attachment C.

THIS ADDENDUM MUST BE SIGNED BY ALL BIDDERS AND ATTACHED TO THEIR BIDS.

If additional information is required, please contact the Department of Design and Construction, Contract Section at (718) 391-1041, by email at CSB_projectinquiries@ddc.nyc.gov or by fax at (718) 391-2627.

Bogdan Pestka, FAIA
Assistant Commissioner
DEP / Sanitation / Transportation /
Tanks Programs

Prismatic Development Corporation
Name of Bidder

By: Michael Dickhaus, CFO

THE CITY OF NEW YORK
DEPARTMENT OF DESIGN AND CONSTRUCTION
DIVISION OF PUBLIC BUILDINGS

February 6, 2020

ADDENDUM No. # 3

FOR FURNISHING ALL LABOR AND MATERIAL NECESSARY AND REQUIRED FOR:

S136-367
Staten Island 1 & 3 Garage – Phase 2

This addendum is issued for the purpose of amending the requirements of the Bid and Contract Documents and is hereby made a part of said Bid and Contract Documents to the same extent as though it were originally included therein.

The bidder is advised that the items listed below apply to the project:

1. **The Bid Opening for the contract described below scheduled for February 11, 2020, at 2:00 pm is rescheduled to February 18, 2020 at 2:00 pm.**

   Contract #1 – General Construction Work

2. **Bidders Questions and Responses to Questions:**
   See Attachment A.

3. **Revisions to the Specifications:**
   See Attachment B.

4. **Revisions to the Drawings:**
   See Attachment C.

5. **Revisions to Volume 2:**
   See Attachment D.

6. **Revisions to the Bid Booklet:**
   See Attachment E.

7. **Revisions to the Addendum to the General Conditions:**
   See Attachment F.

THIS ADDENDUM MUST BE SIGNED BY ALL BIDDERS AND ATTACHED TO THEIR BIDS.

If additional information is required, please contact the Department of Design and Construction, Contract Section at (718) 391-1041, by email at CSB_projectinquiries@ddc.nyc.gov or by fax at (718) 391-2627.

Bogdan Pestka, FAIA
Assistant Commissioner
DEP / Sanitation / Transportation /
Tanks Programs

Prismatic Development Corporation

Name of Bidder
By: Michael Dickhaus

THE CITY OF NEW YORK
DEPARTMENT OF DESIGN AND CONSTRUCTION
DIVISION OF PUBLIC BUILDINGS

February 12, 2020

ADDENDUM No. # 4

FOR FURNISHING ALL LABOR AND MATERIAL NECESSARY AND REQUIRED FOR:

S136-367
Staten Island 1 & 3 Garage – Phase 2

This addendum is issued for the purpose of amending the requirements of the Bid and Contract Documents and is hereby made a part of said Bid and Contract Documents to the same extent as though it were originally included therein.

The bidder is advised that the items listed below apply to the project:

1. **The Bid Opening for the contract described below scheduled for February 18, 2020, at 2:00 pm is rescheduled to February 21, 2020 at 2:00 pm.**

   Contract #1 – General Construction Work

2. **Bidders Questions and Responses to Questions:**
   See Attachment A.

3. **Revisions to the Specifications:**
   See Attachment B.

4. **Revisions to the Drawings:**
   See Attachment C.

5. **Revisions to the Addendum to the General Conditions:**
   See Attachment D.

THIS ADDENDUM MUST BE SIGNED BY ALL BIDDERS AND ATTACHED TO THEIR BIDS.

If additional information is required, please contact the Department of Design and Construction, Contract Section at (718) 391-1041, by email at CSB_projectinquiries@ddc.nyc.gov or by fax at (718) 391-2627.

Glenn Brue FOR B.P.
Bogdan Pestka, FAIA
Assistant Commissioner
DEP / Sanitation / Transportation /
Tanks Programs

Prismatic Development Corporation
Name of Bidder
By: Michael Dellabarca, CFO

THE CITY OF NEW YORK
DEPARTMENT OF DESIGN AND CONSTRUCTION
DIVISION OF PUBLIC BUILDINGS

February 14, 2020

ADDENDUM No. # 5

FOR FURNISHING ALL LABOR AND MATERIAL NECESSARY AND REQUIRED FOR:

S136-367
Staten Island 1 & 3 Garage – Phase 2

This addendum is issued for the purpose of amending the requirements of the Bid and Contract Documents and is hereby made a part of said Bid and Contract Documents to the same extent as though it were originally included therein.

The bidder is advised that the items listed below apply to the project:

1. **Bidders Questions and Responses to Questions:**
   See Attachment A.

2. **Revisions to the Bid Booklet:**
   See Attachment B.

THIS ADDENDUM MUST BE SIGNED BY ALL BIDDERS AND ATTACHED TO THEIR BIDS.

If additional information is required, please contact the Department of Design and Construction, Contract Section at (718) 391-1041, by email at CSB_projectinquiries@ddc.nyc.gov or by fax at (718) 391-2627.

Glenn Bruce FOR B.P.
Bogdan Pestka, FAIA
Assistant Commissioner
DEP / Sanitation / Transportation /
Tanks Programs

Prismatic Development Corporation
Name of Bidder
By: Michael Dickhaus, CFO

CITY OF NEW YORK
DEPARTMENT OF DESIGN AND CONSTRUCTION
DIVISION OF PUBLIC BUILDINGS

ADDENDA CONTROL SHEET

BID OPENING DATE: January 28, 2020

PROJECT No. : S136-367

TITLE: STATEN ISLAND 1 & 3 GARAGE – PHASE 2

ADDENDA ISSUED	NO. OF DWG	DATE	APPROVED BY: ARCHITECTURE/ ENGINEERING	APPROVED BY: GENERAL COUNSEL
#1 Revised Bid Opening Date; Questions from Bidders and Responses to Questions; Revisions to the Bid Booklet; Revisions to Volume 2; Revisions to the Specifications; Revisions to the Drawings		1/16/2020	[signature]	1/17/20 [signature]

THE CITY OF NEW YORK
DEPARTMENT OF DESIGN AND CONSTRUCTION
DIVISION OF PUBLIC BUILDINGS

January 16, 2020

ADDENDUM No. # 1

FOR FURNISHING ALL LABOR AND MATERIAL NECESSARY AND REQUIRED FOR:

S136-367
Staten Island 1 & 3 Garage – Phase 2

This addendum is issued for the purpose of amending the requirements of the Bid and Contract Documents and is hereby made a part of said Bid and Contract Documents to the same extent as though it were originally included therein.

The bidder is advised that the items listed below apply to the project:

1. **The Bid Opening for the contract described below scheduled for January 21, 2020, at 2:00 pm is rescheduled to January 28, 2020 at 2:00 pm.**

   Contract #1 – General Construction Work

2. **Bidders Questions and Responses to Questions:**
   See Attachment A.

3. **Revisions to the Bid Booklet:**
   See Attachment B.

4. **Revisions to Volume 2:**
   See Attachment C.

5. **Revisions to the Specifications:**
   See Attachment D.

6. **Revisions to the Drawings:**
   See Attachment E.

THIS ADDENDUM MUST BE SIGNED BY ALL BIDDERS AND ATTACHED TO THEIR BIDS.

If additional information is required, please contact the Department of Design and Construction, Contract Section at (718) 391-1041, by email at CSB_projectinquiries@ddc.nyc.gov or by fax at (718) 391-2627.

Glenn Brue FOR B.P.
Bogdan Pestka, FAIA
Assistant Commissioner
DEP / Sanitation / Transportation / Tanks Programs

_____
Name of Bidder

By: _____

Attachment A
Addendum #1
January 16, 2020

DDC PROJECT #: S136-367 – Phase 2

PROJECT NAME: Staten Island 1 & 3 Garage – Phase 2

ATTACHMENT A - BIDDERS QUESTIONS AND DDC RESPONSES

No.	Bidders Questions	DDC Responses
1.	Please provide a listing of union firms by construction trade that were used to determine the 26% MWBE Utilization goal for this contract and have done work greater than $1,000,000 for NYCDDC.	Refer to the Bid Booklet – Volume 1, M/WBE Program: M/WBE Utilization Plan on page 5, with the addition of Attachment of Department of Small Business Services (SBS) M/WBE List Request form; see Attachment B, Revisions to the Bid Booklet, for this information. MWBE list can also be searched at the SBS website: http://mtprawvwsbswtp1-1.nyc.gov/Search.aspx
2.	Please provide a copy of any outreach done by NYCDDC for this project to MWBE firms.	No individual outreach was done for any trades during this goal setting process.
3.	The Special Notice to Public Bidders and the preamble to the Bid Breakdown indicate that failure to submit the Bid Breakdown as given is grounds for disqualification of bid. Please confirm that the "Contractor's Bid Breakdown Form" given between page 21-1 through page 21-113 is the valid form to be completed. If so, please be advised that the form as given is infeasible to complete prior to the bid date. The level of detail is unprecedented. Please consider removing the bid breakdown requirement or providing a greatly simplified Contractor's Bid Breakdown Form.	The Bid Breakdown can be submitted by filling out the Subtotals in pages 21-1 through 21-113. The detailed Breakdown will be required from the lowest responsible Bidder three days after Bid Opening. Refer to Attachment B, Revisions to the Bid Booklet, for further information.
4.	Please provide an electronic version of the "Contractor's Bid Breakdown Form," preferably an Excel spreadsheet or similar format. The length of the form will make it difficult to complete by hand by our forces, those of our subcontractors, and those of our suppliers.	The Excel spreadsheet of the Bid Breakdown is included with this Addendum. Refer to Attachment B, Revisions to the Bid Booklet, for this information.
5.	Drawing A1-030.00 Detail 6; PCT to RF Saddle Detail shows 1/4" Rubber Tile, please advise if we use 1/4" or 1/8" per finish schedule?	Use 1/8" rubber flooring for detail 6 on sheet A1-030.00. Refer to Attachment E, Revisions to the Drawings.
6.	Drawing # A1-103.00; What is the Floor and Base in Room #s; 300, 301, 303, and Stair S4?	For rooms 300, 301, 303 and Stair S4, the following finishes shall apply: • Floor Finish: SC-01 • Base: RB-01 • Wall Finish: PT-01 • Ceiling Finish: PT-01 Refer to the Finish Schedule on sheet A1-030.00
7.	Do we install the New Rubber Tile Wall to Wall under the Lockers, Casework & Millwork of New Building?	Rubber flooring will not be installed under the lockers, casework and millwork of the New Building.

8.	Section 142400-5 para 2.3B.10; What is the floor finish for Elevator PE-3 in the new building?	Floor Finish in elevator PE-3 to be RF-01. Refer to the Finish Schedule on sheet A1-030.00 and section 2.3/A/10 in the Hydraulic Elevators Specification 142400.
9.	Drawing A1-903.00 2nd Floor; Finish Plan Refers to Detail 2 on A1-904. The Detail on A-904.00 is not as extensive as outlined on Drawing A1-903.00. The rooms 215-219 are not shown on the floor plan. Please clarify.	For rooms 215, 216, 217, 218, 219 and Stair 3 the following finishes shall apply: • Floor Finish: SC-01 • Base: RB-01 • Wall Finish: PT-01 • Ceiling Finish: PT-01 Refer to the Finish Schedule on sheet A1-030.00
10.	RF-02 Rubber Tile on Drawing A2-030.00 Existing Building is for which rooms? Or is it only for PE-4 the new elevator?	RF-02 noted on the Existing Building Finish Schedule (sheet A2-030.00) will only be included in the new elevator PE-4.
11.	Is Rubber Base required on Bay / Parking Walls Adjacent to Office / Locker Room Walls of New Building?	No, Rubber Base is not required on Bay / Parking Walls Adjacent to Office / Locker Room Walls of New Building.
12.	What are the number of days from NTP to substantial completion for the new building?	New Building substantial completion date is a duration of 731 CCDS from NTP.
13.	Section 096500-3 Resilient Tile Flooring para 2.3F Crack Isolation Membrane, is not a Resilient flooring product. Please confirm Crack Isolation Membrane not required for this Resilient flooring bid scope.	Installation of a Crack Isolation Membrane is not required for the products listed under spec section 096500. Refer to Attachment D, Revisions to the Specifications, for further information.
14.	Rubber Tile Section 096500-5 para 3.5A notes the application of floor polish; however, floor polish is not required by the Rubber Tile manufactures listed in para 2.1A.1. Please confirm floor polish is not required for this bid scope.	Floor polish not required for the Rubber Tile listed in spec section 096500. Refer to Attachment D, Revisions to the Specifications, for further information.
15.	Drawing A2-030.00: RB-02, 6" Rubber Cove Base is not listed in Section 096500 Resilient Tile Flooring para 2.2. Please clarify.	The 6" rubber base (RB-02) noted on drawing A2-030.00 is to be replaced with a 4" rubber base (RB-01). Refer to the Finish Schedule on sheet A1-030.00.
16.	Radial Low Profile RLT Flexco Repel grease resistant Rubber Tile is only available in 18" x 18", RF-02/03 call for 12" x 12" which is available for Hammered and Smooth styles, please advise.	RF-02/03 to remain Radial Low Profile RLT Flexco Repel grease resistant Rubber Tile – increase tile size to 18" x 18" in order to meet product requirements. Reference Attachment D, for revisions to the specification section 096500.
17.	Rubber Tile Section 096500-3 Moisture Proof Adhesive for Rubber Tile is for Topical Moisture or for Moisture from the Concrete Subfloor?	Rubber Tile Section 096500, Part 2, Article 2.3 ACESSORIES, subsection 'A. Adhesives' calls for waterproof adhesive as recommended by the tile manufacturer. This product provides moisture protection from the concrete subfloor.
18.	Contractors Bid Breakdown; Page 21-40, no RF-03 Rubber Tile is listed for the new building. Please advise.	Contractors Bid Breakdown is including both RF-01 and RF-03 rubber flooring material into the RF-01 takeoff.
19.	In the Contractor's Bid Breakdown; Page 21-40, RB-01 Rubber Base Existing Building is listed as 4". In drawing A2-030.00, there is no RB-01, but RB-02 is 6", please advise.	The 6" rubber base (RB-02) is to be replaced with a 4" rubber base (RB-01). Refer to Attachment E, 'Revisions to the Drawings' included within this Addendum.
20.	Drawing 4-101.00 Office 003, Detail 10 refers to New Flooring finish; what is the Flooring Finish? Is the Flooring by the Container Supplier?	The floor finish in the Household Goods Office 003 is to be RF-01 and is to be provided by the Contractor. Refer to the Finish Schedule on sheet A1-030.00.

21.	Is the Rubber Base not required under Lockers or Behind lockers, in the new building 1st and 2nd Floors? Please clarify.	Rubber base is not required at the New Building lockers. Reference Locker Base details 16 and 17 on sheet A1-604.00.
22.	We Request a two week bid extension from the 1-21 bid date due to the size and complexity of the project as well as having to deal with a lot of holiday vacations.	Bid Opening will be extended to 01/28/2020.
23.	Is the bid breakdown form required to be submitted with the bid?	Yes, Bid Breakdown is required to be submitted with the Bid. Refer to #3 response.
24.	Please provide spec 024119 Selective Demolition and Alternation Work. This is not included in Volume 3 of the specifications.	Specification 02 41 19 will be provided. See Attachment D, Revisions to the Specifications.
25.	Please provide a searchable version of the specifications and update the Table of Contents to reflect all work on the project. Division 1 – General Requirements for examples only lists (3) specification sections. A lot of scanned in pages in the spec book are illegible as they appear to be scanned. Please also provide an excel file for any tables that are to be included with the bid.	No, this will not be provided. Specification book copy can be purchased at the DDC Bid Room or Downloaded.
26.	Reference 014339-7 Façade Mockup Testing and Samples. Section 1.2B.1. states to "Provide mockups as shown on Drawing EN1-004 for review." There are (45) mockups listed and this has the potential to seriously delay the project. 1. Please review the actual mockups required and advise. 2. Can the mockups be permanent in place finished products if elected by the contractor?	1. The reference to EN1-004 is incorrect; See Attachment D, Revisions to the Specifications for updated verbiage. The new building facade mockup diagram is located on drawing A1-471, which is also referenced in section 1.2.E.4 of specification 014339. 2. Mockup should be a separate structure built and tested prior to construction of the building. Specification 014339 Section 1.2.B.5 states that mockups will be removed when testing is complete.
27.	Reference 014339-7 Façade Mockup Testing and Samples. Section 3.2 lists three tests that are to be performed for each system shown on the mockup drawing. This specification is unclear. The three tests listed are: Static pressure air infiltration, Static pressure water infiltration and Dynamic pressure water infiltration. 1. What are the specific elements of the mockup that require the above tests? 2. What governing code or body is used for each of the specific elements that require these tests? 3. Please provide examples of these tests and durations for each element that requires testing. 4. Please provide a list of firms that have performed this tests on NYCDDC / DSNY projects.	1. Refer to the new building facade mockup diagram is located on drawing A1-471. All systems represented on this sheet should be included in the testing. 2. and 3. Refer to the system specifications as described in Part 1 of each for the test standards to be applied (e.g. for the rainscreen system described in 070001 the static and dynamic water pressure infiltration tests are described in detail in 070001-1.4-G-3). 4. A list will not be provided.

28.	The bid breakdown is 224 pages. This is a burdensome document to be included in the bid. Note that we don't even get pricing from our MEP subcontractors until under 30 minutes before the bid is submitted. Since this is for bid analysis purposes only, and shall not be binding for any other purpose, can we submit this post bid?	Refer to RFI #3 response.
29.	Substitution Request: Spray Foam Insulation QUIK-SHIELD 118 is the first Ultra-Efficient closed-cell, spray foam on the market today. It is specially formulated to increase jobsite efficiency, decrease labor and overhead costs, reduce jobsite risk, and deliver the lowest cost installed. QUIK-SHIELD 118 has the lowest density of any commercially available, code-compliant, medium-density foam. This medium density spray foam will yield 10% more material than some competitors, which saves money on the project without sacrificing its superior performance. QUIK-SHIELD 118 can spray up to an 8" lift eliminating the need to spray a second lift – this speeds up the installation process by up to 50%. Key features of Quik-Shield 118 • Core Density: nominal, 1.8-2.0 lb/ft3. • R-value at 1": 6.6. • 9% total renewable/recycle content. • Meets GREENGUARD Gold standard for low VOC's. • 12 hr. commercial project re-entry (vs. 24 hr. for the specified product). • Limited Lifetime Warranty.	Substitutions are to be submitted and reviewed once the successful bidder has been awarded the project. Note that substitutions, or other changes to the work proposed by the Contractor or their Subcontractors, will not be allowed if such changes compromise the LEED BUILDING criteria.
30.	Provide location on the drawing for following Items: a. Vehicle Charging Equipment. (Specification section 111136) b. Suspended Maintenance and Fall Protection. (Specification section 112400) c. Single Girder Crane. (Specification section 146050)	a. Vehicle Charging Equipment are shown on sheet E4-101.00 b. Suspended Maintenance and Fall Protection anchors are shown on 3/A1-201 + 2/A1-404. c. Single Girder Crane is shown in the Repair Bay Interior Elevations on A1-706 and in the following sheets/details: 2/A1-921, S1-103C and E1-102.00

31.	Several Details on Drawings A1-401 to A1-432 show a precast wall system that comprises of two separate precast concrete wall panels with 6" of insulation and a 1" air space. The total wall panel section is 21" thick. Can a composite precast concrete wall system be provided in lieu of the wall section shown? The composite precast wall system will have a 3" thick exterior precast concrete face, 4" of rigid insulation and a 8" thick interior precast concrete face for a total of 15". This system will meet the R-24 insulation rating. If the 21" wall thickness is required, additional insulation could be added to the inner layer.	The exterior wall system is to be constructed and detailed as shown on the Contract Documents. Reference the details in the New Building 400 series (A1-401-432). The precast concrete rain screen provides the best overall performance for the wall assembly. With a traditional precast assembly, the joints become a common point of failure and will require constant long-term maintenance by the owner.
32.	Please give an allotment of time for the takeover from the start date.	Takeover will begin 30 days prior to the end of Phase I.
33.	Please elaborate on the construction fence, take over, size and type of the Phase 2 fence, etc.	The fence is to be a standard DOB construction fence - takeover is outlined on the Phase I drawings.
34.	The Phase 2 drawing show the piles for the salt storage shed; however, the CM acknowledged that the salt storage shed piles are in the Phase I contract. Please confirm.	Confirmed. Salt Shed Piles are included in the Phase 1 scope of work. See Phase 1 Structural drawings for reference.
35.	Please elaborate on the associated cost paid or waived to NYC DEP for sewer and or water main services.	NYC DEP related work is shown in Phase II contract documents. No cost is paid or waived to NYC DEP for sewer and water main services.
36.	The fire suppression system looks like it will be mounted on a pipe rack underneath the canopy. Can you confirm this?	Sprinkler nozzle is to be located at max. height 14 ft. above grade, as per code requirements.
37.	F101.00 shows 'Architectural Sections' of the North & South fueling islands. Each of these "lanes" has a side that shows a separate gasoline and diesel dispenser and then a single diesel dispenser on the other side. This layout contradicts A5-101.00 & A5-201.00 which show a pair of dispensers on each end of the canopy for each lane. The pair consists of one gasoline and one diesel dispenser. Can you confirm which layout is accurate? Consequently, A5-101.00 shows fire protection over each pair of dispensers creating four separate areas of fire protection. However, if the layout in F101.00 is correct, then fire suppression coverage may not be needed over the stand-alone diesel dispensers. Please clarify.	Layout F101.00 is accurate. Sheets A5-101 & A5-201 have been revised to match the layout shown on sheet F101. See provided sketch, A5SK-001, included with Attachment E, Revisions to the Drawings.

38.	On Drawing A2-010, there are masonry wall angle braces shown at the top of the masonry walls and reference to the structural drawings. There is no information on the structural drawings for these angles. Please provide.	Reference detail 4/S1-430 for the connection detail.
39.	On Drawing A2-020, Detail H2 shows a steel lintel over the top of the new door frame and refers to the structural drawings. There is no lintel information shown on the A2 structural drawings. Please provide.	Structural lintel detail is provided on 13/S-431. Structural lintels are concrete per typical detail.
40.	On Drawings S1-001 and FO-203, the piles for the Salt Shed appear to be installed in the Phase 2 contract, while the same drawings in the Phase 1 contract indicate that these same piles are part of the Phase 1 scope of work. Please confirm that the piles for the Shed will be driven, tested, filled with concrete and have the bearing plate installed in the Phase 1 contract.	Confirmed. Salt Shed Piles are included in the Phase 1 scope of work. Piles installed for the Shed will be driven, tested, filled with concrete and have the bearing plate.
41.	On Drawing L-111, the concrete pavement at the existing recycling center area is shown to be removed and disposed of. Are the removal of the concrete walls and fence on top of the wall to be removed under this contract?	Yes. Demo and complete removal of concrete wall (including foundation) and fence above included in this Phase 2 scope of work. Drawing L-111 indicates the demo of this fence as graphic - refer to legend on same sheet.
42.	On Drawing L-111, the existing trailer adjacent to the recycling center is shown to be removed and disposed of. Please confirm that this work will be done by the Phase 2 Contractor.	DSNY will remove all of their equipment (plows, highway barriers, etc.) from the site including the trailer at the existing recycling center. The Phase 2 Contractor will be responsible for disconnecting the trailer utilities.
43.	Page 504 of the Drawings (SEC1-400.00) is labeled as Security Camera Details, however the details on that page are that of security wall fields and electric lock/strike doors, not cameras. On the security site plan, it is notated "all camera devices installed under separate contract." Please confirm that Security cameras are part of the Phase 2 contract, and, if so, please provide the related details.	The drawing title should read "SECURITY DOOR DETAILS" – refer to Attachment E 'Revisions to Drawings' within this Addendum. Cameras will be furnished and installed by the owner. The Day 1 installer is only required to run cable to the camera locations to the patch panel on the I.T. rack.
44.	Are there "Buy America" requirements for Structural Steel?	No.

45.	Reference Allowance for Incidental Asbestos Abatement. There is a $30,000 allowance listed in specification 028013 to cover undefined costs for asbestos abatement work. The specification further defines that $25/SF is the reimbursement rate to be billed against the allowance. This $25/SF is to cover all permits, fees, containments, safety, replacement with new materials, etc. There are problems with this formula, and here are two quick examples: Example 1) If asbestos has to be removed at a steel or pipe connection, this might require a 4 SF remediation. The total reimbursement would be $100. The labor costs alone involved with union rates around $100/hour would be $800 having to pay for an entire day. Then there are the additional costs including: all permits, fees, containments, safety, replacement of new materials, etc. The real cost would probably be over $2,500. Example 2) If asbestos containing flooring materials are to be removed at a 10'x10' floor area, this would provide for a reimbursement of $2,500. The cost to setup the containment alone would probably be $3000. Then there are the additional costs including: all permits, fees, doing the asbestos abatement work, safety, etc. a- We are figuring a reasonable amount of large areas of abatement based on the examples above showing minor work is not feasible at the unit price listed. Can the unit cost be deleted and work billed against the allowance per the "Extra Work" specification? b. Can the specification be revised to read that all fees will be paid by the owner? This is an unreasonable burden on the contractor that is incalculable. c. Is the $30,000 allowance to be included in our base bid number? In summary, $25/SF is an unreasonable amount for reimbursement.	Refer to Section 028013, Article 1.09 Method of Payment, page 10, Note 2. The minimum payment per call at any individual job site or various job sites during the same day will be $800. a- If minor work equal less than the minimum payment, Section 1.09, Note 2 will govern. b- No, this Specification will not be revised. c- No, the $30,000 allowance is already included on the Bid Form, page 13 of the Bid Booklet – Volume 1.

Attachment B
Addendum #1
January 16, 2020

DDC PROJECT #: ***S136-367 – Phase 2***

PROJECT NAME: Staten Island 1 & 3 Garage – Phase 2

ATTACHMENT B – REVISIONS TO THE BID BOOKLET

MWBE List Request Form is included with this Addendum.

Delete pages 21-21, 21-91, 21-92, and 21-93, and replace with revised pages 21-21R, 21-91R, 21-92R and 21-93R, included with this Addendum.

The electronic Excel version of the Bid Breakdown is included with this Addendum.

Attachment C
Addendum #1
January 16, 2020

DDC PROJECT #: ***S136-367 – Phase 2***

PROJECT NAME: Staten Island 1 & 3 Garage – Phase 2

ATTACHMENT C – REVISIONS TO VOLUME 2

Revised Project Labor Agreement (PLA) Notice:
The PLA has been extended thru January 31, 2020. Refer to Notice to Bidders, included with this Addendum.

Revised Safety Requirements for Construction Contracts:
Delete existing Safety Requirements, dated February 1, 2019, and replace with revised Safety Requirements and corresponding Notice to Bidders, dated January 2, 2020, included with this Addendum.

DDC PROJECT #: S136-367 – Phase 2

PROJECT NAME: Staten Island 1 & 3 Garage – Phase 2

ATTACHMENT D – REVISIONS TO THE SPECIFICATIONS

The following sections are included with this Addendum:

Specification Section 02 41 19: This section is included with the Addendum

Remedial Action Plan Report for Reference dated December 19, 2019

The following Sections have been modified:

Specification Section 01 43 39 Facade Mockup Testing and Samples (Revised as per below)

Replace: Part 1, Article 1.2 SUMMARY, B.1

B. Mockups
   1. Provide mockups as shown on Drawing A1-471 for review.

Specification Section 09 65 00 Resilient Tile Flooring (Revised as per below)

Replace: Part 2, Article 2.1 RUBBER TILE (RF-01, RF-02, RF-03), A

A. 18" x 18" x 1/8" thick rubber tile

Delete: Part 2, Article 2.3 ACCESSORIES, F. & G.

Replace: Part 3, Article 3.5 FINISHING, A.

A. Finishing: After completion of the project and just prior to the final inspection of the work, thoroughly clean tile floors and accessories. Remove soil, adhesive, and blemishes from floor tile surfaces.

Specification Section 10 51 13 Metal Lockers (Revised as per below)
Delete Part 2, Article 2.1 in its entirety and replace with the following text:

Part 2, Article 2.1 METAL LOCKERS

A. Basis of Design: Subject to compliance with requirements, provide Heavy Duty Corridor Lockers as manufactured by Republic Storage Systems, LLC or comparable product by one of the following:
   1. ASI Storage Solutions
   2. Corcraft
   3. Penco Products
   4. Or approved equal

B. Provide single tier steel lockers with closed bases and continuous sloped tops. Basic locker shall meet the following size requirements:
   1. Lockers on West Side of Building: 15" wide by 18" deep by 72" high.
   2. Lockers on East Side of Building: 18" wide by 18" deep by 72" high.

Specification Section 14 60 50 Single Girder Crane (Revised as per below)

Replace: Part 1, Article 1.2 SUMMARY, A.

A. Work Included: The Work of this Section shall include but not be limited to the following:
   1. Motorized overhead under running single girder crane and runway beams.

Specification Section 32 93 00 Trees, Shrubs, Groundcovers (Revised as per below)

Replace: Part 1, Article 1.5 DEFINITIONS, C. & F.

C. Topsoil: Soil that is present at the top layer of the existing soil profile at the Project site. This soil, amended per Part 2, Article 2.2B shall be used to complete backfill in areas of deep excavation up to the one (1) foot soil depth needed for imported planting soils.

F. Imported Planting Soil: Unless otherwise indicated throughout this Section, the term "Imported Planting Soil" shall apply to New York City Department of Environmental Protection (NYCDEP) approved off-site blended soils modified with planting soil components and soil amendments to meet the specific planting soil mix recommendations submitted by the testing laboratory.

Replace: Part 1, Article 1.6 SUBMITTALS, A.

A. Samples: The following samples shall be submitted:

Material	Sample Size or Quantity
Mulch (organic)	1 ft.3
Mulch (gravel)	0.25 ft.3
Compost	1 ft.3
Topsoil	1 ft.3
Imported planting soil	1 ft. 3, One (1) sample per 250 cubic yards
Tree stake	24 in. length
Tree wrap	24 in. length

Replace: Part 2, Article 2.2 PLANTING SOIL, A. & B.

A. Existing Topsoil
   1. Existing topsoil from on-site source(s) may be used for backfill applications beneath the required one (1) foot depth of imported planting soils in all landscaped areas if, to the extent available, it meets the requirements of this Section for planting soil, or if approved by the Commissioner.

B. Imported Planting Soil
   1. A minimum of one (1) foot depth of New York City Department of Environmental Protection (NYCDEP) approved clean fill/top soil shall be imported from an approved facility/source and graded across all landscaped areas.

   2. NYCDEP approved fill/top soils shall be segregated at the source/facility, have qualified environmental personnel collect representative samples at a frequency of one (1) sample for every 250 cubic yards, analyze the samples for Target Compound List VOC's by EPA Method 8260, SVOCs by EPA Method 8270, pesticides by EPA Method 8081, PCBs by EPA Method 8082, and TAL metals by a NYSDEC 6 NYCRR Part 375 Environmental Remediation Programs. Upon completion of the investigation activities, a detailed clean soil report shall be submitted to NYCDEP for review and approval prior to importation and placement on-site. The report shall include, at a minimum, an executive summary, narrative of the field activities, laboratory data, and comparison of soil analytical results (i.e., NYSDEC 6 NYCRR Part 375 Environmental Remediation Programs).

3. Imported planting soils shall be composed of a natural, fertile, friable soil typical of cultivated topsoils of the locality, suitable for the germination of seeds and support of vegetative growth, with additives, if required, to achieve particle distribution and organic content specifications. Topsoil shall be taken from a well-drained, arable site, free of subsoil, large stones, earth clods, sticks, stumps, clay lumps, roots, other objectionable, extraneous matter or debris nor contain toxic substances. Imported planting soil shall have a pH value between 6.0 and 6.8 and organic matter content of 5 to 10% of total dry weight.

4. Imported planting soil shall have the following mechanical analysis (see paragraph 1.8 for particle sizes):

Replace: Part 2, Article 2.3 COMPOST, A.

A. Compost shall be derived from organic wastes such as food and agricultural residues, animal manures, mixed solid waste and bio solids (treated sewage sludge) that meet all New York State Department of Environmental Conservation (NYSDEC) and New York City Department of Environmental Protection (NYCDEP) requirements. The product shall be well composted, free of viable weed seeds and contain material of a generally humus nature capable of sustaining growth of vegetation, with no materials toxic to plant growth. Compost shall meet all NYCDEP standards for imported planting soil listed in Section 2.2B.

Replace Part 3, Article 3.4 DECOMPACTION OF PLANTING AREAS, A.

A. After subgrade levels have been reached and immediately prior to placing imported planting soils, the entire subgrade area shall be loosened to a minimum depth of 6 inches. Care shall be exercised to minimize damage to existing tree roots that may be in the area. Contractor shall obtain Commissioner approval for the equipment method used to loosen subgrade prior to starting work.

DDC PROJECT #: S136-367 – Phase 2

PROJECT NAME: Staten Island 1 & 3 Garage – Phase 2

ATTACHMENT E – REVISIONS TO THE DRAWINGS

LANDSCAPE

REFER TO SHEET L-202 Layout Plan
1. Revised: Emergency generator fence at existing building
2. Reference Sketch LSK-001, included with this Addendum

REFER TO SHEET L-302 Materials Plan
1. Revised: Emergency generator fence at existing building
2. Reference Sketch LSK-002, included with this Addendum

REFER TO SHEET L-700 Site Details
1. Revised: Detail 03: Emergency generator fence at existing building plan
2. Reference Sketch LSK-003, included with this Addendum

REFER TO SHEET L-700 Site Details
1. Revised: Detail 03: Emergency generator fence at existing building elevation
2. Reference Sketch LSK-04, included with this Addendum

ARCHITECTURAL

REFER TO SHEET EN1-005
1. Detail 24. Conventional Roof System. Added Note to roof insulation Dimension string: *AVG. 7" DEPTH. MIN. 3.5" @ CFRD. 10.5" @ OFRD. MAX. 11" @ RIDGES*
2. Reference Sketch: EN1SK-001, included with this Addendum

REFER TO SHEET EN1-006
1. Added Door and Window Exterior Performance value schedule
2. Reference Sketch: EN1SK-002, included with this Addendum

REFER TO SHEET A1-030
1. Revised: Detail 3 – Scheduled rubber flooring to be 1/8" thick

REFER TO SHEET A1-102C
1. New Building Second Floor Partial C – Added – Dimension string locating window opening and size at south end of BBM Corridor 220
2. Reference Sketch: A1SK-001, included with this Addendum

REFER TO SHEET A1-103
1. New Building Overall Roof Plan. Revised Elevated walkway length to align with dunnage. Walkway pads modified to accommodate revised length. Typical at all location along south dunnage PV array
2. Reference Sketch: A1SK-002, included with this Addendum

REFER TO SHEET A1-103
1. Added – Detail Tag 2/A1-461 "Typical Roof Drain Detail" at Roof Drain.
2. Reference Sketch: A1SK-002, included with this Addendum

REFER TO SHEET A1-203
1. West Elevation – Enlarged. Detail #1. Maintenance Tie-off and keynote added
2. Reference Sketch: A1SK-003, included with this Addendum

REFER TO SHEET A1-301

1. Drawing 2. Building Section – Transverse @ Personnel Stair/Elev 2. Deleted additional Joint line at Fiber Cement Panel
2. Reference Sketch: A1SK-004, included with this Addendum

REFER TO SHEET A1-401

1. Wall Section 3. Typical Recessed Pocket Entry. Deleted: *Level Tag. Bottom of Steel Dunnage. 35'-3 ¼"*
2. Reference Sketch: A1SK-005, included with this Addendum

REFER TO SHEET A1-432

1. Drawing 3. Building Expansion Joint – Second Floor. Note added: *CONTINUOUS VERTICAL 1 1/2" C-CHANNELS AT EXPANSION JOINT SYSTEM ALUM. FLANGES*
2. Reference Sketch: A1SK-006, included with this Addendum

REFER TO SHEET A1-461

1. Drawing 2. Typ. Roof Drain Detail. Added: Dimension strings noting: 1) *CFRD INLET @ 4 1/2" ABV. T.O. ROOF SLAB, TYP.* and 2) *MIN. 3 ½" RIGID POLYISO INSUL. @ CFRD, TYP.*
2. Reference Sketch: A1SK-007, included with this Addendum

REFER TO SHEET A1-461

1. Drawing 9. Building Expansion Joint at Exterior Soffit. Detail was revised to match plan detail #3 on sheet A1-432
2. Reference Sketch: A1SK-008, included with this Addendum

REFER TO SHEET A1-461

1. Drawing 5. Elevated walkway @ Roof Dunnage. Detail revised.
2. Reference Sketch: A1SK-009, included with this Addendum

REFER TO SHEET A1-601 & A602

1. Sheet Legend. Added ADA turning radius and clearance symbol and description
2. Reference Sketch: A1SK-010, included with this Addendum

REFER TO SHEET A1-703

1. Drawing 1. Interior Elevation: Garage Personnel – West Elevation – Deleted – Additional Joint line at Fiber Cement Panel.
2. Reference Sketch: A1SK-011, included with this Addendum

REFER TO SHEET A1-704

1. Drawing 3. New Building Interior Elevations Garage. Garage East Elevation 3. Added. Dimension strings to window opening sill and masonry opening height. Align notes.
2. Reference Sketch: A1SK-012, included with this Addendum

REFER TO SHEET A1-706

1. Drawing 4. Repair Bay North Elevation. Added graphically for coordination purposes mechanical duct work and electrical equipment.
2. Reference Sketch: A1SK-013, included with this Addendum

REFER TO SHEET A1-921

1. Specialty Equipment Schedule. Added Type M-50 Overhead Hoist Crane.
2. Reference Sketch: A1SK-014, included with this Addendum

REFER TO SHEET A1-921

1. Drawing 2. Repair Bay Transverse Section. Added Dimensions indicating required min. clearance and graphically indicated mechanical ductwork for coordination.
2. Reference Sketch: A1SK-015, included with this Addendum

REFER TO SHEET A2-030

1. Replace: RB-02, 6" Resilient Cove Base with RB-02, 4" Resilient Cove Base

REFER TO SHEET A5-101

1. Drawing 8. Fueling Canopy – Ground Floor Plan. Deleted Fueling Dispenser at Northeast and Southeast fueling island locations. Gasoline Dispenser at both fueling locations is revised to a Diesel Dispenser
2. Reference Sketch: A5SK-001, included with this Addendum

REFER TO SHEET A5-201

1. Drawing 2, South Elevation – Fueling Station and Drawing 4, North Elevation Fueling Station. Revisions to the elevations on sheet A5-201 correspond with revisions to the Fueling Canopy Ground Floor Plan on sheet A5-101. Deleted Diesel Dispenser at Northeast and Southeast fueling island locations. Gasoline Dispenser at Northeast and Southeast fueling island locations is revised to a Diesel Dispenser

STRUCTURAL

REFER TO SHEET S1-102C, NEW BUILDING SECOND LEVEL FRAMING PARTIAL C

1. Steel framing of second level at bulkhead area.
2. Reference Sketch S1SK-001, included with this Addendum

REFER TO SHEET S1-103C, NEW BUILDING ROOF FRAMING PARTIAL C

1. Elevated slab detail. Floor deck in that specific area changed from R1 to S4. Two beams sizes are increased.
2. Reference Sketch S1SK-004, included with this Addendum

REFER TO SHEET S1-301, LEVEL 2 SECTION AND DETAILS

1. Steel dunnage framing of second level at backpack area.
2. Reference Sketch S1SK-002, included with this Addendum

REFER TO SHEET S1-301, LEVEL 2 SECTION AND DETAILS

1. Kicker detail of dunnage framing at backpack area.
2. Reference Sketch S1SK-003, included with this Addendum

REFER TO SHEET S1-410, TYPICAL STEEL DECK DETAIL

1. Elevated slab cross section detail.
2. Reference Sketch S1SK-005, included with this Addendum

REFER TO SHEET S3-105, SALT SHED FRAMING PLAN

1. Support reaction force of roof access platform
2. Reference Sketch S3SK-001, included with this Addendum.

REFER TO SHEET S5-104, FUEL CANOPY FRAMING PLAN

1. Modification of foundation plan.
2. Reference Sketch S5SK-001, included with this Addendum

REFER TO SHEET S5-104, FUEL CANOPY FRAMING PLAN

1. Updated GL FS.2 elevation view.
2. Reference Sketch S5SK-002, included with this Addendum

REFER TO SHEET S5-104, FUEL CANOPY FRAMING PLAN

1. Updated GL FS.C elevation view.
2. Reference Sketch S5SK-003, included with this Addendum

REFER TO SHEET S5-104, FUEL CANOPY FRAMING PLAN

1. New elevation view; sprinkler support system framing detail, base plate and pier reinforcement detail.
2. Reference Sketch S5SK-004, included with this Addendum

Attachment E
Addendum #1
January 16, 2020

SECURITY

REFER TO SHEET SEC1-400, SECURITY CAMERA DETAILS

1. Revised: Drawing title to read "SECURITY DOOR DETAILS"

CITY OF NEW YORK
DEPARTMENT OF DESIGN AND CONSTRUCTION
DIVISION OF PUBLIC BUILDINGS

ADDENDA CONTROL SHEET

BID OPENING DATE: February 11, 2020

PROJECT No. : S136-367

TITLE: STATEN ISLAND 1 & 3 GARAGE – PHASE 2

ADDENDA ISSUED	NO. OF DWG	DATE	APPROVED BY: ARCHITECTURE/ ENGINEERING	GENERAL COUNSEL
#1 Revised Bid Opening Date; Questions from Bidders and Responses to Questions; Revisions to the Bid Booklet; Revisions to Volume 2; Revisions to the Specifications; Revisions to the Drawings		1/16/2020		
#2 Revised Bid Opening Date; Questions from Bidders and Responses to Questions; Revisions to the Specifications; Revisions to the Drawings		1/29/2020		1/28/2020

THE CITY OF NEW YORK
DEPARTMENT OF DESIGN AND CONSTRUCTION
DIVISION OF PUBLIC BUILDINGS

January 29, 2020

ADDENDUM No. # 2

FOR FURNISHING ALL LABOR AND MATERIAL NECESSARY AND REQUIRED FOR:

S136-367
Staten Island 1 & 3 Garage – Phase 2

This addendum is issued for the purpose of amending the requirements of the Bid and Contract Documents and is hereby made a part of said Bid and Contract Documents to the same extent as though it were originally included therein.

The bidder is advised that the items listed below apply to the project:

1. **The Bid Opening for the contract described below scheduled for February 4, 2020, at 2:00 pm is rescheduled to February 11, 2020 at 2:00 pm.**

   Contract #1 – General Construction Work

2. **Bidders Questions and Responses to Questions:**
   See Attachment A.

3. **Revisions to the Specifications:**
   See Attachment B.

4. **Revisions to the Drawings:**
   See Attachment C.

THIS ADDENDUM MUST BE SIGNED BY ALL BIDDERS AND ATTACHED TO THEIR BIDS.

If additional information is required, please contact the Department of Design and Construction, Contract Section at (718) 391-1041, by email at CSB_projectinquiries@ddc.nyc.gov or by fax at (718) 391-2627.

Bogdan Pestka, FAIA
Assistant Commissioner
DEP / Sanitation / Transportation /
Tanks Programs

_____
Name of Bidder

By: _____

Attachment A
Addendum #2
January 29, 2020

DDC PROJECT #: S136-367 – Phase 2

PROJECT NAME: Staten Island 1 & 3 Garage – Phase 2

ATTACHMENT A - BIDDERS QUESTIONS AND DDC RESPONSES

No.	Bidders Questions	DDC Responses
1.	Reference 018000 Building Enclosure Contractor Performance Requirements. Section 1.7C states to provide field water testing by an independent third party agency. 1. What is the extent of field water testing? (ie, is it to test 16 SF for every 20,000 SF of building?) 2. What is the test and duration to be performed? Please provide the appropriate code that applies.	1. Field Water Testing per ASTM 501.2 is recommended. 2. Test 10% of the installed work per Contract Documents. Testing shall be a minimum of 300 sq ft; if any leaks result, test additional 5% of each leak area. Also, please refer to Attachment B "Revisions to the Specifications" for Specification Section 01 91 17.
2.	Please clarify the scope of security guard requirements & hours required, and if a Guard booth will be required under the Phase 2 Contract.	Yes, Security Guards/Fire Guards will be required under the Phase 2 Contract. Refer to General Conditions 01 50 00/Article 3.18. Contractor to provide Security Guards/Fire Guards per NYC DOB requirements. Contractor is responsible for site security and control of site access at all times. Security Guard Booth will be required.
3.	Please define the cost take over and timing for the construction trailer complex. How many and of what size are the trallers, electrical service, water service, sewer service, telephone service, etc.	Phase 2 Contractor to define stand-alone costs for the construction trailer complex.
4.	It was stated at the pre-bid meeting that during snow operations, DSNY might delay or cancel construction operations. How will the Contractor to be reimbursed for these impacts as they are currently incalculable?	The Contractor will not be reimbursed. The Phase 2 Contractor is to contemplate sequence of work to and schedule accordingly to avoid conflict of shared space with DSNY during snow seasons. Construction will not cease with the exception of areas shared with the DSNY.
5.	We hereby request a 4 week extension of the bid date due to the volume of bids due the week of Jan 20. The various large item subcontractors claim there is not enough time to prepare the bids.	Bid Opening is extended to 2/11/2020.

6.	Reference Schedule A and Subcontracts Not to Exceed 60% of the contract price. There is an issue with the maximum subcontracted percentage to be 60%. Here is an example of the problem: $100,000,000 Construction Estimate $60,000,000 Available to be Subcontracted Out at 60%. $26,000,000 Represents the 26% MWBE goal. You can only get MWBE participation on $60,000,000 of subcontracted work. This equates to a 43.33% MWBE participation goal ($26,000,000 / $60,000,000). 1. What is the NYC-DDC construction estimate for this project? 2. Please increase the maximum subcontracting percentage to 75% of the contract price and decrease the MWBE goal to 26% of the subcontracted amount (26% MWBE goal of 75% of work subcontracted.)	1. The DDC Construction Cost Estimate will not be provided. 2. The Maximum Sub-Contract amount of 60% included in Schedule A of the Addendum to General Conditions in Volume 3 will remain. MWBE goal of 26% Requirement will also remain per Contract requirements.
7.	Please provide the availability of certified subcontractor firms to perform the services required on this project, and specifically for these large trades as used to determine the 26% MWBE goal for this project: 033000 Cast-in-Place Concrete 034500 Architectural Pre-Cast Concrete 042000 Unit Masonry 051200 Structural Steel 064023 Architectural Woodwork 0724214 Metal Panels 075216 Modified Bituminous Membrane Roofing Combined Subcontracting Trade: 084001 Glazed Storefronts and Curtain Wall System 088000 Exterior Glazing 088010 Interior Glass and Glazing 111136 Vehicle Charging Equipment 112400 Suspended Maintenance and Fall Protection 142400 Hydraulic Elevators 146050 Single Girder Crane Div 21 Fire Protection Div 22 Plumbing Div 23 HVAC Div 26 Electrical Div 27 Communications Div 28 Electronic Safety and Security 310000 Earthwork 316219 Timber Piles 32121 Asphaltic Paving Div 33 Utilities Div 43 Process Gas and Liquid Handling, Purification, and Storage Equipment Div 48 Electrical Power Generation	This information can be found in the response to question #1 of Addendum#1, as well as the MWBE List Request Form included in Attachment B of Addendum #1.

8.	Reference is made to the Safety Requirements for Construction Contracts dated February 2019. The section lists the following possible safety representatives that may be required of the Contractor: Competent Person, Project Safety Representative, Licensed Site Safety Manager, and Registered Construction Superintendent. 1. Can the competent person also serve the role of Registered Construction Superintendent assuming they have the required licenses? (ie, one person serves dual roles required by the specifications to not have more employees than needed.) 2. Can the Project Safety Representative also serve the role of Licensed Site Safety Manger assuming they have the required licenses? (ie, one person serves dual roles required by the specifications to not have more employees than needed.)	1. Yes, if Registered Construction Superintendent will be present at the site full time during all work activities. 2. Yes, if Licensed Site Safety Manager will be present at the site full time during all work activities.
9.	Reference to DDC General Conditions section 019115 General Commissioning Requirements for Building Enclosure. 1. What specific systems require to be commissioned on this project? 2. What are the tests required for these specific systems? 3. Who is responsible to perform the tests on these systems?	1) & 2) Please refer to Attachment B "Revisions to the Specifications" Specification Section 01 91 17, for the components that require to be commissioned for the Building Enclosure. 3) Contractor must retain a third-party independent testing firm as the building enclosure testing agency.
10.	Dwg. M1-301 has a detail for heat trace, but none is shown. Is that an error?	Heat trace is required for plumbing traps; The heat trace detail has been relocated to plumbing drawing P1-302. Refer to Attachment C "Revisions to the Drawings" for this information.
11.	Dwgs. M1-101 & 104 show hoods for the pressure washers. Who provides these? If by the Contractor, please provide a detail.	Contractor to provide. The pressure washer hoods are indicated in the mechanical set and the detail is included drawing on M1-301.
12.	Dwg. M1-104 shows induced draft fans for the pressure washers. Who provides these? If by the Contractor, provide more information.	Contractor to provide. Roof exhaust fan selection is indicated on M1-003 and the note from drawing M1-104 was removed. The fans have been added to M1-107. Please refer to Attachment C "Revisions to the Drawings" for this information.
13.	In Specification section 232116 "Hydronic Piping Specialties," page 8, there is a specification for Glycol Make Up Systems, yet there are none shown on the Drawings for the 11 HXGL Systems. How will pressure be maintained?	Glycol solution has been specified in the notes for the Air Curtains schedule on M1-003. Heat exchanger details on M1- 302 have been modified to indicate testing and filling glycol ports. Please refer to Attachment C "Revisions to the Drawings" for clarification.
14.	The Pump Schedule shows 1-Pump for each H & V Unit HXGL System. Dwg. M1-401 shows 2- Pumps each. Please clarify.	Each HV unit is served by two pumps. Schedule M1-004 and mechanical plans M1-503-506 have been revised to indicate pump "A" and "B". Please refer to Attachment C "Revisions to the Drawings".

15.	HXGL-1 thru 10 appear to be two of each per notes #1 & 2 and Drawing M1-401. Please confirm.	See response above to #16, and refer to Attachment C "Revisions to the Drawings".
16.	Dwg. M1-504 shows HXGL-11 as Duplex for Air Curtains # 3 & 4. Dwg. M1-506 shows HXGL-11, again, as Duplex for Air Curtains # 1 & 2. Dwg. M1-401 shows each set of Air Curtains requiring 138 GPM. The Schedule shows HXGL-11 at 30 GPM and in the Boiler Room. It appears that this is the Ht. Exchanger for the Solar? Please correct.	HXGL-11 tag has been renamed to HXGL-10 for Air Curtains. HXGL-11 is used for solar heat exchangers. HXGL-10-A/B/C/D has been added to the Heat Exchanger Schedule on sheet M1-004 and the floorplans M1-504, M1-506. Please refer to Attachment C "Revisions to the Drawings" for this information.
17.	Please clarify if DDC's Design Guide and/or DSNY's Design Guide standard for Motors under ½ HP to be single phase, and ½ HP and up to be 3 Phase. The Motors are all over the lot. Is that correct?	Fan Schedule power requirements have been revised to meet DSNY's Design Guide Standard for KEF-R-1, GEF-R-2, KEF-5, 6, EF-CR-1 on sheet M1-003. Please refer to Attachment C "Revisions to the Drawings", for this information.
18.	There are no VFD's shown except on the Control Drawings for a few Pumps. Is that correct?	VFDs are required for RTU's, Pumps, as indicated in their respective schedules. Please refer to Attachment C "Revisions to the Drawings" for clarification.
19.	There is Gas Detection shown on the Drawings, but no specification, sequence, etc. Please provide.	Co2/NOx detectors sequence and interlocks are indicated on the control drawings on sheets M1-601 and M1-602.
20.	Specification section 237200, "Heating and Ventilating/ Rooftop Units with Energy Recovery Equipment" does not include a list of acceptable alternative manufactures. Please advise.	Spec section 237200 - Heating and Ventilating/ Rooftop Units with Energy Recovery Equipment was revised to include additional manufacturers. Please refer to Attachment B "Revisions to the Specifications" for this information.
21.	Specification section 233113 "Metal Ducts," page 9 calls for cleaning ductwork as it is installed. Contractor to deliver all ducts clean and sealed, so we assume that additional cleaning is unnecessary. Please confirm.	Ducts are required to meet requirements of spec section 233113 Metal Ducts. Contractor to follow all LEED requirements for duct installations, see Specifications DDC General Conditions Section 018119.
22.	Dwgs. # M1-106 and 107 have items marked "VCB" as noted by others. What are they and do we have to do anything with them?	Contractor to provide the items marked "VCB;" they are vacuum blowers connected to the Sub membrane Depressurization System - refer to Attachment C "Revisions to the Drawings" included within this Addendum. See civil drawings N-200, 201, 202 and 203 for system information.
23.	The fire protection schematics refer to the system as a "Fire Sprinkler" system and don't really show any proper detail that would indicate the type of dry chemical system the design is looking for. Can this be clarified?	Note and detail are included on SP5-101.00.
24.	Specification section 230549, 3.3D calls for duct isolation hangers. Ductwork will not be rigidly connected to any fans or units. Please confirm that if specified flexible connection is used at equipment for vibration isolation, isolation hangers are not required.	Seismic category B and all related details on M1-303 are not applicable. Sheet M1-303 and specification section 230549 have been removed from the contract documents. Refer to Attachment B "Revisions to the Specifications" and Attachment C "Revisions to the Drawings" included within this Addendum.
25.	Duct construction class is not specified. Please	Confirmed. Duct construction class is 2" WG.

	specify or confirm that all ductwork will be 2" WG construction per SMACNA.	
26.	Specification section 233113, 3.12 has a generic leak testing description. Please clearly note if any ductwork will need to be leak tested, including leakage class. Please note that the Energy Code or SMACNA manual do not recommend testing of ductwork unless it is in excess of 3" WG and a clear scope of work is provided.	Seal ductwork in accordance with the SMACNA seal class A. Leakage test is not required for ductwork class below 3" WG. Please refer to Attachment B "Revisions to the Specifications".
27.	Structural drawings designate Seismic Category "B" for this project. Please confirm that all mechanical systems are exempt from seismic restraints for this project.	Confirmed - all mechanical systems are exempt from seismic restraints for this project.
28.	M1-002 "Top & bottom register schedule" notes call for Titus 300RL-SS which are stainless steel. Please clarify if ALL sidewall air outlets on this project will be stainless steel? Even in non-truck washing areas?	Confirmed, all outlets to be stainless steel, even in non-truck washing areas. Please refer to specification section 233713 Diffusers, Registers and Grilles, for a list of acceptable manufacturers.
29.	M1-003 HV-7 remark note states for ductwork to be aluminum; however, drawing M1-104 calls for duct to be stainless steel. Please clarify. Also, provide duct WG construction.	Ductwork for HV-7 must be stainless steel. The note on M1-003 schedule has been revised. Ductwork indicated on M1-104 must be stainless steel. Refer to Attachment C "Revisions to the Drawings" for clarification. Refer to SMACNA standards for WG construction.
30.	Please clarify if all HV-7 ductwork needs to be (stainless steel or aluminum) or only in truck wash area. If so, please provide a clear point of material separation.	See response above to #29, and refer to Attachment C "Revisions to the Drawings".
31.	M1-103 Note 3 states to provide fire and fire smoke dampers at rated walls whether shown or not. Many different factors and code exemptions can determine whether dampers and types of dampers are requited at rated walls. Please note that, as Contractor, we do not have the authority to determine code required damper locations. Please confirm that we are to include only dampers that are clearly noted on drawings.	Ductwork penetrating fire rated walls require fire or fire and smoke dampers. Provide dampers as indicated on the Contract Documents.
32.	M1-104 HV-5 duct riser up calls for SD (assuming smoke damper). M1-003 HV schedule states that units are to be provided with integral smoke dampers and M1-201 calls for motorized dampers that are not shown on floor plans. Please clarify what type of dampers are required and where are they located.	Smoke dampers required on the supply/return for any units handling 15,000 CFM or more, will be duct mounted. Notes on M1-003 HV schedule indicating integrated smoke dampers have been revised. Refer to Attachment C "Revisions to the Drawings", for this information.
33.	The specifications call for galvanized ductwork to be G90. If ductwork is exposed to view, can it be G90 or does it need to be galvanneal?	Galvanized ductwork to be G90 as specified. All exposed ductwork shall be painted, as per architectural drawing notes.
34.	M1-300 shows detail for companion angle flanged joint connection. Please clarify if ALL ductwork needs to be fabricated using only this connection or can we use all SMACNA approved connections?	All ductwork shall be fabricated as per SMACNA latest edition. Contractor shall submit the Duct Standards submittal for review and approval before fabrication.

35.	M1-302 "Detail of duct roof penetration" calls for 16 gauge aluminum ductwork on the roof. Please confirm that all ductwork on the roof will be 16 gauge aluminum.	Detail has been revised to eliminate reference to aluminum ductwork. Please refer to Attachment C "Revisions to the Drawings", for clarification.
36.	M1-103 Note 6 calls for 1" acoustical liner 15' from units on supply and return ductwork only. Please confirm that liner is not required in outside air intake or exhaust ductwork.	Confirmed, liner is not required in the outside air intake or exhaust ductwork.
37.	Please clarify if liner is required in HV-7 truck wash ductwork.	Acoustic liner is required in HV-7 for 15 feet after supply fan. Liner is not required for return/exhaust air to ERV at HV-7 unit.
38.	Please confirm that all louvers will be furnished and installed by Division 8 subcontractor.	Confirmed, Contractor to supply - all louvers to be furnished and installed per Division 8.
39.	Are secondary drain pans required under AC, FCU and ERV units? If so, please provide material type and construction detail.	Secondary drain pans for AC's, FCU's and ERV's are not specified.
40.	Please provide specifications for double wall pressure washer hood exhaust per dwg M1-101.	Double wall pressure washer flue to be similar to double wall flue listed in the Specification section 235100 "HVAC Breeching, Chimneys and Stack."
41.	Refer to drawing E1-001, note #30 which mentions use of Armored BX cable. The Bid breakdown form does not show this. Please clarify.	The option for the use of armored cable has been removed from sheet E1-001. Please refer to Attachment C "Revisions to the Drawings" for clarification.
42.	Refer to drawing E1-001, note #30: are we allowed to install Armored BX cable for all feeders and branch circuits?	No, armored cable is not allowed.
43.	Please confirm the Gas Generator, associated ATS's (#1 thru #5), and feeders shown on drawing E2-300 are new to be furnished.	Confirmed, all ATS's and feeders are new.
44.	We assume for the existing buildings work we will be tying into an existing BMS/ATC system. Is this correct and, if so, what manufacturer's system is present?	Yes, it is correct. The manufacturer is Honeywell. Refer to Appendix, Reference Volume II – S136-383S WSP Drawings for BMS in the existing building.
45.	Is there an existing BMS system at the facility that we will be tying into?	Yes, there will be an existing BMS at the Existing Building that can be tied into. Refer to Appendix, Reference Volume II – S136-383S WSP Drawings for BMS in the existing building.
46.	Please provide a list of accepted manufacturers for the BMS/ATC work.	The manufacturer for the existing building BMS is Honeywell. Refer to Appendix, Reference Volume II – S136-383S WSP Drawings for BMS in the existing building.
47.	Drawing P1-098 is showing non-vented 4" floor drain w/ funnel near column F-5 & 2, and it is more than 15 ft. from the vented line which is a code issue. Please check and revise the drawings accordingly.	Floor drain and RPZ has been relocated to meet the 15 ft. vent length requirement. Please refer to Attachment C "Revisions to the Drawings" for this information.

48.	For PTAC-A, are there any outside air requirements? Be advised that the "Q" series units do not have vent doors and cannot bring in any outside air. Standard Amana PTAC units (-AX series) can bring up to 65 CFM of outside air through manual vent door, please verify requirements.	PTAC-A has been replaced with a window unit. See M4-101 and E4-101. Please refer to Attachment C "Revisions to the Drawings".
49.	On Drawing A2-401, Details 5 and 7 show a steel channel at the jambs of the new overhead doors. Please provide a size for these steel channels.	Sizes are not provided as the Steel Channels shown on Details 5 and 7 on Drawing A2-401 are per the manufacturers requirements as a part of the roll-up door assembly.
50.	Please provide the scope of work for the performance spec in section 112400 Suspended Maintenance and Fall Protection. We are looking for a drawing with details showing quantities and system most used on NYCDDC and/or DSNY projects. The specification leads you to believe this work is only at the roof. A1-103 New Roof Plan does not call out this work in the legend.	ASK-016 thru ASK-0018 have been issued showing the west elevation with locations of the required fall protection brackets. Section Detail 14, sheet ASK-019 has been added showing the steel connection back to structure and the fall protection system. Please refer to Attachment C "Revisions to the Drawings" for this information.
51.	Please provide a listing of firms that provide this work for NYCDDC / DSNY projects. One of the named manufacturers Pro-Bel stated that they will likely not bid this project as they have cut down on work in NY.	Provide fall protection equipment by one of the manufacturers as listed in Specification Section 112400 SUSPENDED MAINTENANCE AND FALL PROTECTION. If listed manufacturers are not bidding, the potential bidder is to submit an approved equal that meets the requirements of the specification.
52.	Please provide a legend and nomenclature for the dimensions and symbols shown on edge of roof plan A1-113.	Legend added to Sheets A1-111, A1-112, and A1-113. See Sketch A1SK-020 for Legend. Please refer to Attachment C "Revisions to the Drawings" for this information.
53.	Reference special experience requirement called in the bid booklet. On pg. 3a, it lists Manufacturer: HVAC and Electrical Work. Please confirm you mean HVAC and Electrical Work subcontractors. There are many manufacturers involved with these trades. Note HVAC and Electrical subcontractors will also be named in the Identification of Bidders in sealed envelope #2. If you list these firms in Envelope #1, it defeats the purpose of a sealed envelope #2.	The scope of the Special Experience Requirements for HVAC and Electrical Work are noted on pages 3a, 3b and 3c and are applicable to both subcontractors and manufacturers.
54.	Reference is made to Addendum to the General Conditions Page 6 of 58. 1. Note 10 states "Contractor to verify and maintain operation of existing site lighting beyond phase II work limits." Please provide specific details as to the extent of this work and expected condition upon Notice to Proceed. 2. Note 17 states "Contractor to coordinate with "sister" project for site and construction access." Are there any limitations on our access for Phase 2?	1. On Phasing Drawing PH-010, zones B2 and B4 show extents of this work. 2. Refer to phasing drawings PH-010, PH-020, PH-030 and coordinate site and construction access with the Phase 1 Contractor.
55.	Reference drawing A1-021. What does the "T" symbol stand for?	On reference drawing A1-021, the 'T' symbol stands for 'Tempered'. Please refer to Attachment C "Revisions to the Drawings" for clarification.

56.	Reference drawing A1-101. Note 15 states to provide OSHA compliant tie-off anchors at all maintenance gratings. Please provide a specification for these tie-offs and a typical detail.	On Sheet A1-101 and A1-102, New Work General Notes: Note 15 has been revised to "NOT USED". Maintenance gratings are not being used on the project. Please refer to Attachment C "Revisions to the Drawings" for clarification.
57.	Reference drawing A1-101. Please provide a specification for the snow plow equipment racks. What is the quantity of interior racks? What is the quantity of exterior racks?	Provide 1/4" thick galvanized steel plow racks as detailed on A1-621 and in Specification Section 055000 "Miscellaneous Metals." Overall floor plan A1-101 and enlarged floor plans A1-101A, A1-101B, A1-101C shows quantities of snow plow equipment.
58.	Reference drawing A1-401 and A1-421. Please provide more information on the vapor intrusion barrier and how it will interface with the sub slab depressurization system.	Vapor intrusion barrier installation details and specifications can be found on drawing Sheet N-202, Detail 12 & 13 and in Specification Section 071326 SHEET MEMBRANE WATERPROOFING.
59.	Reference drawing 3/A1-403. How is the overhead door supported?	Overhead door shall be attached to the steel beam above the door as shown on 3/A1-403.
60.	Reference drawing 1/A1-422. What is the fill layer between the rigid insulation and glazed brick below the flashing and mortar net? It does not have a call out.	The cavity below the thru-wall flashing to be grouted solid as shown on drawing 1/A1-422.
61.	Reference drawings 1/A1-422. What is the extent of the metal deck closure plug?	Metal deck closure plug is not required at location shown on section detail 1/A1-422. Note has been deleted. Refer to Attachment C "Revisions to the Drawings" for clarification.
62.	What is the finish at areas exposed to structure? Is the fireproofing painted?	All exposed structure and fireproofing to be painted. Refer to note 12 on sheet A1-030 Finish Schedule
63.	Reference A1-911, A1-912, A1-921. Please confirm all items in the FFE legend and specialty equipment schedule are furnished and installed by DSNY. Also, please confirm these drawings are for reference only.	The hatched items on Sheets A1-911 and A1-912 are furnished and installed by DSNY. Refer to the note in the FFE Legend on these sheets. All items on the Specialty Equipment Schedule on sheet A1-921 are for reference only and are to be furnished and installed by the DSNY.
64.	Specification Section 105113, "Metal Lockers" Article 2.1C specifies the "Lockers to be air evacuated with ventilation to rear plenum connected to through – floor exhaust." Please provide clarification on this requirement.	This requirement has been deleted per Addendum #1, Attachment D, Revisions to the Specifications, revised Specification Section 105113 METAL LOCKERS.
65.	At dwg. A2-401 detail 2, repair/ replacement of damaged window sill is mentioned, but extent of work is not shown anywhere on drawings. Please clarify.	This note has been removed on drawing A2-401 detail 2. Replacement of damaged window sill is not part of this contract - refer to Attachment C "Revisions to the Drawings" for clarification.
66.	At dwg. A2-401 detail 2, S.S thru wall flashing and brick replacement work is shown, but extent of work is not given in dwgs. Please clarify location where this detail is applicable.	See Sketches A2SK-001, A2SK-002, and A2SK-003 for scope. Please refer to Attachment C "Revisions to the Drawings" for clarification.
67.	At dwg A2-401, details 1-4, patching and repair of exterior masonry wall is mentioned, but no extent of work is shown in dwgs. Please clarify location where this detail is applicable.	This note has been removed on drawing A2-401, details 1-4. Patching and repair of exterior masonry wall is not part of this contract - refer to Attachment C "Revisions to the Drawings", for clarification.

68.	Please advise and clarify Metal Panel Types with Material, Gauge, Finish and Color as indicated in Specification Section 070001 "Rainscreen System," Section 074214 "Metal Panels," and as shown on drawings EN1-003.00 and A1-030.00.	Corrugated Metal Panels (MP-01; MP-01A, MP-02 and MP-02A, MP-04) are to be 20 gauge, galvalume material. Finish and color information is noted on the Finish Schedule on Sheet A1-030. Ribbed Metal Panels (MP-03) are to be 0.5mm thick zincalume. Finish and color information is noted on the Finish Schedule on Sheet A1-030.
69.	Please provide a designation for the exterior entrance between column lines D.7 & E at the south elevation of the new building (1/A1-201.00). Is it intended to be door 189, as there does not appear to be a door with this number shown on the plan?	The southern exterior entrance door between column lines D.7 & E of the New Building is designated with the type mark 189 as indicated on the door schedule on drawing sheet A1-020.
70.	1. Drawing A1-603.00 calls for all welded lockers on the schedule; however 2.3 E calls for 24 gauge interior components with a 16 gauge bottom. 24 gauge material cannot be welded. Please advise if the drawings or specifications should be followed. 2. Specification section 105113 "Metal Lockers," Article 2.1 B states lockers are based on a 36" wide locker with double doors and a center vertical partition. However, Lockers are drawn as 15" and 18" wide which would be a single door. Is a vertical partition still required?	1. The specifications are correct; see updated note to the Locker Schedule on Sheet A1-603 in Attachment C "Revisions to the Drawings". 2. No vertical partition is required for the 15" and 18" lockers. Refer to Addendum 1, Attachment B "Revisions to the Specifications" for clarification.
71.	There is not enough information to quote either a cabinet or extinguisher from the information provided in the specifications or drawings. Please advise.	Fire Extinguisher Cabinet finish information is noted in Specification Section 104416 FIRE EXTINGUISHER CABINETS, Part 2, Article 2.2. Reference note 12 on the 'New Work General Notes' on sheet A1-101 for cabinet mounting information.
72.	Please reference drawing S1-301.00 Detail 1: does grating go on the bottom as shown? Can you please provide a better connection detail for the grating and HSS tubes?	Correct, the metal grating is attached to the bottom of the WT steel flange - refer to detail 13/A1-422. The HSS 4X4X3/8 along the edge is not required.
73.	Please clarify locations of roof edge support at shown on detail 9/S1-410.00.	9/S1-400 is a typical steel roof deck edges detail, applicable to all steel roof deck edges.
74.	Are welded moment connections acceptable?	Yes, welded moment connections are acceptable.
75.	Finish of structural steel framing for the fuel station is not shown. Please clarify if the structural steel for the fuel station will be hot dip galvanized, or if it will need intumescent/ spray fireproofing.	The structural steel framing for the fuel station is to be hot dipped galvanized. Refer to Structural General Notes, S1-001, and note 4.8.A. for more information.
76.	3" metal roof deck is listed in the deck schedule on S1-103A, while 1.5" metal deck is called out for entire roof area as R1. Please clarify locations where 3" metal roof deck is required.	Schedule on S1-103A presents roof schedule of the whole project. 3" metal deck is on Salt Shed only.
77.	Specification section 316219, "Timber Piles," Part 2 Article 2.1 B, specifies an 8" tip with a uniform taper, which would result in a 45' pile having an approximate butt diameter of 12.5. However, Article 2.1C specifies a 14" butt diameter and an 8" tip. The 14" butt is a custom produced pile. Test piles have	Please use 14" butt diameter and 9.5" tip diameter timber piles. Refer to Attachment B "Revisions to the Specifications".

	to be driven and there will be a time delay in order to produce the custom piles. These piles are much more expensive and cannot be returned, so the contractor will have to order additional piles which will not be utilized in order to account for any variation in driven pile length during the course of the job. In contrast, the 8" tip natural taper pile is a stock pile. One day after test piles are driven, production piles can arrive on the site. They are also significantly less expensive. Please advise which pile types we are to utilize in our bid.	
78.	The Langan Geotechnical Engineering Report dated October 22, 2018, revised March 05, 2019, page 18, states the following with regard to the foundation design: "Ultimately, the Contractor is responsible for the final design." Please clarify.	This is under the Section "Option 1: Shallow Foundations on Vibro-Stone Column" and only regards the final design of the Vibro-Stone Columns (VSCs). VSCs will not be used for this project.
79.	There aren't any schedules or drawings showing the equipment or piping downstream of the pumps P-3A/3B & P-4A/4B on the roof for the solar collecting system. Is this forthcoming?	All information regarding equipment integral to the solar collector system, including schedules, is included on PV-002, and on M-004 as part of the mechanical schedules. Piping of the solar hot water system is shown on M1-103 and M1-106.
80.	Request to Exit devices are shown to be present on the typical electric strike door Drawing, but are not present on the wiring diagram, nor on the floor plan. Please advise.	Doors have manual (mechanical) overrides, either via panic bars or turn levers allowing instant override of the access control in the direction of egress.

DDC PROJECT #: S136-367 – Phase 2

PROJECT NAME: Staten Island 1 & 3 Garage – Phase 2

ATTACHMENT B – REVISIONS TO THE SPECIFICATIONS

The following Section is included with this Addendum:

Specification Section 01 91 17 Building Enclosure Functional Performance Test Protocol

The following Sections have been modified:

Specifications Table of Contents (Revised as per below)

Delete Section 23 05 49 HVAC Seismic Specification from the list noted under Division 23

Specification Section 23 05 49 HVAC Seismic Specification (Revised as per below)

Delete: Section 23 05 49 HVAC Seismic Specification

Specification Section 23 31 13 Metal Ducts (Revised as per below)

Remove: Part 3, Article 3.12 FIELD QUALITY CONTROL

Specification Section 23 72 00 Heating and Ventilating / Rooftop Units with Energy Recovery Equipment (Revised as per below)

Add: Part 2, Article 2.1 OUTDOOR ENERGY RECOVERY UNIT, subsection B.:

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Trane
   2. Daikin
   3. annexAir
   4. Carrier
   5. Or approved equal

Specification Section 31 62 19 Timber Piles (Revised as per below)

Replace: Part 2, Article 2.1 MATERIALS FOR DRIVEN PILES, subsections B and C:

B. Pile Material: The timber pile shall be Class A Southern Pine, Douglas Fir or approved equal, and shall conform with the requirements of ASTM D25. The piles shall have a circular cross-section, a minimum diameter of 9.5-inch at the tip with uniform taper, and the corresponding butt diameter specified in ASTM D 25.

C. Pile Section Sizes: 14-inch-butt-diameter timber piles with an 9.5-inch-tip-diameter are recommended to be driven to 40 feet below the bottom of pile caps. The calculated allowable axial capacity of this timber pile is 30 tons.

Attachment C
Addendum #2
January 27, 2020

DDC PROJECT #: S136-367 – Phase 2

PROJECT NAME: Staten Island 1 & 3 Garage – Phase 2

ATTACHMENT C – REVISIONS TO THE DRAWINGS

The following drawing sheets were revised as noted with this addendum:

ARCHITECTURAL – NEW BUILDING

REFER TO SHEET G-002

1. Delete Drawing M1-303 from drawing list.

REFER TO SHEET A1-021

2. Under door types, the 'T' symbol stands for 'Tempered'.

REFER TO SHEET A1-101 and 102

1. Under New Work General Notes: Revise Note 15 to "NOT USED". Maintenance gratings are not being used on the project.

REFER TO SHEET A1-422

1. Metal deck closure plug is not required at location shown on section detail 1/A1-422. Delete Note "Metal deck closure plug".

REFER TO SHEET A1-603

1. Under Locker Schedule. Delete from description "ALL WELDED".

ARCHITECTURAL – EXISTING BUILDING

REFER TO SHEET A2-401

1. Under Detail 2. Delete note "Existing sill to remain, protect in place; if damaged, repair or replace to match as needed".
2. Under Detail 1 through 4. Delete note "Existing 4" fluted block on 8" CMU masonry wall; patch and repair masonry per envelope conditions report and recommendations".

MECHANICAL – EXISTING BUILDING

REFER TO DRAWING M1-303

1. Delete Drawing M1-303 in its entirety. Seismic design is not applicable for this project.

The following drawing sheets includes sketches and drawings amended with this addendum:

ARCHITECTURAL – NEW BUILDING

REFER TO SHEET A1-203

1. Detail 1. West Elevation Enlarged. Added Dimension string to fall protection anchors
2. Reference Sketch: A1SK-016, A1SK-017 and A1SK-018 included with this Addendum

REFER TO SHEET A1-422

1. Detail 14. Curtainwall to Utility Band at Green Roof @ Fall Protection. Detail added to show fall protection anchor.
2. Reference Sketch: A1SK-019 included with this Addendum

REFER TO SHEETS A1-111, A1-112 and A1-113

1. Legend added for the edge of slab roof plans
2. Reference Sketch: A1SK-020 included with this Addendum

ARCHITECTURAL – EXISTING BUILDING

REFER TO SHEETS A2-201

1. Revised Elevations to show the scope of Existing Building repair work
2. Reference Sketch: A2SK-001, A2SK-002, and A2SK-003 included with this Addendum

MECHANICAL – NEW BUILDING

REFER TO DRAWING M1-001

1. Added TR-8 items, revised system commissioning narrative

REFER TO DRAWING M1-002

1. Added AC-GMP and ACU-GMP units in the schedules.

REFER TO DRAWING M1-003

1. Revised Fan Schedule.

REFER TO DRAWING M1-004

1. Revised Pump and Heat Exchanger Schedule.

REFER TO DRAWING M1-100

1. Updated equipment designation

REFER TO DRAWING M1-101

1. Updated pressure washer hood dimensions.

REFER TO DRAWING M1-103

1. Added glycol tank in Boiler room and revised PV tanks layout.

REFER TO DRAWING M1-104

1. Updated pressure washer hood flue note.

REFER TO DRAWING M1-106

1. Remove 'BY OTHERS' from all VCB tags

REFER TO DRAWING M1-107

1. Added fans for pressure washer flues.
2. Remove 'BY OTHERS' from all VCB tags

REFER TO DRAWING M1-108

1. Remove 'BY OTHERS' from all VCB tags

REFER TO DRAWING M1-200

1. Added ductwork dimensions and relocation of duct smoke damper

REFER TO DRAWING M1-202

1. Added tags for locker room ductwork connections

REFER TO DRAWING M1-301

1. Revised Details: "Water to Glycol Heat Exchanger Piping" and added "Pressure Washer Hood and Flue".

REFER TO DRAWING M1-302

1. Revised "Detail of Duct Roof Penetration".

REFER TO DRAWING M1-402

1. Revised hot water diagram

REFER TO DRAWING M1-503.00, M1-504, M1-505, M1-506

1. Updated equipment designation and added pumps

REFER TO DRAWING M1-603

1. Remove boiler circulating pumps

MECHANICAL – EXISTING BUILDING

REFER TO DRAWING M2-002

1. Revised schedules and notes: "Dedicated Outdoor Air System Schedule" was renamed "Rooftop Schedule";
2. "Air Conditioning Unit Schedule" was renamed "Fan Coil Schedule".
3. Note 4 under 'Fan Coil Schedule" was removed.

REFER TO DRAWING M2-301

1. Added detail for "Hot Water Piping With Freeze Protection Pump" and revised piping riser diagram.

MECHANICAL – HOUSEHOLD GOODS

REFER TO DRAWING M4-101

1. Replaced PTAC unit with window ac unit designation

PLUMBING (NEW BUILDING)

REFER TO DRAWING P1-098

1. Relocated floor drain and piping.

REFER TO DRAWING P1-101

1. Relocated floor drain and RPZ

REFER TO DRAWING P1-302

1. Added "Heat Trace Detail"

REFER TO DRAWING P1-400

1. Added operating temperature for air compressor
2. Added valves for air compressor branches serving H & V on roof

PLUMBING – EXISTING BUILDING

REFER TO DRAWING P2-101

1. Bubble area of work on keyplan.
2. Revised gas piping to emergency generator

PLUMBING - SALT SHED

REFER TO DRAWING P3-101

1. Indicated concrete pad at overflow roof drain discharge

FIRE PROTECTION – NEW BUILDING

REFER TO DRAWING SP/SD1-002

1. Modify sprinkler to sidewall

REFER TO DRAWING SP/SD1-100

1. Added the list of Items for the Lobby hose cabinet

REFER TO DRAWING SP/SD1-104

1. Coordinated sprinkler heads with lighting in Garage area
2. Coordinated occupancy sensor in the Locker room area

REFER TO DRAWING SP/SD1-105

1. Coordinated sprinkler heads with lighting in Garage area
2. Coordinated occupancy sensor in the Locker room area

FIRE PROTECTION – EXISTING BUILDING

REFER TO DRAWING SP2-002

1. Add sprinkler head under duct to schedule

REFER TO DRAWING SP2-101

1. Bubble area of work on keyplan

REFER TO DRAWING SP2-102

1. Add sprinkler head & piping to BME small vehicle bays.
2. Add sprinkler head & piping to first floor electrical rooms.
3. Add sprinkler head & piping to first floor elevator corridor.
4. Bubble area of work on keyplan

REFER TO DRAWING SP2-103

1. Add sprinkler head & piping to second floor ceiling plan.
2. Bubble area of work on keyplan
3. Hydraulic Calculations provided

REFER TO DRAWING SP2-300

1. Add pre-action cabinet, control panel and compressor to sprinkler riser diagram.

REFER TO DRAWING SP2-DM-101

1. Bubble area of work on keyplan & first floor ceiling plan.

REFER TO DRAWING SP2-DM-102

1. Bubble area of work on first floor partial ceiling plan.

ELECTRICAL – NEW BUILDING

REFER TO DRAWING E1-002 TO E1-007

1. Added connected loads to panel schedules.
2. Revised panel schedules to conform to power floor plan changes.
3. Removed exception for monitoring on emergency panels.

REFER TO DRAWING E1-008 TO E1-009

1. Added connected loads to panel schedules.
2. Removed exception for monitoring on emergency panels.

REFER TO DRAWING E1-100

1. Added note for "(2) additional 4#500MCM cables for the incoming service pending final confirmation from ConEd for revised load letter.

REFER TO DRAWING E1-101

1. Revised circuiting and receptacle layout for kitchenette area.
2. Added zoning for "Elevator Machine Rooms".
3. Revised electrical receptacle circuiting.

REFER TO DRAWING E1-102

1. Revised electrical receptacle circuiting.

REFER TO DRAWING E1-103

1. Revised circuiting and receptacle layout for kitchenette area.
2. Added zoning for "Elevator Machine Rooms".
3. Revised electrical receptacle circuiting.

REFER TO DRAWING E1-104

1. Revised circuiting and receptacle layout for kitchenette area.
2. Relocated panel boards.
3. Showed power circuiting to "HWP-P5A & P6B".

REFER TO DRAWING E1-105

1. Re-circuited boiler room pumps.

REFER TO DRAWING E1-106

1. Revised circuiting to hand dryers.
2. Added zoning to IT/AV room.
3. Revised receptacle type.
4. Revised circuiting and receptacle layout for kitchenette area.

REFER TO DRAWING E1-107

1. Revised power to condenser units.
2. Revised circuiting to fans.

REFER TO DRAWING E1-108

1. Revised circuiting to fans.

REFER TO DRAWING E1-201 TO E1-203

1. Added exit lights notes.

REFER TO DRAWING E1-204

1. Added exit lights notes.
2. Added switching to boiler room.

REFER TO DRAWING E1-205

1. Added exit lights notes.
2. Added switching to boiler room.

REFER TO DRAWING E1-206

1. Added exit lights notes.

REFER TO DRAWING E1-300

1. Revised power riser diagram to conform to floor plan and schedule changes.

REFER TO DRAWING PV-002

1. Added schedules from M-004 to sheet. Revised tank specifications

ELECTRICAL - EXISTING BUILDING

REFER TO DRAWING E2-002

1. Added panel "DPP" to schedules.

REFER TO DRAWING E2-101

1. Relocated generator and revised conduit routing.
2. Added Panel "DPP" and showed existing "MDP-G" and CT cabinets.

REFER TO DRAWING E2-102

1. Added ATS#5 to ATS room.

REFER TO DRAWING E2-103

1. Revised generator conduit routing.

REFER TO DRAWING E2-104

1. Relocated Generator.

REFER TO DRAWING E2-300

1. Showed relocation of Generator.
2. Added feeder sized to feeders on panel "DPP".
3. Showed panel "PS-B" and associated feeder as dotted lines.

ELECTRICAL - FUELING STATION

REFER TO DRAWING E5-101

1. Revised note showing location of Veeder-Root monitoring panel.

FIRE ALARM – NEW BUILDING

REFER TO DRAWING FA1-001

1. Added lockable fused disconnect switch to symbol list.

REFER TO DRAWING FA1-101

1. Added lockable fused disconnect switch in electrical service room.

REFER TO DRAWING FA1-104

1. Added smoke detectors to new electrical closets.

REFER TO DRAWING FA1-300

1. Revised riser to conform to floor plan changes.

CITY OF NEW YORK
DEPARTMENT OF DESIGN AND CONSTRUCTION
DIVISION OF PUBLIC BUILDINGS

ADDENDA CONTROL SHEET

BID OPENING DATE: February 18, 2020

PROJECT No. : S136-367

TITLE: STATEN ISLAND 1 & 3 GARAGE – PHASE 2

ADDENDA ISSUED	NO. OF DWG	DATE	APPROVED BY: ARCHITECTURE/ ENGINEERING	GENERAL COUNSEL
#1 Revised Bid Opening Date; Questions from Bidders and Responses to Questions; Revisions to the Bid Booklet; Revisions to Volume 2; Revisions to the Specifications; Revisions to the Drawings		1/16/2020		
#2 Revised Bid Opening Date; Questions from Bidders and Responses to Questions; Revisions to the Specifications; Revisions to the Drawings		1/29/2020		
#3 Revised Bid Opening Date; Questions from Bidders and Responses to Questions; Revisions to the Specifications; Revisions to the Drawings; Revisions to Volume 2; Revisions to the Bid Booklet; Revisions to the Addendum to the General Conditions		2/6/2020	AZ	2/6/2020 MP

THE CITY OF NEW YORK
DEPARTMENT OF DESIGN AND CONSTRUCTION
DIVISION OF PUBLIC BUILDINGS

February 6, 2020

ADDENDUM No. # 3

FOR FURNISHING ALL LABOR AND MATERIAL NECESSARY AND REQUIRED FOR:

S136-367
Staten Island 1 & 3 Garage – Phase 2

This addendum is issued for the purpose of amending the requirements of the Bid and Contract Documents and is hereby made a part of said Bid and Contract Documents to the same extent as though it were originally included therein.

The bidder is advised that the items listed below apply to the project:

1. **The Bid Opening for the contract described below scheduled for February 11, 2020, at 2:00 pm is rescheduled to February 18, 2020 at 2:00 pm.**

   Contract #1 – General Construction Work

2. **Bidders Questions and Responses to Questions:**
   See Attachment A.

3. **Revisions to the Specifications:**
   See Attachment B.

4. **Revisions to the Drawings:**
   See Attachment C.

5. **Revisions to Volume 2:**
   See Attachment D.

6. **Revisions to the Bid Booklet:**
   See Attachment E.

7. **Revisions to the Addendum to the General Conditions:**
   See Attachment F.

THIS ADDENDUM MUST BE SIGNED BY ALL BIDDERS AND ATTACHED TO THEIR BIDS.

If additional information is required, please contact the Department of Design and Construction, Contract Section at (718) 391-1041, by email at CSB_projectinquiries@ddc.nyc.gov or by fax at (718) 391-2627.

Bogdan Pestka, FAIA
Assistant Commissioner
DEP / Sanitation / Transportation /
Tanks Programs

Name of Bidder
By: _____

SCHEDULE A (FOR PUBLICLY BID PROJECTS)
PART I - Contract Requirements

Various Articles of the Contract refer to requirements which are set forth in Schedule A of the General Conditions. The Schedule set forth below specifies the following: (1) the referenced Articles of the Contract, and (2) the specific requirements applicable to the contract.

REFERENCE	ITEM	REQUIREMENTS	CONTRACT #1	
Information For Bidders	Bid Security		See Attachment 1 – Bid Information in the Bid Booklet	
Information For Bidders	Performance and Payment Bonds		See Attachment 1- Bid Information in the Bid Booklet	
Article 14 Contract	Time of Substantial Completion	Consecutive Calendar Days	915 CCDS	
Article 15 Contract	Liquidated Damages	For each consecutive calendar day over completion time	$7,000	
SECTION 012000 MILESTONE 1 AND LIQUIDATED DAMAGES	Milestone Liquidated Damages	For each consecutive calendar day over completion time If the **Contractor** fails to substantially complete the Milestone within the time fixed for Milestone Completion plus authorized time extensions, the **Contractor** shall pay to the **City** the amount indicated to the right.	Milestone 1: $6,000.00 for each calendar day over substantial completion time	
Article 17 Contract	Sub-Contracts	Not to exceed Percent of Contract Price	60%	
Article 21 Contract	Retainage	Percent of Voucher	If 100% bonds are required	5%
			If 100% bonds are not required, and Contract Price is $1,000,000 or less	5%
			If 100% bonds are not required, and Contract Price is more than $1,000,000	10%
Article 24 Contract	Deposit Guarantee	Percent of Contract Price	1%	
Article 24 Contract	Period of Guarantee		See Schedule B of the Addendum to the General Conditions	
Article 74 Contract	Statement of Work		Addenda, numbered: _____	
Article 75 Contract	Compensation to be Paid to Contractor		Amount for which the Contract was Awarded: _____ _____ Dollars ($_____)	
Article 79 Contract	MWBE Program		See M/WBE Utilization Plan in the Bid Booklet	

Attachment A
Addendum #3
February 5, 2020

DDC PROJECT #: ***S136-367 – Phase 2***

PROJECT NAME: Staten Island 1 & 3 Garage – Phase 2

ATTACHMENT A - BIDDERS QUESTIONS AND DDC RESPONSES

No.	Bidders Questions	DDC Responses
1.	Please provide a specification for the interior storefront framing and doors. Section 084001 is titled "Glazed Storefronts and Curtain Wall System;" however, there are no descriptions provided for either the interior storefronts or the interior doors.	Refer to **Article 2.15 Doors** within Specification Section 08 40 01 for this information, as well as Specification Section 08 80 10 INTERIOR GLASS AND GLAZING for further information on manufacturers, products, interior doors, borrowed lites, and laminated glass partitions.
2.	Hardware sets 01 and 01A (for nine pairs of doors) includes two each of panic devices and locking ladder pull handles listed as "DB-100-JS". The DB designation indicates that these handles will have a dead bolt locking feature. Blumcraft also offers a PA series of handles that are panic exit devices. These two types of handles cannot be used together on the same door leaf. Please clarify if these pairs of doors should have dead bolt locking handles or handles that function as exit devices and provide the appropriate product designation for each.	The Panic Exit Device is a Locking Ladder Pull Type - the Basis of Design is model JS from CRL Interior Operating Handle (push side) to be a panic exit device with an ability to lock from the inside and still release when the panic exit device is engaged. Exterior operating handle (pull side) to be a fixed handle and have a key lock mechanism that still allows for exiting from the interior, but remains locked from the exterior. Based on CRL products, assume hardware set revised to PA-100-JS. Please reference Specification Section 08 71 00 DOOR HARDWARE, **Article 2.1 Manufacturers**, for a list of acceptable alternative manufacturers. Please refer to Attachment B, "Revisions to the Specifications" for updates to Specification Section Section 08 71 01 DOOR HARDWARE SCHEDULE.
3.	Drawing P1-097 is showing "SIX" 2" W up to SH. Also, Drawing P1-100 shows "SIX" 2" W to shower. However, the Architectural drawings show only four showers & two Janitors closets and the fixtures in the janitor closets aren't identified. Is it a mop sink or something else, please advise? If it is a mop sink, where is the schedule of this mop sink?	Sinks shown in Janitor closets 106C, 113D, 127, 203B, 207B, and 226 are Mop Sinks (P-14). Mop Sink has been added to the Plumbing Fixture Schedule. Please refer to Attachment C, "Revisions to the Drawings".
4.	Please confirm the roll up doors required for the project, as there are conflicts between the specs and drawings. The spec call for "Rubber roll up door assembly..." but the drawings show the following: New Building • Dwg. A1-020.00, Basis of Design Door Model Information: "Rytec Heavy Duty Fast Seal Fabric Door, 17" HD" • Dwg. A1-431.00, Detail 3: "Fabric Door" • Dwg. A1-403.00, Detail 3: "Garage and Fabric Door Jamb Track Assemblies Beyond" Existing Building	The roll up doors are to be rubber rapid roll-up doors. Provide as noted in the revised Specification Section 08 33 23 ROLL-UP DOORS – please refer to Attachment B, "Revisions to the Specifications". Additionally, notes on Sheets/Drawings A1-020, 3/A1-431 and 3/A1-403 have been edited to say "rubber door" – please refer to Attachment C, "Revisions to the Drawings" for clarification.

	• Dwg. A2-020.00, Rapid Roll Door: "To Match Existing"; (We understand that the existing high-speed doors are Rytec Fast-Seal fabric doors) • Dwg. A2-401.00, Detail 3: "Sched. New Surface Mount Rapid Roll Door Assembly To Match Existing To Be Demolished"; (We understand that the existing high-speed doors are Rytec Fast-Seal fabric doors). Please confirm if the type of door is fabric or rubber.	
5.	What is the roof material and surface? What will the collector racking be attached to?	The roof finish material is PVC—please reference the Finish Schedule on Sheet A1-030 and the New Building Roof and Parapet Details on Sheet A1-461. The collector racking is attached to rooftop dunnage – please reference the Dunnage Framing drawings on Sheets S1-106 to S1-106C.
6.	According to several of the drawings, panel type MP - 02 is to be perforated. The specs do not provide information on the perforation pattern required. Please provide.	MP-02 is to be 40% open with a 1/8" hole and 3/16" spacing pattern. Please refer to Attachment C, "Revisions to the Drawings" for clarification.
7.	The Contractor's Bid Breakdown Form, page 21-33 of the Volume 1 Bid Booklet (CSI # 08 4519 for the Polycarbonate Wall System) mentions "Parapet @ Salt Shed with 40mm Polycarbonate panel on interior side - 2'9" high with Top Channel and its support (Details @ A3-302/2,3)." Detail 2 is not applicable to this scope. Details 3 and 13 do not show an interior side polycarbonate panel. Please confirm that this 2'-9" high parapet interior side polycarbonate panel is required and the extent of this work be limited to areas at Column Lines SE, S1 and S5.	Polycarbonate is not required on the interior side of the parapet. Please refer to detail 13, Sheet A3-302 for the accurate condition around the entire perimeter of the Salt Shed.
8.	On page # 21-10R of the contractors bid breakdown there is a line item showing an 8" CMU wall at the green roof, it refers you to detail A1-422/6; however, when you go to this detail, it does not show any CMU. Please advise.	Detail 6, Sheet A1-422 shows the wall along column line A, which is a Cast-in-Place Concrete Knee Wall. Please refer to Sheet A1-112, Second Floor Edge of Slab Plan, for full scope. Also, please refer to Section 1 & 2 on Sheet S1-300 for additional details.
9.	Please clarify if the quantity of glazed brick for the exterior of the building, as shown on A1-703.00 and detail 1/A1-422, is only 660 square feet as shown on the building envelope drawings.	The glazed brick on the interior of the building is not included in the quantity on the building envelope drawings. See drawings on Sheets A1-101A, A1-701, and A1-703, for the extent of the interior glazed brick.
10.	There is a note at the fuel tank structural piers that shows 16" CMU @ columns and truss. Based on detail 7/A5-201, at these columns it only shows aluminum cladding at these columns. Is it correct that no CMU is required at this location? Please advise.	See Drawings on Sheet F-102, Fuel System Details, for location of 16" CMU. Drawing 7, Sheet A5-201 shows details for the surrounds at the steel columns.

11.	Please clarify the partition types for the area shown between grid lines D7 to A, and from 1 to 8, as shown on contract drawing A1-102A.00.	See enlarged plans and general notes as called out on Sheet A1-102A for partition types.
12.	For work called out in the Contract Documents to be provided by the contractors, including Spectrum, Charter, Verizon, please confirm they are not included in this Phase II package scope of work to be carried by the general contractor, i.e.- that they are for reference only.	All utility work shown in the Contract Documents is to be carried out and/or coordinated by the Phase II Contractor.
13.	Where is the schedule of the lavatory faucets?	Please refer to Attachment C, "Revisions to the Drawings", Sheet A1-603 and reference Sketch A1SK-026 for revised plumbing fixture schedule.
14.	There is a sink shown in drawing A1-101A & detailed drawing A1-711. There is no schedule for this sink. Will this sink, faucet, etc. be supplied by others?	Sink and faucet to be included with Contract. Refer to Attachment C, "Revisions to the Drawings", Sheet A1-603 and reference Sketch A1SK-026 for revised plumbing fixture schedule that includes the pantry sink and faucet.
15.	Reference 014000 Quality Requirements: Please provide a breakdown of all tests that are borne by the Contractor, and which ones are borne by the City.	All items that require Special Inspection are borne by the City of New York; all other testing included in the bid documents will be borne by the Contractor.
16.	Many subcontractors have requested the bid date be pushed back an extra week until February 4th. Considering they have not yet seen an addendum and it will take time to process all the information, distribute to suppliers and have said suppliers review all the relevant information to update pricing.	The Bid Opening Date has been extended to 02/18/2020.
17.	Who is the Low Voltage Contractor, Security Contractor and Audio-Visual Contractor?	Low Voltage (IT, Security, and A/V) is part of project scope. Low Voltage, Security and A/V subcontractors have not been awarded. It is the bidder's responsibility to find an acceptable control subcontractor.
18.	Please provide a list of acceptable control contractors.	Refer to Specification Section 23 09 00 INSTRUMENTATION AND CONTROL FOR HVAC for installation requirements. It is the bidder's responsibility to find an acceptable control subcontractor.
19.	Referring to M1-102: please provide size, elevation view and detail of plenum for RTU-1&2 air intake.	RTU air intake plenum is 26' x 6'. Refer to Attachment C, "Revisions to the Drawings" for this information.
20.	a) Are air separators required for HV unit hook-ups with the scheduled expansion tanks. b) Please provide a piping detail for the HV units hook-ups.	a) Air separators and expansion tanks are required for each heat exchanger glycol loop. b) Piping detail is included on Sheet M1-301 Addendum 2. .
21.	Drawing PV-002 shows two 1,400 Gallon Tanks. They are not shown on the HVAC Drawings and there is no information given. Please provide.	Tanks are shown in the Boiler Room on sheet M1-104.

22.	Please provide mechanical specification sections for the following equipment: - Chiller - Fan Coil Units - DOAS Units - Air Conditioning Units - PTAC Units	Chillers, DOAS and PTAC units are not used in the Project scope. Fan Coil Units are included in Specification Section 23 82 39 UNIT HEATERS with revised information included in Attachment B, "Revisions to the Specifications". For Air Conditioning Units, refer to Specification Section 23 81 26 SPLIT SYSTEM AIR CONDITIONERS.
23.	Please verify the drawings for the existing building that we are to install gas piping for the new emergency generator. The plan drawings P2-103 and P2-105 show a 3" gas line up the building to feed the generator. The detail on P2-300 shows the gas line to be 5". Please advise which size is adequate. We are assuming that the size of 3" is sufficient.	Emergency generator gas requirement is 6,994CFH. A new 6" gas piping from the new gas meter to the generator is shown on sheet P2-101, P2-105, P2-300- - please refer to Attachment C, "Revisions to the Drawings".
24.	In the drawings and specifications, there are no mentions of what model drains, cleanouts, or roof drains to use. Please provide make and model #s for the drains, CODPs, Controlled Flow Roof Drains, and Overflow Roof Drains. Otherwise, we will assume industry standards.	Refer to Specification Section 22 14 23 STORM DRAINAGE PIPING SPECIALTIES, **Part 2, Subsection 2.2 Roof Drains**, for the acceptable equipment manufacturers and performance criteria
25.	There is a chiller on this project, however there is no specification for this chiller. Can you please send the specification for the chiller?	There is no reference to a chiller in the Contract Documents –no chiller is to be provided.
26.	Drawing P1-100 shows a 3" branch from the 4" DW line with 3" sub-meter; however, Drawing P1-202 riser diagram shows a 4" branch with 4" sub-meter. Which one is correct?	Please refer to Attachment C, "Revisions to the Drawings" for revised Drawing P1-100.
27.	Please confirm all rectangular tail pipe exhaust ductwork is single wall stainless steel.	Confirmed - tail pipe exhaust ductwork material is single wall stainless steel.
28.	Please clarify if round tail pipe exhaust is to be single wall or double wall stainless steel.	Reel pipe exhaust is part of the product provided by the manufacturer and not specified. See acceptable manufacturers listed in Specification Section 23 12 17 VEHICLE EXHAUST SYSTEM for reference.
29.	Please clarify the note on drawing M2-102 that states fume vent up to roof double wall stainless steel. Is the entire ductwork system to be double wall? What is the extent of this double wall fume vent?	Note is referring to exhaust ductwork between fan and roof. Provide double wall stainless steel ductwork for the entire system.
30.	Please advise if indoor ductwork exposed to view is to be acoustically lined or externally insulated. If this ductwork is to be externally insulated, please advise if rigid board or wrap will be required.	Ductwork will be insulated with rigid insulation, thickness as required per NYC Energy Code.
31.	Please confirm internal acoustical duct lining shall be 1" fiberglass 1 1/2lb density.	Confirmed - provide 1" fiberglass 1 1/2lb density internal acoustical duct lining.

32.	Please provide a schedule and specify manufacturer model for the vehicle exhaust equipment shown on drawing M1-102.00 and pictured below from drawing M1-200.00.	Fan manufacturer and schedule is located on Sheet M1-003. See acceptable manufacturers listed in Specification Section 23 12 17 VEHICLE EXHAUST SYSTEM for reference.
33.	Drawing P1-102 floor plan part C and Drawing P1-099 underground piping part C show a mop sink in the JC 127. This mop sink is not vented in the drawings, but has to be vented according to code. Please clarify. Also, where is the schedule of this mop sink?	A vent line has been is provided – reference Attachment C, "Revisions to the Drawings" for the revisions to Drawings P1-099 and P1-201. The plumbing fixtures are specified on Sheet A1-603 – see sketch A1SK-026 for the revised plumbing fixture schedule.
34.	Riser diagram drawing P1-202 shows mixing valves for each set of showers. What is the schedule for this mixing valve?	There is no schedule for the mixing valves – all valve information is located within Specification Section 22 11 19 DOMESTIC WATER PIPING SPECIALTIES, **Article 2.4 Temperature-Actuated Water Mixing Valves**.
35.	Drawings L-202, L-302 and L-700 show an area outdoors for an Emergency Generator. The Electrical drawings for the existing building do not indicate any generators to be furnished in this area; the only gas generator shown is to be located in the rooftop of the existing building (refer to drawings E2-300 and E2-104). Please confirm there is no Emergency Generator to be furnished in the area shown in drawing L-700. If there is one, please provide electrical details and underground feeders and conduits.	The generator was relocated from the roof to the ground floor – please refer to Addendum 2 for revised Sheets P2-101, E2-101, E2-103, E2-104 and E2-300. Also see revised Drawings P2-101, P2-105 and P2-300 for generator location, gas piping, and riser included with this Addendum in Attachment C, "Revisions to the Drawings".
36.	Drawing P1-102 Plumbing – Ground Floor Plan - Part C and drawing P1-105 Second Floor Plan - Part C show 1 1/2" CW UP & DN near column N & 5; however. the riser diagram drawing P1-202 shows this line as 2". Please clarify.	Piping sizes have been revised on floor plan Drawings P1-102 and P1-105 – please refer to Attachment C, "Revisions to the Drawings" for clarification.
37.	Reference the ground floor plumbing plan on sheet P1-102. At the intersection of column line 1 & J.7, a 1-1/4" cold water pipe is shown. This pipe reduces in size to 1" (between column lines L.2 & M) and then again to ¾" after column line M. There is no feed to this line appear in this drawing. Please advise.	Cold water connection has been added to Drawing P1-102 – please refer to Attachment C, "Revisions to the Drawings" for this information.
38.	Drawing P1-099 underground drawing area C shows 3" SAN UP between column M & N near Column 1; however, there is no fixture in this area in Drawing P1-102 first floor drawing area C. Please advise.	The 3" san up line is connected to the washing machine. Refer to drawing A1-921 for washing machine location.
39.	At what tilt angle do they want the collectors mounted?	Solar collectors are to be mounted at a 10-degree angle facing South.
40.	The collectors specified are Sunmaxx ALDH 29-V3 which have a rating of 33.5 KBtu per day and a size of 45" X 93". The SunEarth panels are different sizes. The TRB-26 is 48" X 80" and the performance is 30.1 KBtu per	SunMaxx is one of the manufacturers listed. Refer to Specification Section 23 56 00 SOLAR HOT WATER SYSTEM for the system performance criteria and to **Article 2.1A** for a list of acceptable manufacturers. Any proposed substitutions are to be submitted and

	day which would require 89 panels or the TRB-32 is 48" X 98" and the performance is 37.3 KBtu per day which would require 72 panels. Would either of these configurations be acceptable to produce the same amount of heating per day?	reviewed once the successful bidder has been awarded the project. Note that substitutions or other changes to the work proposed by the Contractor or their Subcontractors, will not be allowed if such changes compromise the LEED Building criteria.
41.	1. The Langan Geotechnical Engineering Report dated October 22, 2018, revised March 05, 2019 page 29 states the following: "Environmental issues (such as permitting or potentially contaminated soil and groundwater) are outside the scope of this study and should be addressed in a separate evaluation." We find no sampling or testing of contaminated soils addressed. Please advise. 2. Review of Specification section 026113, "Excavation, Handling, Transportation and Disposal of Contaminated Materials," page 10, Article 3.2A states "The contractor shall accept the site "as-is" and shall be deemed to have inspected the site and reviewed all drawings, reports applicable to this work." Please clarify.	1. Waste characterization soil sampling was conducted by Louis Berger and summarized in the October 12, 2018 Phase II Environmental Site Investigation Report. The contractor should review and coordinate the data with their proposed disposal facilities for acceptability and for disposal of soil and liquid wastes generated during construction. Depending on the selected facility, the disposal facility may require additional sampling to meet their permit requirements. 2. Article 3.2A does not require further clarification.
42.	Please elaborate on the associated cost paid or waived to National Grid for the Gas Services.	National Grid will provide gas service installation from the existing service in the street and north of the existing building: 1. Existing gas service pipe rerouting around the new fueling station up to the existing building's gas meter, and; 2. Extend existing gas service in the street to the new building's north side up to the new gas meter. The Contractor must coordinate project construction work with National Grid's work. The City will make payment to National Grid directly for their gas-related work. The Contractor is responsible for the installation and costs of gas-related work within the existing and new buildings, including, the gas service meter bar and all gas-related work within the building interior per bid drawings and specifications.
43.	It was stated at the pre-bid meeting that the temporary fence shown in drawing PH-010.00 for Phase 1 work is being provided by the Phase 1 Contractor. 1. Are there any rental or maintenance costs that the Phase 2 Contractor is to assume? 2. Who is paying for the removal of the temporary fence?	Phases I and II each have construction fencing requirements for which each respective contractor is responsible to install, maintain, and remove, including costs for these associated tasks. See drawings PH-010.00, PH-020.00 and PH-030.00 for Phases 1, 2 and 3.
44.	Provide location in the plan view drawings for the following equipment shown in drawing E2-300: a. ATS#5	a. ATS#5 is in ATS room with ATS#1 to ATS#4. b. This work will be completed under separate Phase 1 Contract. Work that is outside of the project scope is shown as a dashed line. See

	b. Panel PS-B as well as associated disconnect switch and transformer. c. Panel DPP d. Main switchgear equipment (SS#1-SS#4) e. MDP-G 1,200A f. Also, please provide size of feeder and conduits for equipment above.	legend on E2-300 for clarification. c. New panel DPP is located in electric service room. d. Existing service switch in electric service room. e. Existing MDP-G In electrical service room. f. Feeders to panel DPP is (3) sets of 4#600MCM - (3) 4""C. Feeder from ATS#3 is (1) set 4#500MCM - 4""C.
45.	Reference Addendum to General Conditions and LEED specifications: 1. Please confirm DSNY will submit to USGBC for LEED Silver certification and pay all related costs. The Contractor is only responsible to help provide data to achieve the LEED credits. 2. What are the LEED points that are chosen on this project to obtain LEED Silver certification? 3. Who is responsible for providing energy metering for LEED documentation? 4. Pages 6 thru 13 of 58 in the Addendum to General Conditions list Environmentally Preferable Purchase (EPP) minimum standard construction products. Please confirm all specified products on this job meet this EPP standard.	1. Confirmed that the Contractor is not responsible for the LEED certification fees. However, the Contractor must provide the data as outlined in the Contract Documents for initial LEED construction submission and respond to GBCI's technical comments for the final LEED construction submission (and, if necessary by USGBC/GBCI, any additional data that may be required through an appeal or clarification) in order to achieve LEED Certification. 2. Please refer to the DDC General Conditions, which outlines the Contractor's responsibilities related to the LEED v4 credits to be tracked and achieved. 3. Energy metering is included in the Contract Drawings. Specifics of the advanced metering requirements are included in the Notes and Drawings and will need to be addressed by the Contractor. Advanced metering Notes are included on Sheet M-600; Energy meters are captured on the piping layout on Sheets M-501 through M-506. (MB: BTU meter, ME: electric meter). Water meters are captured on Sheets P1-101, P1-202, P1-103. 4. The Contractor is required to meet Environmentally Preferable Purchase requirements for all applicable products being provided for the Existing Building scope only. All products specified for the Existing Building meet the EPP standard- provide as shown in the Contract Documents.
46.	All three telecom space Drawings only identify the security and Audio/Video Rack. Are the other (3) within the 1st floor MDF Closet the (3) Telecommunication racks? Please specify.	Security Equipment and required rack will be provided under Specification Section 28 10 00 ACCESS CONTROL & VIDEO SURVEILLANCE and audio visual will be provided under Specification Section 27 40 00 AUDIO VISUAL COMMUNICATIONS. The only Technology Room Equipment Rack required under Specification Section 27 02 00 STRUCTURED CABLING will be the two (2) post racks for cable management and wire terminations at patch panels. All other IT Hardware and Racks will be provided by DSNY.
47.	All three telecom space drawings state that the Security and AV Rack on the 2nd floor IDF closet are part of a separate contract. Does this also apply to the other (3) unidentified racks within the same room?	Yes.

48.	Please confirm the subcontracting firms noted in Addendum 1, question 1: are union and/or will sign a PLA; have completed work of similar dollar value; and will work in Staten Island, NY. We have reached out to almost the entire NYC SBS MWBE list, and have had only a few responses. Typically, the MWBE goal for a project is set based on the availability of firms in the MWBE list for the trades needed for the project. Is there further backup in determining availability, and that the subcontractors also meet the jobsite requirements?	The Contractor is responsible to determine the areas it anticipates subcontracting to meet the 26% M/WBE Participation Goal for the Project, as noted in Addendum #1, question #1. Once these areas are determined, the bidder should reach out to potential M/WBE vendors to discuss questions or concerns regarding MWBE participation goals.
49.	It was stated at the pre-bid meeting that the Phase 2 contractor will have to pick up the cost of the CM trailer after Phase 1. What is the duration and monthly costs that should be included for the CM trailer and any related facilities and materials to run the trailer?	Phase 2 Contractor to determine costs for the construction trailer complex per Contract Documents. Reference phasing drawings on Sheets PH-010, -020 and -030 for the phasing scope.
50.	Reference Information for Bidders, pg. 9, section 32. Lump Sum Contracts. Please advise if a unit price for excavation is required, and the scope and procedure for identifying on the bid form.	Unit Price for excavation is not needed.
51.	When submitting the Bid Breakdown, can we submit the subtotal of categories in CSI form with the bid then if low bidder complete the individual items?	Yes, subtotals may be submitted for the bid. A detailed bid breakdown of all line items will be required from the lowest bidder after the Bid Opening.
52.	Please provide us with the password for the electronic version bid breakdown form in excel. The columns are too small to fit numbers over 1Million and turn in to unreadable symbols.	Columns on the excel file were fixed to be adjustable. Please refer to Attachment E, "Revisions to the Bid Booklet".

Attachment B
Addendum #3
February 5, 2020

DDC PROJECT #: S136-367 – Phase 2

PROJECT NAME: Staten Island 1 & 3 Garage – Phase 2

ATTACHMENT B – REVISIONS TO THE SPECIFICATIONS

The following Sections are included with this addendum:

Division 1 General Requirements:
Specification Section 01 20 00 Milestones and Liquidated Damages
Specification Section 01 32 16.30 Project Schedules (Method C)

Division 3 Concrete:
Specification Section 03 30 00 Cast in Place Concrete

The following Sections have been modified:

Specification Section 08 33 24 Roll-Up Doors (Revised as per below)

Replace: Part 2, Article 2.1 ROLL-UP DOOR ASSEMBLY, Part A, as follows:

A. Basis of Design: Subject to compliance with requirements, provide Entrematic Albany RR1500 Tough or comparable products by one of the following:
   1. TNR Industrial Doors
   2. Applied Handling - PerforMax MaxPower
   3. Rytec
   4. Or approved equal

Specification Section 08 40 01 Glazed Storefronts and Curtain Wall Systems (Revised as per below)

Add: Part 1, Article 1.2.SUMMARY, Part D.

9. Section 08 80 10 - Interior Glass and Glazing

Specification Section 08 71 01 Door Hardware (Revised as per below)

Remove: Part 2, Article B. Hardware for New Buildings. Subsection 1. Hardware Group No. 01, part a:

2 EA Locking Ladder Pull DB-100-JS SS CRL

Revise: Part 2, Article B. Hardware for New Buildings. Subsection 1. Hardware Group No. 01, part a:

Revise Panic Exit Device catalog number to: PA-100-JS

Remove: Part 2, Article B. Hardware for New Buildings. Subsection 2. Hardware Group No. 01A, part a:

2 EA Locking Ladder Pull DB-100-JS SS CRL

Revise: Part 2, Article B. Hardware for New Buildings. Subsection 2. Hardware Group No. 01A, part a:

Revise Panic Exit Device catalog number to: PA-100-JS

Specification Section 23 05 00 Common Work Results for HVAC (Revised as per below)

Add: 1.5 CONTRACTOR FEE FOR DEP DOCUMENTATION

A. Contractor to include cost for all fees and preparations of all required documents, forms, calculations, affidavits, etc., for the boiler filings with local jurisdiction and equipment installation approvals from the Department of Environmental Protection. Certificates required by the governing bodies shall be obtained and paid for by this Contractor as part of the contract.

Specifications Section 23 72 00 - Heating and Ventilating/ Rooftop Units with Energy Recovery Equipment (Revised as per below)

Add: Part 2.1 B Basis-of-Design Product: Subject to compliance with requirements, provide Xetex or comparable product by one of the following:

1. Trane
2. annexAir
3. Daikin
4. Carrier
5. Or approved equal

Specifications Section 23 82 39 - Unit Heaters (Revised as per below)

Replace: Part 1.4 'Submittals,' items D and E:

D. Schedule: List manufacturer, unit type, model number, and performance data for each heater and fan coil unit. Equipment schedules to include rated capacities, operating characteristics, furnished specialties, and accessories.

E. Location and arrangement of piping valves and specialties

Replace: Part 2.1 'Unit Heaters, Cabinet Heaters,' Subsection A, items 7-10:

7. Filters for Fan Coil Unit: Minimum arrestance according to ASHRAE 52.1 and a minimum efficiency reporting value (MERV) according to ASHRAE 52.2.

   Washable Foam: 70 percent arrestance and 3 MERV.
   Pleated: 90 percent arrestance and 7 MERV.

8. Coil: Mechanically bonded copper/aluminum, pressure tested at 250 psi.
9. Power Supply: All units shall be single-point power.
10. Controls: Units shall be provided with thermostats.

Add: Part 2.1 'Unit Heaters, Cabinet Heaters,' item C:

C. Fan Coil Unit Manufacturers:

1. Trane
2. Carrier
3. Daikin
4. Enviro-Tec
5. Or approved equal

Add: Part 3.3 'Installation,' items C-G:

C. Suspend cabinet unit heaters from structure with hangers and fan coil with all-thread hanger rods and vibration isolators.

D. Install wall-mounting thermostats and switch controls in electrical outlet boxes at heights to match lighting controls. Verify location of thermostats and other exposed control sensors with Drawings and room details before installation.

E. Piping installation requirements are specified in other Division 23 Sections. Drawings indicate general arrangement of piping, fittings, and specialties. Install piping adjacent to equipment to allow service and maintenance.

F. Connect supply and return ducts to fan coil unit with flexible duct connectors specified in Division 23 Section "Air Duct Accessories." Comply with safety requirements in UL 1995.

G. Install union and gate or ball valve on chilled –supply/return connection and union, strainer connection of fan coil unit. Install condensate drain piping and condensate pump pitched to a floor drain.

Replace: Part 3.4 'Adjusting and Cleaning' item A:

A. General

1. After construction is completed, clean unit exposed surfaces, vacuum inside the unit heaters and fan coil units. Retouch any marred or scratched surfaces, using finish materials furnished by the manufacturer.

Specifications Section 26 24 13 – Switchboards (Revised as per below)

Remove: Part 2.1 Manufactured Units, Subsection R

R. Bus-Bar Insulation: Factory-applied, flame-retardant, tape wrapping of individual bus bars or flame retardant, spray-applied insulation. Minimum insulation temperature rating of 105 deg C.

DDC PROJECT #: ***S136-367 – Phase 2***

PROJECT NAME: Staten Island 1 & 3 Garage – Phase 2

ATTACHMENT C – REVISIONS TO THE DRAWINGS

The following drawing sheets were revised as noted with this addendum:

ARCHITECTURAL – NEW BUILDING

REFER TO SHEET G-002

1. Add drawing M1-304 to drawing list.
2. Add drawing M1-403 to drawing list.
3. Add drawing M1-404 to drawing list.

REFER TO SHEET EN1-001

1. MP-02 – Add '40% openness with a 1/8" hole and 3/16" spacing pattern' to Reference/Description
2. MP-02A - Add '40% openness with a 1/8" hole and 3/16" spacing pattern' to Reference/Description

REFER TO SHEET A1-020

1. Basis-of-Design Door Model Information for the 'RAPID ROLL FABRIC DOOR' was revised to: 'RAPID ROLL DOOR: ENTRE MATIC ALBANY RR1500 TOUGH RUBBER DOOR.'

REFER TO SHEET A1-403

1. Detail 3, replace all instances of 'FABRIC DOOR' with 'RAPID ROLL-UP RUBBER DOOR'

REFER TO SHEET A1-431

1. Detail 3, Note revised from 'FABRIC DOOR' to 'RAPID ROLL-UP RUBBER DOOR'

REFER TO SHEET A1-901

1. Room 105 - Change Finish Floor Tag from ER-01 to SC-01 Steel Troweled surface with sealer
2. Room 101 - Change Finish Floor Tag from SC-01 to ER-01
3. Room 103 - Change Finish Floor Tag from SC-1 to ER-01
4. Room 100A - Change Finish Floor Tag from SC-1 to ER-01

STRUCTURAL – NEW BUILDING

REFER TO DRAWING S1-001 GENERAL NOTES

1. Part 2.3 'Piles,' add note H:
   H. Salt shed piles are included in the Phase 1 scope of work. Piles installed for the salt shed will be driven, tested, filled with concrete and will have a bearing plate

2. Part 3.3 'Steel Reinforcement', add note E:
   E. Slab-on-grade typical details generally show one layer reinforcement. Actual number of layers of reinforcement are stated in Note 3 on Drawing FO-101A.

REFER TO DRAWINGS FO-101, FO-101A, FO-101B, and FO-101C

1. Wide flange shapes shown in plan indicates column – see column schedule. Dash line indicates bracing. The diagonal crosshatch indicates the locations of CMU walls and wall thickness is indicated with a notation tag.
2. Typo - OWS-1 near Grid Line L7/4 to be OWS-2, naming of tanks is to be per MEP drawings.
3. Note 3 revised to: 'Slab Reinforcement #6 @ 12" each way in slab S-1 and #7 @ 8" each way top and bottom in Slab S-2.'

REFER TO DRAWING FO-200

1. Detail 13: Omission in note for pile reinforcement is an error. Tag to read "See Detail 1 to 9/FO-200 for reinforcement.'

REFER TO DRAWING S1-001

1. Provide epoxy reinforcement at areas exposed to salt. This is all of the garage slab of the new building and the mat slab at the salt shed. Epoxy reinforcement is not required in the personnel areas. Provide epoxy rebar in the following areas:
    a. Parking area large vehicles - room 101
    b. Repair bays - room 105
    c. Wash bays - 104A, 104B, 104C
    d. Broom storage - room 103
    e. Stat shed storage - room 001

2. Add Note to 1.7 DESIGN LOADS – SALT SHED, subsection B. Live Loads,
    2. Salt: 2,160 psf

REFER TO DRAWINGS S1-002 and S1-003

1. Callout references are an error. Disregard all callout references.
2. "BR8-5" tag near Gridline 8 is an error. Disregard tag.

REFER TO DRAWING S1-102A

1. Detail callout near Gridline 1 between Gridlines B and C reversed is an error. Reference 4/S1-201
2. Provide C8x11.5 channel framing around perimeter of slab depressions at ADA showers, see architectural drawings for locations.

REFER TO DRAWING S1-102B

1. Detail callout near Gridline 1 between Gridlines G.5 and H reversed is an error. Reference 3/S1-201. S1-102C
2. Detail callout near Gridline 1 between Gridlines K and K.4 reversed is an error. Reference 2/S1-201.
3. Detail callout near Gridline 1 between Gridlines M and N reversed is an error. Reference 1/S1-201
4. Provide C8x11.5 channel framing around perimeter of slab depressions at ADA showers, see architectural drawings for locations.

REFER TO DRAWING S1-300

1. Detail 5: Note 4: "SER" is Structural Engineer of Record

REFER TO DRAWING S1-420

1. Arrow leader stops short of graphic in error. Channel size above C12 is a mechanical unit rail.
2. Detail 8: "L1-1/2 x 1-1/2 x 3/16" is a notation per joist manufacturer

The following drawing sheets includes sketches and drawings amended with this addendum:

ARCHITECTURAL – NEW BUILDING

REFER TO SHEET A1-101A

1. New Building First Floor Partial A – Added – Bollards in the garage to the east and west of garage door 100.1.
2. Reference Sketch: A1SK-021 & A1SK-022

REFER TO SHEET A1-101B

1. New Building First Floor Partial B – Added – Bollards in the garage to the east and west of garage door 105.5.
2. Reference Sketch: A1SK-023

REFER TO SHEET A1-101C

1. New Building First Floor Partial C – Added – Bollards in the garage to the east and west of garage door 105.3 and to the west of garage door 105.1.
2. Reference Sketch: A1SK-024 & A1SK-025

REFER TO SHEET A1-111

1. Ground Floor Edge of Slab Plan – Added – Slab depression locations and dimensions for the recessed shower pans and walk-off mats.
2. Reference Sketch: A1SK-031 & A1SK-032

REFER TO SHEET A1-112

1. Second Floor Edge of Slab Plan – Added – Slab depression locations and dimensions for the recessed shower pans.
2. Reference Sketch: A1SK-033, A1SK-034 & A1SK-035

REFER TO SHEET A1-603

1. New Building Enlarged Locker Room Elevations – Added – fixtures and descriptions to "Plumbing Fixture Schedule.
2. New Building Enlarged Locker Room Elevations – Added – Detail Section Tags @ Elevation 7, Type A 2-Stall Shower and at Elevation 8, Type B 2-Stall Shower
3. Reference Sketch: A1SK-026, A1SK-027

REFER TO SHEET A1-604

1. New Building Enlarged Locker Room Elevations – Added –Section detail @ shower pan threshold transition and at Shower pan @ wall finish detail.
2. Reference Sketch: A1SK-028 & A1SK-029

REFER TO SHEET A1-711

1. New Building Millwork – Added –identified plumbing fixtures within Millwork Section 16.
2. Reference Sketch: A1SK-030

MECHANICAL – NEW BUILDING

REFER TO DRAWING M1-001

1. Added note outlining contractor fees and removed references to commissioning.

REFER TO DRAWING M1-004

1. Revised Expansion Tank and Pump schedules.

REFER TO DRAWING M1-102, M1-105

1. Added dryer exhaust duct

REFER TO DRAWING M1-200

1. Removed MD from the tail pipe exhaust fan discharge.

REFER TO DRAWING M1-304

1. Added new Sheet to add revised Expansion Tank and Pump schedules.

REFER TO DRAWING M1-401

1. Included Boiler Part-Plan

REFER TO DRAWING M1-402

1. Added air vents.

REFER TO DRAWING M1-403

1. Relocated unit heaters piping diagram from M1-401.:

REFER TO DRAWING M1-404

1. Relocated H & V unit from M1-401 and added pump tags, expansion tanks

REFER TO DRAWING M1-504, M1-505, M1-506

1. Added expansion tanks for each H & V units piping

REFER TO DRAWING M1-507, M1-508, M1-509

1. Relocated glycol loop pumps to roof for each H & V units

MECHANICAL – EXISTING BUILDING

REFER TO DRAWING M2-002

1. Revised Hot Water Coil, Rooftop and Fan Coil Unit schedules

REFER TO DRAWING M2-301

1. Revised riser diagram to include Coil Freeze Protection

PLUMBING – NEW BUILDING

REFER TO DRAWING P1-097, P1-200, P1-202

1. Revised to indicate mop sink

REFER TO DRAWING P1-099

1. Added vent line

REFER TO DRAWING P1-201

1. Added Vent line
2. Revised to indicate mop sink

REFER TO DRAWING P1-100

1. Revised piping size
2. Revised to indicate mop sink

REFER TO DRAWING P1-102, P1-105

1. Added cold water connection, revised piping sizes

PLUMBING – EXISTING BUILDING

REFER TO DRAWING P2-101, P2-105, P2-300

1. Revised generator location, gas piping and riser

ELECTRICAL – NEW BUILDING

REFER TO DRAWING E1-004

1. Added loads to panel "SBHV-2E" for unit ACCU-10

REFER TO DRAWING E1-006

1. Added "GLWP's" to panel HV-2C

REFER TO DRAWING E1-007

1. Included panel schedule "EM-G"

REFER TO DRAWING E1-104

1. Picked up unit "AC-CMP" for power.

REFER TO DRAWING E1-105

1. Added "GLWP" controllers and power to boiler room.

REFER TO DRAWING E1-106

1. Drawing revised to clearly show disconnect switches for ACCU-9 to 13

REFER TO DRAWING E1-107

1. Added "GLWP" motors at HV units.
2. Picked up unit "ACCU-CMP" for power.

REFER TO DRAWING E1-108

1. Added "GLWP" motors at HV units.

REFER TO DRAWING E1-109

1. Added "GLWP" motors at HV units.

REFER TO DRAWING E1-201 to E1-204 and E1-206

1. Added emergency exit lights to ceiling plans

REFER TO DRAWING E1-300

1. Added Panel "LV-1F".
2. Moved and relocated panel "EMHV-2C" as per floor plans.

ELECTRICAL – HOUSEHOLD GOODS

REFER TO DRAWING E4-101

1. Drawing revised to show panelboard PP-REC

ELECTRICAL – FUELING STATION

REFER TO DRAWING E5-101

1. Added light fixture to Fuel Station booth

Attachment D
Addendum #3
February 5, 2020

DDC PROJECT #: ***S136-367 – Phase 2***

PROJECT NAME: Staten Island 1 & 3 Garage – Phase 2

ATTACHMENT D – REVISIONS TO VOLUME 2

Revised Project Labor Agreement (PLA) Notice:
The PLA has been extended thru February 29, 2020. Refer to Notice to Bidders, included with this Addendum.

Attachment E
Addendum #3
February 5, 2020

DDC PROJECT #: ***S136-367 – Phase 2***

PROJECT NAME: Staten Island 1 & 3 Garage – Phase 2

ATTACHMENT E – REVISIONS TO THE BID BOOKLET

The electronic formatted Excel version of the Bid Breakdown is included with this Addendum.

Attachment F
Addendum #3
February 5, 2020

DDC PROJECT #: ***S136-367 – Phase 2***

PROJECT NAME: Staten Island 1 & 3 Garage – Phase 2

ATTACHMENT F – REVISIONS TO THE ADDENDUM TO THE GENERAL CONDITIONS

Delete page 16 and replace with revised page 16R, included with this Addendum.

NOTICE TO BIDDERS

Please be advised the Project Labor Agreement (PLA) attached and incorporated in this Invitation for Bids has been extended to apply to contracts let prior to February 29, 2020, including this contract. Other than extending the expiration date, all other terms of the PLA continue to apply in full force and effect.

CITY OF NEW YORK
DEPARTMENT OF DESIGN AND CONSTRUCTION
DIVISION OF PUBLIC BUILDINGS

ADDENDA CONTROL SHEET

BID OPENING DATE: February 21, 2020

PROJECT No. : S136-367

TITLE: STATEN ISLAND 1 & 3 GARAGE – PHASE 2

ADDENDA ISSUED	NO. OF DWG	DATE	APPROVED BY: ARCHITECTURE/ ENGINEERING	GENERAL COUNSEL
#1 Revised Bid Opening Date; Questions from Bidders and Responses to Questions; Revisions to the Bid Booklet; Revisions to Volume 2; Revisions to the Specifications; Revisions to the Drawings		1/16/2020		
#2 Revised Bid Opening Date; Questions from Bidders and Responses to Questions; Revisions to the Specifications; Revisions to the Drawings		1/29/2020		
#3 Revised Bid Opening Date; Questions from Bidders and Responses to Questions; Revisions to the Specifications; Revisions to the Drawings; Revisions to Volume 2; Revisions to the Bid Booklet; Revisions to the Addendum to the General Conditions		2/6/2020		
#4 Revised Bid Opening Date; Questions from Bidders and Responses to Questions; Revisions to the Specifications; Revisions to the Drawings; Revisions to the Addendum to the General Conditions		2/12/2020		2/12/2020 MP

THE CITY OF NEW YORK
DEPARTMENT OF DESIGN AND CONSTRUCTION
DIVISION OF PUBLIC BUILDINGS

February 12, 2020

ADDENDUM No. # 4

FOR FURNISHING ALL LABOR AND MATERIAL NECESSARY AND REQUIRED FOR:

S136-367
Staten Island 1 & 3 Garage – Phase 2

This addendum is issued for the purpose of amending the requirements of the Bid and Contract Documents and is hereby made a part of said Bid and Contract Documents to the same extent as though it were originally included therein.

The bidder is advised that the items listed below apply to the project:

1. **The Bid Opening for the contract described below scheduled for February 18, 2020, at 2:00 pm is rescheduled to February 21, 2020 at 2:00 pm.**

   Contract #1 – General Construction Work

2. **Bidders Questions and Responses to Questions:**
   See Attachment A.

3. **Revisions to the Specifications:**
   See Attachment B.

4. **Revisions to the Drawings:**
   See Attachment C.

5. **Revisions to the Addendum to the General Conditions:**
   See Attachment D.

THIS ADDENDUM MUST BE SIGNED BY ALL BIDDERS AND ATTACHED TO THEIR BIDS.

If additional information is required, please contact the Department of Design and Construction, Contract Section at (718) 391-1041, by email at CSB_projectinquiries@ddc.nyc.gov or by fax at (718) 391-2627.

Glenn Brue FOR B.P.
Bogdan Pestka, FAIA
Assistant Commissioner
DEP / Sanitation / Transportation /
Tanks Programs

Name of Bidder
By: _____

Attachment A
Addendum #4
February 12, 2020

DDC PROJECT #: S136-367 – Phase 2

PROJECT NAME: Staten Island 1 & 3 Garage – Phase 2

ATTACHMENT A - BIDDERS QUESTIONS AND DDC RESPONSES

No.	Bidders Questions	DDC Responses
1.	Architectural drawings A1-201.00 and A1-203.00 show an exterior window at the west elevation with note 10 attached. Note 10 describes this window as an "SSG window (door)". The only window listed in the specifications that fits this description is the OBE 30p. After reviewing the manufacturer's product data for this window, it does not appear that it will accommodate the triple glazing nor will achieve the size (5' x 7') shown on the elevation. Please confirm if this is the appropriate product for this application.	The OBE 30p is not the appropriate product for this application. Instead, provide a 3'-0" wide triple-glazed operable window with an adjacent fixed glazing panel. Reference the acceptable curtainwall manufacturers specified in Specification Section 08 40 01 GLAZED STOREFRONTS AND CURTAIN WALL SYSTEM, along with **Article 2.1B**, for manufacturer models.
2.	Re: detail #5 on drawing #A1-432.00. Please clarify where this detail should be applied.	On sheet A1-101A, detail 5/A1-432 occurs south of column D.7 / 7. The wall in which this detail is located contains two different wall assemblies (GFB-01 and GFB-02) that transition at the sill of the interior glazing. See the elevation on A1SK-037 included with Attachment C, "Revisions to the Drawings" for clarification of the plan detail location, the line of the partition type transition, and the wall finish.
3.	Specification section 084001 calls for the exterior entrances (type D) to be thermally broken doors, similar to OBE AD-375 or YKK 35XT. However, Drawing A1-021.00 shows type D as CRL Entice the basis of design. These products are completely different with different price structures. a. Please clarify which type of entrance should be provided for this project. b. Please advise if the interior entrances in the curtain wall frames (door series 106 and 113) should be thermally broken with triple insulated glass, or if non-thermal doors and monolithic glazing would be appropriate.	a. For entrance types, please provide product specified in Specification Section 08 40 01 GLAZED STOREFRONTS AND CURTAIN WALL SYSTEM - **Article 2.15B**. b. Provide thermally broken triple insulated glass for interior entrances as specified in Specification Section 08 40 01 GLAZED STOREFRONTS AND CURTAIN WALL SYSTEM.
4.	The Existing Building schedules and finish plans are showing conflicting information for the floor finish at the Small Vehicle Maintenance Bay. Currently, I am accounting for an epoxy floor finish in this space - is this correct?	No, this is not correct. The floor finish at the Existing Building BME Small Vehicle Maintenance Bays is to be a sealed concrete (SC-01) with a steel trowel finish. Reference the Existing Building finish schedule on Sheet A2-030 and Attachment C, "Revisions to the Drawings" for more information.
5.	Reference Drawing A1-101. Please provide a spec for the welded wire equipment cages.	Specification Section 05 50 00 MISCELLANEOUS METALS has been revised to include the welded wire equipment cages. Refer to Attachment B, "Revisions to the Specifications" for clarification.

6.	Drawing A1-911 shows window shades in various offices. Please provide details and specifications for window shades.	Specification Section 12 24 13 WINDOW SHADES has been added to the Contract Documents. Window Shade details have been provided within this addendum on SK-036 - Refer to Attachment B, "Revisions to the Specifications" and Attachment C, "Revisions to the Drawings" for further information. Window shade costs are to be included in the Bid Breakdown as per instructions stated on page 21 of the V1- Bid Booklet.
7.	Re: A1-010 glass wall notes. CW01 calls for 1" IGU, clear GL-03, while A1-030 GL-03 is not used. Please provide make-up for GL-03.	GL-03 is not a glass type within the Project. This note has been replaced with GL-01. Refer to Attachment C, "Revisions to the Drawings" for this clarification.
8.	Re: A1-010 glass wall notes. CW02 calls for 1" IGU, tinted GL-01, while A1-030 GL-01 calls for 1¾" thick. Please confirm which thickness is accurate for GL-01.	GL-01 is to be 1¾" thick per the Finish Schedule on Sheet A1-030 and the Exterior Glass Type Matrix on Sheet EN1-003. The dimension on A1-010 has been replaced with 1¾". Refer to Attachment C, "Revisions to the Drawings" for this clarification.
9.	Per A1-101A & A1-101C, the punched openings are all CW01, which should be with GL-03 glass. However, all the elevations showing the glass to be GL-01.	The glass in CW01 is to be GL-01 as noted on the elevations and in the Building Enclosure System Matrix on sheet EN1-003. GL-03 is not a glass type within the Project - refer to the Exterior Glass Type Matrix on Sheet EN1-003.
10.	Can you provide details to reference on the support steel, drop downs and bracing required for the crane rail installation? I see where the crane rail is indicated, but couldn't find any details or design on the structural drawings for the support of such.	See revision to Specification Section 14 60 50 SINGLE GIRDER CRANE for clarification. Refer to Attachment B, "Revisions to the Specifications".
11.	Refer to scope of work for overhead doors. There are (5) doors specified to be overhead coiling fire-rated doors at the interior openings between 100 Garage & 105 Repair Bays: doors # 105.1 - #105.2 - #105.3 - #105.4 - #105.5 per door schedule on A1-021. Please confirm the following for these overhead doors: a. Specification section 083323, "Overhead Coiling Doors," refer in Article 1.2.A.2 to '45 minute rated interior overhead doors;' however, there appears to be no other specifications for these doors in this section, nor basis of design products/ acceptable manufacturers/ models. Please confirm if this information is forthcoming or specified elsewhere in the plan documents. b. For the overhead coiling fire-rated doors, please confirm that the wall openings are masonry block (per A1-704 Garage Elevations). Jamb and head details are not referred to for these doors on the door schedule, which seems to show steel frames for all OH doors. c. For the overhead coiling fire-rated doors, all appear per the door schedule to be sized for openings 28' W x 17'2" H. Please confirm that this dimension is for the finished door opening, as the height seems atypical.	a. Basis of design for these interior fire rated overhead coiling doors is McKeon Door Company FSFD-M-G. Refer to Attachment B, "Revisions to the Specifications". b. For overhead coiling fire-rated doors, the wall openings are masonry with a steel plate trim. Refer to detail 3/A1-431 Jamb Detail @ Garage Door for more information. c. The overhead coiling fire-rated doors are sized for 28' W x 17'-2"H openings. See drawing 2/A1-411 for coiling door placement and door clear opening size.

12.	Refer to scope of work for overhead doors. there are (2) doors specified to be overhead coiling insulated service doors at exterior openings: #100A.1 - @ 100 Garage and #100B.1 - @ 100B Misc. Equip. Storage. Please confirm the following for these overhead service doors: a. Specification section 083323, "Overhead Coiling Doors," refers to Vision Panels (see 2.2.J) as "indicated on drawings" but per review, drawing elevations depict doors without vision slats. Please confirm if vision slats are required at these doors, and if so, the required number of vision slats. b. Specification section 083323, "Overhead Coiling Doors," refers to Door Finish (see 2.2.K) as "baked-enamel or powder coat as indicated on drawings, or if not indicated, as selected by Commissioner from manufacturer's full range." Additionally, it is indicated that the bottom 12" of door slats should be painted OSHA orange on both sides of the curtain. Please confirm finish requirements. If powder coat finish is required, please confirm if standard RAL colors are acceptable, or if a custom RAL color is required (the latter option adds significant cost and lead time).	a. Provide doors as shown on elevation drawing A1-201. Vision panels are not required for these doors. b. For the overhead doors, Commissioner will select from powder coat standard RAL colors.
13.	Please confirm if GB-01 glazed brick rainscreen and GFR-01 ACMU rainscreen are to be priced with Specification Section 070001 "Rainscreen System," as indicated in the Contractor's Bid Breakdown Form, or if these materials should be installed by the masonry subcontractor and pricing be included with the Unit Masonry work. The materials are not specified or included in discussion of the rainscreen system in Section 070001 of the Specification, but are instead specified in Section 042000 "Unit Masonry." Is it your intent to have the rainscreen subcontractor install these materials?	The cost for GB-01 glazed brick rainscreen and GFR-01 ACMU rainscreen are to be priced in Specification Section 07 00 01 as indicated in the Contractor's Bid Breakdown. Yes, the rain screen subcontractor should install these materials.
14.	Please confirm if pricing for the supply and installation of 6" and 8" CMU wall backup listed under Specification Section 070001 "Rainscreen System," (types GB-01 and GFB-01) in the Contractor's Bid Breakdown Form should be included there, or with Section 042000 Unit Masonry?	Cost for supply and installation of 6" and 8" CMU wall backup are to be included under Specification Section RAINSCREEN SYSTEM 07 00 01 as indicated in the Contractor's Bid Breakdown.
15.	The cladding panel components for the rain screen system listed within Specification Section 070001 "Rainscreen System," include formed metal panels, precast concrete cladding panels, and louver panels, yet these different types of panels are NOT all included in the Contractor's Bid Breakdown Form under 070001. Please advise.	Include all formed metal panels, precast concrete cladding panels, and louver panels within the Bid Breakdown Form for Specification Section 07 00 01 RAINSCREEN SYSTEM. Refer to page 21 of the V1-Bid Booklet for instructions on completing the Bid Breakdown.

16.	Where are we to include costs for the green roof system required? We find no line item on the Contractor's Bid Breakdown Form for the Green Roof. Additionally, please clarify what specification will govern work on the green roof and provide applicable details.	The green roof system is identified in Specification Section 32 93 00 TREES, SHRUBS AND GROUNDCOVERS of the Contractors Bid Breakdown. See Specification Section 07 20 00, **Part 2.2., Subsection G**. for specification language on the PRMA roofing and root barriers. See Specification Section 32 930 0, **Part 2 - Products for the planting specifications**, and Sheets L-413, EN1-006, A1-404, and A1-422 for applicable details.
17.	Please clarify if "Outdoor Terrace @ Level 2" under 075216 "Modified Bituminous Membrane Roofing" noted on the Contractor's Bid Breakdown Form is referring to the Mechanical Terrace Rm. 230?	Yes, the Bid Breakdown is referring to the Mechanical Terrace Room 230. The outdoor terrace at Level 2 has a PVC roofing system for the Green Roof, which includes PVC roofing membrane, a 1/2" cover board, and waterproofing.
18.	MP-06 is listed twice on the Contractor's Bid Breakdown Form under Section 074214 "Metal Panels:" once as "flat metal panel rain screen Detail EN1-001" and again as "flat metal panel fascia + soffit Detail EN1-002." Please clarify.	The first MP-06 is for the Exterior Rain screen metal panels. The second MP-06 is for the Soffits and flat metal fascia panels.
19.	MP-07 (Metal Panel Soffit) is listed twice in the Contractor's Bid Breakdown Form. It appears under both 074214 "Metal Panels," and under 095133 "Metal Ceilings." Where are the costs to be carried?	Cost for the exterior metal panels should be carried in Specification Section 07 42 14 METAL PANELS. Cost for interior metal panels should be carried in Specification Section 09 51 33 METAL CEILINGS.
20.	The Contractor's Bid Breakdown is very confusing as to where to include costs for the different assemblies comprising the Building Envelope. Section 070001, "Rainscreen System" includes line items for metal panels MP-01A, ground face ACMU block GFB - 01, and glazed brick GB-01 only. Section 074214 "Metal Panels" includes line items for additional types of metal panels including MP-01, MP-02, MP-02A, MP-03, MP-04, MP-05, and MP-06, as well as a second entry for MP-01A, which are all identified as part of the rainscreen system. Why are some items listed under "Rainscreen System," and some included with other specification sections? Please clarify where we are to include costs for each item.	Provide costs for the rainscreen system and its components in Specification Section 070001, "Rainscreen System." Cost for Metal Panels MP-01A associated with rainscreen to be included in Specification Section 070001. Cost for Ground face ACMU block GFB-01 associated with the rainscreen and the cost for Glazed Brick GB-01 associated with the rainscreen should also be included in Specification Section 070001. Provide cost for other Metal Panels (specifically, MP-01, MP-02, MP-02A, MP-03, MP-04, MP-05, and MP-06) within Specification Section 074214, "Metal Panels."
21.	It is not clear if the steel joists and beams supporting the roof above the Garage shall receive spray on fireproofing or paint. Please clarify.	The exposed steel joists and beams supporting the roof above the garage shall receive spray on fireproofing and paint. See drawing A1-005 for the fire rating requirements of the roof. See 1 &2 / A1-005 for detailed notes on the roof fire protection requirements for garage and staff areas.
22.	As per Note #4 on Drawing S1-106, all the dunnage supporting steel shall be hot dip galvanized. The Contract Documents do not specify if the hot dip galvanized steel shall be painted or not. However, Article 1.2A of 099000 "Painting and Finishing" has a paint system provided for Exterior Galvanized Ferrous Metals. Please clarify if the exposed hot dip galvanized dunnage steel shall be painted or not.	Dunnage supporting steel shall be hot dip galvanized per Specification Section 05 12 00 STRUCTURAL STEEL, **Article 2.10 Galvanizing**. The dunnage shall not be painted.

23.	As per Detail 2 on A1-621, all components of the plow rack assembly shall be painted with OSHA Orange. Please clarify whether the plow rack assembly will be shop finished or field painted. Also, clarify if the wooden snowplow pallets shall also be painted, or if only the steel tube frame shall be painted.	All components of the plow rack assembly will be shop primed and painted. It is not required to paint the wooden snowplow pallets.
24.	Please clarify if the structural steel supporting the roof and polycarbonate panels at the Salt Shed shall be painted or not. (Refer to Drawing S3-202.00.)	All steel members supporting the roof and polycarbonate panels of the salt shed shall be primed and painted.
25.	Please clarify if the structural steel at the Fueling Station shall be painted or not. (Refer to Drawing S5-104.00.)	Fueling station structural steel members are not required to be primed or painted. These steel members are enclosed with metal panels, as shown on Drawings A5-101 and A5-201.
26.	As per the Finish Plan key note #2 and 3 on Drawing A2-901.00, all existing and new walls shall be painted. Please clarify if the existing paint contains lead and requires lead abatement. If existing paint contains lead, please provide Lead Abatement Specification.	For key note #2 and 3 on Drawing A2-901, paint only the new walls with matching color as exiting walls. Existing wall paint to remain as is.
27.	The Contractor's Bid Breakdown Form includes an item for the central stair at the New Building under Section 034500, "Architectural Pre-Case Concrete." The stair treads are described here as pre-cast concrete treads with integral anti slip rake, metal pan and welded attachments. Details on Drawing A1-501 call out the treads as pre-cast as well. However, under Section 055100, "Steel Pan Stairs" in the Contractor's Bid Breakdown Form, there is a second section for the central stair where the treads are described as cast in place treads. Please clarify what is required and edit the Breakdown as required.	Stair tread finish cost is to be carried in Specification Section 03 45 00 ARCHITECTURAL PRE-CASE CONCRETE. Steel stair construction cost is to be carried in Specification Section 05 51 00 STEEL PAN STAIRS.
28.	The specification for the skylight calls out for a "Pressure equalized Fire Rated Skylight". To our knowledge, no such item exists. One of the specified manufacturers "Super Sky" does not make this. Can we provide this accordingly with a thermally broken, insulated glass skylight in lieu of the called out specification? Please advise.	There is no mention of a "Pressure Equalized Fire Rated Skylight" in Specification Section 08 63 01 ALUMINUM-FRAMED SKYLIGHT SYSTEM. Reference **Article 1.5 Performance Requirements** within Specification Section 08 63 01, for additional information.
29.	Confirm the voltage rating for the indoor EM generator in the new building is different from the outdoor generator in the existing building.	The new building emergency generator is 480/277V and the Existing building emergency generator is 208/120V. See revised Specification Section 26 32 13 ENGINE GENERATORS in Attachment B, "Revisions to the Specifications", for clarification.

30.	There are a number of issues with the selection for the hot water coil basis of design manufacturer. The face area of the HW58CDD01802250003R is 2.8125 sq. ft. 6,150 CFM yields 2,186 FPM (opposed to MAX 500 FPM scheduled) 12.3 sq. ft required. 30 GPM feeding 3 tubes (per model number specified) will not equal 10.8" WPD. Please advise.	The Hot Water Coil Schedule has been revised on Drawing M2-002 and the riser diagram with coil freeze protection is indicated on M2-301. Refer to Attachment C, "Revisions to the Drawings", for further information.
31.	Solar Water System Pump tags P-3A, P-3B, P-4A, P-4B, P-5A, P-5B, and Brazed Plate and Frame Heat exchangers tags HXGL – 9, 10 and HCGL- 11, are shown on the schedule on Drawing M-1-004. However, there is no piping to this equipment shown on any of the mechanical drawings. Please advise.	The Solar Water System equipment piping is shown on Drawing M1-401 'Boiler Riser Diagram.'
32.	Specification Section 221513.30, "General-Service Compressed-Air Piping" page 3 calls for the compressed air system piping to be aluminum. Drawing P1-400, however, calls for it to be stainless steel with no further information. Please clarify.	The compressed air system piping is to be aluminum per the specification. Drawing P1-400 has been revised and is included in this addendum - reference Attachment C, "Revisions to the Drawings", for this information.
33.	Drawing P2-102 shows new work for motor oil, hydraulic oil & compressed air; however, it does not agree with the associated flow diagrams on P2-202 & P2-203. Additionally, piping is not sized and a tie-in point for the compressed air is not located. Please clarify.	The air compressor piping riser diagrams and piping sizes in drawings P2-102, 202 and 203 have been revised. Refer to Attachment C, "Revisions to the Drawings", for clarification.
34.	The FTR sections shown on M1-501 are inconsistent with the flow diagrams with regard to the type of FTR for each section (RAD-1 vs RAD-3). Please clarify.	Flow diagram on M1-402 has been revised to match the floor plans M1-501-506. Refer to Attachment C, "Revisions to the Drawings", for this information.
35.	Please tag all FTR sections on the floor plans with the types indicated on the schedule (RAD-1, RAD-2 or RAD-3).	All FTR sections have been tagged in the floorplans M1-503, M1-504, and M1-506. Refer to Attachment C, "Revisions to the Drawings", for this information.
36.	Is the BMS system for Building 2 standalone? Or is it to be interconnected with Building 1?	The BMS for the new building, Building 1, is not connected to the Existing Building (Building 2).
37.	Provide panel schedules and/or more details for the Existing building DDP and PS-B (see dwg E2-300).	Panel PS-B is a new panel installed in Phase 1. There is no work associated with panel PS-B in this Contract. See Addendum 2, Attachment C, "Revisions to the Drawings", for the revised E2-300 Sheet.
38.	Provide panel schedules and/or more details for the following New Building electrical items: a- FCO (DISC SW) (see dwg E1-300) b- LMCP-24 (see dwg E1-101) c- PNL LV-1D (see dwg E1-101) d- PNL SBLV-1F (see dwg E1-103 & E1-300) e- PNL SBLV-2C (see dwg E1-102)	a- FCO: The project will use a Fused Disconnect Switch (FDS) instead of an FCO- see revised E1-300 drawings. Refer to Attachment C, "Revisions to the Drawings", for this information. b- LMCP-24: This is a site lighting relay panel and therefore, there is no schedule provided for this panel. See Drawing E1-305 Electrical Wiring Diagram 4 for panel details. c- PNL LV-1D: For schedules, see Drawing E1-006 Electrical Schedules. d- PNL SBLV-1F: For schedules, see Drawing E1-002 Electrical Schedules. e- PNL SBLV-2C: For schedules, see Drawing E1-003 Electrical Schedules.

39.	Note on Drawing M1-106 states that the solar hot water glycol down to HXGL-11 is in the boiler room; however, this heat exchanger is shown in a completely different location on piping Drawing M1-506. Please clarify.	The reference to HXGL-11 on Drawing M1-506 was replaced with the correct designation of HXGL-10-A and 10-B in Addendum 2, Attachment C, "Revisions to the Drawings". Refer to revised Drawing M1-506 included in Addendum 2 for clarification.
40.	Please advise if a glycol feeder will be required for each glycol loop.	There is no requirement for an independent feeder for each loop. The glycol loop for each H & V and RTU's coil includes a fill in port and glycol concentration testing.
41.	In Specification section 026113, "Excavation, Handling, Transportation and Disposal of Contaminated Materials," Article 1.10 states that the work in this specification section will be paid as part of the allowance. This specification section discusses testing, excavation, stockpiling, removal and reuse of existing on-site material, the importing of suitable fill, dewatering, UST removals, and other associated items of work. What exactly will be paid for under this allowance?	The allowance statement in **Article 1.10** of the Specification Section 02 61 13 covers all work within the Specification Section.
42.	Specification Sections 026113, "Excavation, Handling, Transportation and Disposal of Contaminated Materials" and 310000 "Earthwork," state that the existing on-site material can be used as backfill, as long as the existing material meets the criteria noted in the specifications. Based upon our review of the Contract Documents, we are unable to determine if the on-site material will be able to meet the specified criteria or if there will be sufficient quantity of suitable on-site material that can be used as backfill for the needs of this project. Should we assume that all on-site material will be able to be utilized as backfill? Or, if a large quantity of on-site material is not acceptable and will need to be disposed of off-site, and imported off-site material will be required to cover the shortfall, will the allowance noted in Section 026113 cover the cost for removal and disposal of on-site material, and the cost of importing suitable off-site material?	The Contractor must review the available sampling data, including the *Louis Berger October 12, 2018 Phase II Environmental Site Investigation Report*, and determine which materials may be reused onsite as backfill. If onsite material is not reusable as backfill, imported material, in accordance with the specifications and Contract Documents, may be used to meet Project needs.
43.	Specification Sections 026113, "Excavation, Handling, Transportation and Disposal of Contaminated Materials" discusses the requirements for dewatering. Will a dewatering filtration system be required on this project, and if so, will the costs to setup, operate, maintain, and remove the system be included in the allowance shown in Section 026113, Article 1.10? If any dewatering costs are to be included in the base bid, please provide the dewatering requirements.	Dewatering costs will be covered in the allowance within **Article 1.10** of this Specification Section. The need for dewatering must be determined by the Contractor based on geotechnical and environmental reports provided in the Contract Documents. If needed, the Contractor (or subcontractor) must design the system and obtain permits for Dewatering.
44.	Please confirm that all full time environmental consulting, testing, excavation & disposal as per Specification section 026113, "Excavation, Handling, Transportation and Disposal of Contaminated Materials" will be paid on a T&M basis as part of the allowance.	Full time environmental consulting, testing, excavation & disposal will be covered under **Article 1.10** in this Specification Section.

45.	Please confirm that, as per the Geotechnical Report, all soils excavated for this project will not be suitable for backfill and will have to be hauled away and disposed of properly.	Per page 23 of the Geotechnical Report, natural soil materials excavated from within the site conforming to the gradation criteria can be re-used as structural fill. Contractor shall also refer to the Division 31 Earthwork Specifications and the Phase II Site Investigation regarding re-use of any contaminated soils.
46.	How are the tension connectors supposed to attach to the timber piles? Also, there is no detail for the tension connectors. Please advise and provide detail.	The proposed building does not require the tensile capacity of the timber piles.
47.	On page 21 of the Geotechnical Report, there is a reference to a "private sewer & manholes...below Arthur Kill Rd" which are to be supported by a "concrete cradle and 50-foot timber piles." Please confirm this work is not a part of this Contract. Also, please confirm that no water, sanitary or storm piping and precast structures require concrete cradles or pile support.	Confirmed. The private sewer is not in this scope of work. Water, sanitary sewer, and storm sewer piping or structures does not require concrete cradles or pile support.
48.	In reference to Specification Section 323300, "Site furnishings:" a- Article 2.4 Trash and Receptacles lists no manufacturers. Please provide us with a list of manufacturers or advise if the DSNY will be providing these directly at no cost. b- Article 2.5 Bicycle Racks lists no manufacturers. Please provide us with a list of manufacturers or advise if the NYDOT will be providing these directly at no cost.	a- Exterior trash receptacles are DSNY standard item to be supplied direct by DSNY. b- The NYC DOT Standard Large Hoop Bicycle rack is manufactured by Campbell Group Foundry. Two additional options have been provided in this Addendum: Please refer to revised Specification Section 32 33 00 SITE FURNISHINGS, in Attachment B, "Revisions to the Specifications", for more information.
49.	Please provide additional details and complete specifications for the four CACL tanks as shown on the Contract L series Drawings.	CACL tanks and pumps are to be supplied directly by DSNY.
50.	For the new building, O.C spacing of diagonal cross bracing for joists is not shown on the Drawings. Please clarify.	The steel joist framing spans and spacing, including depths with the design criteria and details, are in the Contract Documents. Refer to Specification Section 05 21 00 STEEL JOIST FRAMING **Article 1.5 Subsection G.**
51.	Specification section 034500, "Architectural Pre-Cast Concrete" lists 3 manufacturers. However, the manufacturer for Basis of Design – High Concrete Group, and one other manufacturer listed, BPDL, are not bidding on the project. Since this is a Special Experience item, we request that more manufacturers be provided.	Additional manufacturers have been provided for in revised Specification Section 034500 ARCHITECTURAL PRE-CAST CONCRETE. Refer to Attachment B, "Revisions to the Specifications", for this information.

52.	In review of the Drawings from Addendum 2, the Plumbing Drawing P2-101 seems to have all the generator piping on this drawing: 1. Does this mean that Drawing P2-105 is eliminated from the bid set? 2. Is the generator still located on the roof?	1. No, Drawing P2-105 has not been eliminated from the bid set. 2. No, the generator is no longer on the roof and was relocated to the ground floor - see Addendum 2 for revised Sheets P2-101, E2-101, E2-103, E2-104 and E2-300.
53.	Unless otherwise told, we are taking the assumption that the generator is no longer on the roof, and drawing P2-105 is eliminated.	The generator was relocated from the roof to the ground floor - see Addendum 2 for revised Sheets P2-101, E2-101, E2-103, E2-104 and E2-300. Drawing P2-105 is still in the bid drawing set.
54.	Heat trace detail shown in Addendum #2 Drawing P1-302 contradicts specification 22-05-33. Please clarify.	Provide heat trace as indicated in Specification Section 22 05 33, self-regulating heat trace cable. The heat trace detail on P1-302 has been replaced; Refer to Attachment C, Revisions to the Drawings, for this information.
55.	In Addendum #2, a "glycol make up tank" was added to Drawing M1-103. Is this a glycol makeup system with pumps? Please provide more information. Please note that this equipment is not shown on the piping drawings.	The glycol system consists of an expansion tank, pump, valves, fill in, etc.-see detail for coil installation piping. This detail is applicable to all H &V and RTU units. Connection from main distribution hot water piping to branches up to roof units will not be included on floor plans.
56.	Addendum #2 says to see drawing M1-301 for filling of glycol. The system can't be pressurized by way of the funnel shown. Please clarify.	Glycol system coil is a closed loop that does not need to be pressurized. The funnel shown on M1-301 is used for filling the glycol loop once per year after the solution concentration drops below 40%.
57.	Drawing PV-002 shows two 1,400 Gallon Tanks. They are not shown on the HVAC Drawings and there is no information given. Please provide.	The two (2) 1435 gallon hot water storage tank for the solar hot water is part of the bid scope of work. Tanks are shown in the Boiler Room on sheet M1-104.
58.	a) Title block shows that drawing PH-010 is for the Phase "1" Project. Please confirm that this drawing is not applicable to the Phase 2 project (contract S136-367) b) Please confirm that electrical work to be done in the existing building (B1) can be performed during normal working hours as per drawings PH-020.00 and PH-030.00.	a) The Phase I Phasing Diagrams on sheet PH-010 are for reference only and are not for Phase II construction. Bidders must familiarize themselves with the phasing of the entire project, shown on sheets PH-010, 020, and 030, for specific takeover and sequencing requirements. b) Refer to B2 on Sheet PH-010 for the existing building access requirements.
59.	Please confirm there are no security cameras to be furnished and installed under this contract. Drawing SEC1-100 shows a call-out note saying "All camera devices installed under a separate contract" and none of the "SEC" drawings show cameras but drawings E1-101, E1-102, E1-103, E1-104 and E1-106 do show some cameras.	Refer to Addendum 1, Question 43 for response. Cameras will be furnished and installed by owner.

60.	Please be advised that 2/17/2020 the day before the bid is union holiday and most of the union companies will be closed. Please provide bid extension so we can prepare bid and obtain all required vendor quote and subcontractor prices.	Bid Opening Date will be moved to 2/21/2020
61.	Can you please advise if the Bid Breakdown Sheet issued with Addendum #3 was revised, or if it is simply a copy of the original sheet? We find no changes.	Columns on the excel file were fixed to be adjustable width. Refer to Addendum 3, Question 52 for clarification.
62.	Can you please confirm the Final Completion Date associated with this Contract? We understand Substantial Completion is required within 731 days of NTP.	Refer to Addendum 3 for revised Schedule A. Substantial Completion for Milestone 1 (Article 16) is 731 days, but the time of Substantial Completion for the entire project in Article 14 is 915 ccds.

DDC PROJECT #: S136-367 – Phase 2

PROJECT NAME: Staten Island 1 & 3 Garage – Phase 2

ATTACHMENT B – REVISIONS TO THE SPECIFICATIONS

The following Sections are included with this addendum:

Specification Section 12 24 13 Window Shades

The following Sections have been modified:

Specification Section 03 45 00 Architectural Pre-Cast Concrete (Revised as per below)

Replace: Article 2.1 'Manufacturers'

A. Basis of Design: Subject to compliance with requirements, provide High Concrete Group LLC. Architectural precast concrete or comparable product by one of the following:
    1. BPDL
    2. Universal Concrete
    3. Strescon Limited
    4. Unistress Corporation
    5. Tri-Krete
    6. Joseph P. Carrara & Sons
    7. MGA Cast Stone
    8. Or approved equal

Specification Section 05 50 00 Miscellaneous Metals (Revised as per below)

Add: Article 1.2 'Summary,' Subsection A, item 15:

15. Preassembled Equipment Cage

Add: Article 2.6 'Miscellaneous Metals Items', Subsection M.:

M. Preassembled Equipment Cage

1. Provide a 5'-4" x 5'-4" x 8'-5" preassembled wire mesh security partitions with an integral ceiling and a 3'-0" wide hinged gate.
2. Panels are to be constructed of 10 gauge wire welded into high-strength 2" x 2" center to center square rectangular mesh and secured to a 1-1/4" x 1-1/4" steel 13 gauge roll form angle frame on all four sides for complete security.

3. Basis of Design: Subject to compliance with requirements provide a preassembled equipment cage by Cisco-Eagle #4W558-C 4-Wall Welded Wire Partition, or comparable product by one of the following:

    a. Global industrial
    b. Grainger
    c. Maybury
    d. Or approved equal

Specification Section 08 33 23 Overhead Coiling Doors (Revised as per below)

Replace: Part 2.1, Manufacturers:

2.1 MANUFACTURERS

A. Exterior Overhead Coiling Doors
   1. Basis of Design: Subject to compliance with requirements, provide McKeon Door Company; power operated Climateguard, IS3000 Series, Model IS3018-ADF-G (Heavy Duty / High Cycle) overhead coiling insulated service doors or comparable product by one of the following:
      a. Overhead Door Corp.
      b. Cornell Iron Works Inc.
      c. Or approved equal

B. Interior Fire-Rated Overhead Coiling Doors
   1. Basis of Design: Subject to compliance with requirements, provide McKeon Door Company; Auto Set Vertical Coiling without Egress, Model FSFD-M-G overhead coiling insulated service doors or comparable product by one of the following:
      a. Overhead Door Corp.
      b. Cornell Iron Works Inc.
      c. Or approved equal

Specification Section 14 60 50 Single Girder Crane (Revised as per below)

Add: Article 1.2 Summary, Subsection A, item 2.

2. Contractor provided and installed runway beams.

Add: Article 2.1 Motorized Overhead Crane, Section C, insert 12.

12. Contractor provided and installed runway beams shall be attached to the bottom flange of the building structure at points indicated on Structural Drawing S1-103C. Contractor to provide all necessary connections required to connect runway beams to bottom flange of building structure.

Specification Section 26 32 13 Engine Generators (Revised as per below)

Replace: Article 2.3 'Generator', subsection A.:

A. Rating: The generator shall be rated for standby electrical service as follows: 500 kW/625 kVA, at 0.8p pf, 120/208 volts, 3-phase, 60 Hz, 1,800 rpm for the Existing Building. The New Building generator shall meet the same requirements, with a voltage of 277/480 volts.

Attachment B
Addendum #4
February 12, 2020

Specification Section 32 33 00 Site Furnishings (Revised as per below)

Replace: Article 2.5 Bicycle Racks, Parts A

A. Basis of Design: Subject to compliance with requirements, provide:

1. Bicycle Racks shall be NYCDOT standard "Large Hoop" bicycle racks manufactured by Campbell Group Foundry, 800 Bergen Street, Harrison, New Jersey 07029, Tel: (973) 483-5480.
   a. Mounting: Per Manufacturer's instructions.
   b. Finish/Color: DSNY Standard Color.

or comparable product by one of the following:

2. BRHS-101 Bicycle Rack, manufactured by by Victor Stanley, P.O. Drawer 330, Dunkirk, MD 20754, (800) 368 -2573, www.victorstanley.com/
   a. Mounting: Per Manufacturer's instructions.
   b. Finish/Color: Silver

3. "Ring" Bike Rack, manufactured by QCP , 7800 E. Michigan Ave., Kalamazoo, MI 49048, (800) 430-6209, www.landscapeforms.com
   a. Mounting: Per Manufacturer's instructions.
   b. Finish/Color: Metallic Finish, Silver

4. Or approved equal

SECTION 12 24 13
Window Shades

PART I - GENERAL

1.1 RELATED DOCUMENTS

A. The following documents apply to all required work for the Project: (1) the Contract Drawings, (2) the Specifications, (3) the General Conditions, (4) the Addendum and (5) the Contract (City of New York Standard Construction Contract).

1.2 SUMMARY

A. Section includes:

1. Manually-operated window shades.

2. Accessories and hardware required for complete installation and operation.

1.3 QUALITY ASSURANCE

A. Refer to DDC General Conditions.

B. Provide assemblies which are complete assemblies produced by one manufacturer, including hardware, accessory items, mounting brackets, and fastenings.

1.4 SUBMITTALS

A. Refer to DDC General Conditions.

B. Product Data: For each type of product indicated. Include styles, material descriptions, construction details, dimensions of individual components and profiles, features, finishes, and operating instructions.

C. Shop Drawings: Submit floor layout and elevations, indicating location of all window treatments, mechanism details, type and size of each unit, type and location of controls. Shop drawings must also show seaming of shade fabric. Submit shop drawings showing details of installation and relation to adjoining construction and conditions.

D. Samples for Initial Selection: Provide samples of shade fabric in manufacturer's standard available colors.

E. Samples: Submit full size sample of each shade type for Commissioner's acceptance.

F. Mock-Up

1. Install each type of shade assembly on one complete column bay for Commissioner's acceptance of installation details, workmanship and operation.

2. Approved mock-up shall be used as the standard for installation of work under this Section, and no further installation work shall proceed before Commissioner's acceptance of the mock-up.

1.5 WARRANTY

A. Manufacturer's standard non-depreciating limited warranty covering all hardware, chains, motors, motor control system and shade cloth.

1. Warranty Period: 25 years from date of Substantial Completion.

PART II - PRODUCTS

2.1 MANUALLY OPERATED SHADES

A. Provide manually operated shade system manufactured by MechoShade Systems LLC, Rollease Acmeda, Sol-R-Veil Inc. or approved equal conforming to standards specified herein.

B. Shade system shall be pre-engineered overrunning clutch design that disengages to 90% during the raising and lowering of the shade. The brake can stand a pull force of 40 lb. in the stop position. Requires no adjustment. Self-lubricating hub on to which the brake system is mounted includes an articulated brake assembly which ensures smooth, non-jerky operation in raising and lowering the shades. System shall include the following components:

1. Provide shade hardware allowing for the removal of shade roller tube from brackets without removing hardware from opening and without requiring end or center supports to be removed.

2. Provide shade hardware that allows for removal and remounting of the shade bands without having to remove the shade tube, drive or operating support brackets.

3. Provide for universal, regular and offset drive capacity, allowing drive chain to fall at front, rear or non-offset for all shade drive end brackets. Universal offset shall be adjustable for future change.

4. Provide shade hardware system that allows for removable regular and/or reverse roll fascias to be mounted continuously across two or more shade bands without requiring exposed fasteners of any kind.

5. Provide shade hardware system that allow for operation of multiple shade bands (multi-banded shades) by a single chain operator. Connectors shall be offset to ensure alignment from the first to the last shade band.

6. Provide shade hardware constructed of minimum 1/8" thick plated steel or heavier as required to support 150% of the full weight of each shade.

7. Drive Bracket/ Brake Assembly:

a. Drive bracket shall be fully integrated with accessories including, but not limited to, fascia, channels, center supports and connectors for multi-banded shades.
b. The entire assembly shall be fully mounted on the steel support bracket, and fully independent of the shade tube assembly, which may be removed and reinstalled without effecting the roller shade limit adjustments.

c. Drive Chain: #10 qualified stainless steel chain rated to 90 lb. minimum breaking strength. Nickel plate chain shall not be accepted.

C. Shade Bands: Construction of shade band includes the fabric, the hem weight, hem pocket, shade roller tube, and the attachment of the shade band to the roller tube. Sewn hems and open hem pockets are not acceptable.

1. Hem Pockets and Hem Weights: Fabric hem pocket with RF welded seams (including welded ends) and concealed hem weights. Hem weights shall be of appropriate size and weight for shade band. Hem weight shall be continuous inside a sealed hem pocket. Hem pocket construction and hem weights shall be the same, for all shades within one room.

2. Shade Band and Shade Roller Attachment:

a. Provide extruded aluminum shade roller tube of a diameter and wall thickness required to support shade fabric without deflection. Provide for positive mechanical engagement with drive/ brake mechanism.
b. Provide for positive mechanical attachment of shade band to roller tube; shade band shall be made removable/ replaceable with a snap-on/snap-off spline mounting, without having to remove shade roller from shade brackets.
c. Mounting spline shall not require use of adhesives, adhesive tapes, staples and/or rivets.

2.2 SHADE CLOTH

A. Solar Shade Cloth: Where indicated solar shade the weave, color and optical shall be Eco-veil 1350 by MechoShade, 3000 HT by Rollease Acmeda, G20 Series by Sol-RVeil Inc. or approved equal. Color as approved by Commissioner

2.3 FABRICATION

A. The shade and the fabric shall hang flat without buckling or distortion. The edge, when trimmed, shall hang straight without curling or raveling. An unguided roller shade cloth shall roll true and straight, without shifting sideways more than +/- 1/8" in either direction due to warp distortion or weave design. Shades shall fill window openings from head to sill and jamb to jamb.

PART III - EXECUTION

3.1 EXECUTION REQUIREMENTS

A. Refer to DDC General Conditions for execution requirements.

3.2 INSTALLATION OF MANUAL ROLLER SHADES

A. Install roller shades level, plumb, square, and true according to manufacturer's written instructions and located so shade band is not closer than 2" to interior face of glass. Allow proper clearances for window operation hardware.

B. Adjust and balance roller shades to operate smoothly, easily, safely, and free from binding or malfunction throughout entire operational range.

END OF SECTION 12 24 13

DDC PROJECT #: ***S136-367 – Phase 2***

PROJECT NAME: Staten Island 1 & 3 Garage – Phase 2

ATTACHMENT C – REVISIONS TO THE DRAWINGS

The following drawing sheets were revised as noted with this Addendum:

LANDSCAPE

REFER TO L-401 Planting Plan – Trees and Shrubs

1. Trees and Shrubs: Remove note "EXISTING BERM VEGETATION, REMOVE INVASIVE / NON-NATIVE SPECIES, MAINTAIN NATIVE TREES AND SHRUBS."

REFER TO L-402 Planting Plan– Trees and Shrubs

1. Trees and Shrubs: Remove note "EXISTING BERM VEGETATION, REMOVE INVASIVE / NON-NATIVE SPECIES, MAINTAIN NATIVE TREES AND SHRUBS."

ARCHITECTURAL – NEW BUILDING

REFER TO SHEET A1-010, GLASS WALL NOTES

1. Under 'CW01 Exterior Curtainwall,' replace: 1" IGU, CLEAR (GL-03) with 1-3/4", TINTED (GL-01)

REFER TO SHEET A1-201

1. Provide manual window shades as noted below. See Spec Section 122413 for details.
2. Refer to architectural drawing A1-201 and 7/A1-811 for window dimensions and shade pocket details.
3. At 1st Floor level:
    a. On the North Elevation, 12 windows, window type W1GL-01
    b. On the East Elevation, 5 windows, window type W1GL-01
    c. On the South Elevation, 3 windows, window type W1GL-01
4. At 2nd Floor level:
    a. On the North Elevation, 6 windows, window type W1GL-01
    b. On the South Elevation, 6 windows, window type W1GL-01
    c. On the West Elevation, 40 windows, window type W1GL-01

ARCHITECTURAL – EXISTING BUILDING

REFER TO SHEET A2-901

1. In room G02A BME Small Vehicle Maintenance Bay, the ER-01 (Epoxy Resin) floor finish is to be replaced with SC-01 (Sealed Concrete) with a steel trowel finish.

The following sketches and drawings are amended and included with this Addendum:

CIVIL

REFER TO C-501, UTILTY PLAN: ENLARGEMENT 1

1. Addition of Oil Interceptor between Sanitary MH #'s 6 & 7
2. Revision of Invert's for Sanitary MH #6

REFER TO C-512, DETAILS: UTILITY DETAILS 2

1. Addition of Detail #3: Oil Interceptor

STRUCTURAL – NEW BUILDING

REFER TO SHEET S1-002, LIVE LOAD DIAGRAMS

1. DSNY Truck live load diagram added to the sheet
2. Refer to S1SK-001

REFER TO SHEET S1-103C

1. Added two crane loading points along Gridline M
2. Sizing correction for the beam on Gridline M
3. Refer to S1SK-002

REFER TO SHEET S1-420, TYPICAL STEEL JOIST DETAILS

1. Added Bridging Spacing table to detail 7, Bolted Cross Bridging
2. Revised notes on Detail 8, Typical Rooftop Mechanical Unit Supports

ARCHITECTURAL – NEW BUILDING

REFER TO SHEET A1-201

1. Refer to A1SK-036 for a new shade pocket detail at the lower level personnel

REFER TO SHEET A1-401

1. Detail callouts, partition types and partition transition line added to wall section 3, Typical Recessed Pocket Entry
2. Refer to A1SK-037 for revisions.

REFER TO SHEET A1-421

1. Refer to A1SK-036 for a new shade pocket detail at the lower level personnel

REFER TO SHEET A1-422

1. Detail 13, Sunshade at Lunchroom. Modified the sunshade detail and dimensions
2. Reference Sketch: A1SK-038 included with this Addendum

MECHANICAL – NEW BUILDING

REFER TO DRAWING M1-003

1. Revised power washer exhaust fans schedule.

REFER TO DRAWING M1-004

1. Revised Pump schedules.

REFER TO DRAWING M1-402, M1-404

1. Revised hot water piping distribution to radiators

REFER TO DRAWING M1-503, M1-504, M1-506

1. Added radiators tags and revised air curtain glycol loop piping

REFER TO DRAWING M1-600

1. Removed BMS panel line diagram.
2. Removed BTU meter schedule.
3. Revised Network Control Panel line diagram.
4. Revised Network Architecture Schematic.
5. Added "BTU Energy Measuring Station".
6. Added "Sequence of Operations Exhaust Fans".

7. Added "Sequence of Operations" for Mechanical, Electrical and Plumbing.

REFER TO DRAWING M1-601, M1-602

1. Added pump to glycol loop.
2. Added "DO", "DI", "Pump Start/Stop", "Pump Status" tags.

REFER TO DRAWING M1-605

1. Removed "Sequence of Operations – Destratification Fans".

MECHANICAL – EXISTING BUILDING

REFER TO DRAWING M2-002

1. Revised rooftop schedule and removed hot water coil schedule

PLUMBING – NEW BUILDING

REFER TO DRAWING P1-102

1. Revised cold water piping size in Repair Bay 105 and District Repair Lockers (M) 128.

REFER TO DRAWING P1-202

1. Riser Diagram revised to include a missing cold water line connection to the 2nd floor drinking fountain and hose bib along axis line 8.
2. Provided basis-of-design model for shower mixing valve. For a list of additional manufacturers, see specification section 221119

REFER TO DRAWING P1-302

1. Heat trace detail replaced to match the requirements of specification section 22 05 33

REFER TO DRAWING P1-400

1. Revised air compressor piping material

PLUMBING – EXISTING BUILDING

REFER TO SHEET P2-102

1. Revised plumbing plan. Added existing compressed air piping, air compressor and added pipe sizes.

REFER TO SHEET P2-202

1. Revised Lubrication Borough Repair Plumbing Riser to show existing pipe sizes and new pipe connection to new compressed air hose location.

REFER TO SHEET P2-203

1. Revised motor oil and hydraulic oil dispensing system riser diagram to show new compressor and piping connected to existing compressed air system.

ELECTRICAL – NEW BUILDING

REFER TO DRAWING E1-002
1. Revised panel "SBLV-1D" and panel "SBLV-1F" to include new "GLWP" pumps.

REFER TO DRAWING E1-004
1. Revised panel "SBHV-1G" to include pump controller for RTU-1 & 2.

REFER TO DRAWING E1-100
1. Revised to show feeder run from panel "PP-REC" to transformer "T-REC".

REFER TO DRAWING E1-102
1. Added transformer for "Panel PP-REC".

REFER TO DRAWING E1-103
1. Added pumps "GLWP-9A/9B" for RTU's.

REFER TO DRAWING E1-104
1. Added controller to boiler room for new "GLWP" pumps for RTU-1 & 2.

REFER TO DRAWING E1-300
1. Revised riser to show better locations of panel "PP-REC" and transformer "T-REC".
2. Changed Fused Cut-Out(FCO) for Fused Disconnect Switch(FDS) on panel "EMHV-SL".

REFER TO DRAWING E1-500
1. Added transformer "T-REC" to Elec. Service room.

ELECTRICAL – EXISTING BUILDING

REFER TO DRAWING E2-101
1. Added to show panel P-SB on far East wall.

ELECTRICAL – HOUSEHOLD GOODS

REFER TO DRAWING E4-101
1. Added panel PP-REC and feeder run.

Attachment D
Addendum #4
February 12, 2020

DDC PROJECT #: ***S136-367 – Phase 2***

PROJECT NAME: Staten Island 1 & 3 Garage – Phase 2

ATTACHMENT D – REVISIONS TO THE ADDENDUM TO THE GENERAL CONDITIONS

Delete page 27 and replace with revised page 27R, included with this Addendum.

079201	Exterior Joint Sealants (Structural Silicone)	20 years
084001	Glazed Storefronts and Curtain Wall System Finish	20 years
084519	Polycarbonate Wall System	5 years
084900	Fire Rated Glass and Framing Systems	3 years
086301	Aluminum Framed Skylight Systems Finish	20 years
087100	Door Hardware (Closers - Mechanical)	30 years
087100	Door Hardware (Closers - Mechanical - Concealed)	15 years
087100	Door Hardware (Automatic Operators)	2 years
087100	Door Hardware (Exit Devices - Mechanical)	3 years
087100	Door Hardware (Exit Devices - Electrified)	1 year
087100	Door Hardware (Locksets - Mechanical mortise Locks)	3 years
087100	Door Hardware (Locksets - Electrified)	1 year
087100	Door Hardware (Continuous Hinges)	Lifetime
087100	Door Hardware (Key Blanks)	Lifetime
088000	Exterior Glazing (Glass)	10 years
088000	Exterior Glazing (Coated Glass Products)	10 years
088000	Exterior Glazing (Laminated Glass)	10 years
088000	Exterior Glazing (Insulation Glass)	10 years
088010	Interior Glass and Glazing (Coated Glass Products)	5 years min.
088010	Interior Glass and Glazing (Laminated Glass)	5 years
089000	Louvers (Finish)	20 years
096500	Resilient Tile Flooring	5 years
122413	Window Shades	25 years
142400	Hydraulic Elevators	1 year
220533	Heat Tracing for Plumbing Piping (Heating Cable)	10 years
221513	General-Service Compressed-Air Piping (Aluminum Piping)	10 years
231113	Emergency Generator Fuel oil storage and distribution system (Tank)	30 years
235100	HVAC Breeching, Chimneys and Stack	10 years
235233	Condensing Boilers	25 years
235233	Condensing Boilers (Heat Exchanger)	25 years
235233	Condensing Boilers (Heat Exchanger Corrosion)	12 years
235233	Condensing Boilers (Parts)	2 years
235600	Solar Hot Water System (Performance)	10 years
235600	Solar Hot Water System (Mounting System)	20 years
238126	Split System Air Conditioners	5 years
238129	Variable Refrigerant Flow HVAC System	1 year
262413	Switchboards	5 years
262416	Panelboards	5 years
263213	Engine Generators	3 years
265100	Interior Lighting (Electronic Ballasts)	5 years
265100	Interior Lighting (Electromagnetic Ballasts)	3 years
265100	Interior Lighting (T5 and T8 Fluorescent Lamps)	2 years
265100	Interior Lighting (LED luminaires)	5 years
265113	Architectural Luminaires, Lamps, Ballasts	5 years
270200	Structured Cabling	20 years
274000	Audio Visual Communication	20 years
281600	Access Control & Video Surveillance	20 years
312500	Soil Erosion and Sediment Control (Temporary Erosion Control Materials)	1.5 years
312500	Soil Erosion and Sediment Control (Permanent Erosion Control Materials)	3 years
323119	Decorative Metal Fence and Gate (Product)	3 years
323119	Decorative Metal Fence and Gate (Finish)	20 years
481400	Solar Energy Electrical Power Generation System	10 years
481400	Solar Energy Electrical Power Generation System (Power Output)	25 years

(3) Application: The obligations under the warranty for the periods specified above shall apply only to the manufacturer of the material or equipment, and not to the Contractor or its Surety; provided, however, the Contractor retains responsibility for obtaining all required warranties from the manufacturers and delivering the same to the Commissioner.

(4) Other Provisions: The warranty requirements set forth in this Schedule B are also included in the

CITY OF NEW YORK
DEPARTMENT OF DESIGN AND CONSTRUCTION
DIVISION OF PUBLIC BUILDINGS

ADDENDA CONTROL SHEET

BID OPENING DATE: February 21, 2020

PROJECT No. : S136-367

TITLE: STATEN ISLAND 1 & 3 GARAGE – PHASE 2

ADDENDA ISSUED	NO. OF DWG	DATE	APPROVED BY: ARCHITECTURE/ ENGINEERING	GENERAL COUNSEL
#1 Revised Bid Opening Date; Questions from Bidders and Responses to Questions; Revisions to the Bid Booklet; Revisions to Volume 2; Revisions to the Specifications; Revisions to the Drawings		1/16/2020		
#2 Revised Bid Opening Date; Questions from Bidders and Responses to Questions; Revisions to the Specifications; Revisions to the Drawings		1/29/2020		
#3 Revised Bid Opening Date; Questions from Bidders and Responses to Questions; Revisions to the Specifications; Revisions to the Drawings; Revisions to Volume 2; Revisions to the Bid Booklet; Revisions to the Addendum to the General Conditions		2/6/2020		
#4 Revised Bid Opening Date; Questions from Bidders and Responses to Questions; Revisions to the Specifications; Revisions to the Drawings; Revisions to the Addendum to the General Conditions		2/12/2020		
#5 Questions from Bidders and Responses to Questions; Revisions to the Bid Booklet		2/14/2020	[signature]	2/14/2020 [signature]

THE CITY OF NEW YORK
DEPARTMENT OF DESIGN AND CONSTRUCTION
DIVISION OF PUBLIC BUILDINGS

February 14, 2020

ADDENDUM No. # 5

FOR FURNISHING ALL LABOR AND MATERIAL NECESSARY AND REQUIRED FOR:

S136-367
Staten Island 1 & 3 Garage – Phase 2

This addendum is issued for the purpose of amending the requirements of the Bid and Contract Documents and is hereby made a part of said Bid and Contract Documents to the same extent as though it were originally included therein.

The bidder is advised that the items listed below apply to the project:

1. **Bidders Questions and Responses to Questions:**
   See Attachment A.

2. **Revisions to the Bid Booklet:**
   See Attachment B.

THIS ADDENDUM MUST BE SIGNED BY ALL BIDDERS AND ATTACHED TO THEIR BIDS.

If additional information is required, please contact the Department of Design and Construction, Contract Section at (718) 391-1041, by email at CSB_projectinquiries@ddc.nyc.gov or by fax at (718) 391-2627.

Glenn Bruce FOR B.P.
Bogdan Pestka, FAIA
Assistant Commissioner
DEP / Sanitation / Transportation /
Tanks Programs

Name of Bidder
By: _____

Attachment A
Addendum #5
February 14, 2020

DDC PROJECT #: ***S136-367 – Phase 2***

PROJECT NAME: Staten Island 1 & 3 Garage – Phase 2

ATTACHMENT A - BIDDERS QUESTIONS AND DDC RESPONSES

No.	Bidders Questions	DDC Responses
1.	As per the Bid Breakdown issued with Addenda#03, the Structural Steel at Salt Shed has been listed under Specification 078123, "Intumescent Fireproofing." However, we didn't see anywhere on the Contract Drawings where salt shed steel calls for intumescent fireproofing. Please clarify.	No intumescent fireproofing is required for salt shed structural steel. Refer to Attachment B, Revisions to the Bid Booklet, for updated information.
2.	On the Bid Breakdown Specification 033300, "Architectural Cast in Place Concrete" lists precast concrete stairs in the existing building. However, there are no precast concrete stairs in the existing building. Please clarify.	03 33 00 is for Cast-in Place Concrete, not precast. Refer to Attachment B, Revisions to the Bid Booklet, for updated information.

Attachment B
Addendum #5
February 14, 2020

DDC PROJECT #: ***S136-367 – Phase 2***

PROJECT NAME: **Staten Island 1 & 3 Garage – Phase 2**

ATTACHMENT B – REVISIONS TO THE BID BOOKLET

Delete pages 21-5 and 21-26 and replace with 21-5R and 21-26R, included with this Addendum.

Refer to electronic excel file of the revised Bid Breakdown, included with this Addendum.

Department of Design and Construction

CONTRACTOR'S BID BREAKDOWN FORM

CONTRACT 1 - GENERAL CONSTRUCTION

Project: Staten Island 1 & 3 Garage - Phase II
Location: 1000 West Service Road, Staten Island, NY 10314
Bidder:

DDC ID: S136-367
Sponsor Agency: DSNY

CSI Number	Description	Quantity	Unit	Unit Cost of Material	Total Cost of Material	Unit Cost of Labor	Total Cost of Labor	Total Cost: Materials and Labor
	Reinforcement		LB					
	Formwork		SF					
	9" Concrete SOG. @ Top of Fueling Station & 9" Concrete Suspended Slab. @ Top of Fueling Station							
	Concrete		CY					
	Rebar - #5 @ 12" assumed		LB					
	Formwork		SF					
	Gas Dispenser Pad		SF					
	Column Foundation							
	Pier, 2'6"L x 2'6"W x 16'0"L		CY					
	Rebar - 80LBS/CY		LB					
	Formwork		SF					
	F-14 Spread Footing		CY					
	Rebar - 90LBS/CY		LB					
	Formwork		SF					
	Tank Structural Piers							
	16" X 16" CMU Pier Grouted w/ 4 Bars of #6 per Pier & Truss type Horr. Reinf @ 16" O.C		EA					
	Subtotal							
03 3300	**ARCHITECTURAL CAST-IN-PLACE CONCRETE**							
	Existing Building							
	Cast in place concrete stair from repair shop to garage level overall flight length 9'		FLT					
	Subtotal							
03 4500	**ARCHITECTURAL PRE-CAST CONCRETE**							
	New Building							
	Exterior Partitions							
	Rainscreen							

Department of Design and Construction

CONTRACTOR'S BID BREAKDOWN FORM

CONTRACT 1 - GENERAL CONSTRUCTION

Project: Staten Island 1 & 3 Garage - Phase II
Location: 1000 West Service Road, Staten Island, NY 10314
Bidder:

DDC ID: S136-367
Sponsor Agency: DSNY

CSI Number	Description	Quantity	Unit	Unit Cost of Material	Total Cost of Material	Unit Cost of Labor	Total Cost of Labor	Total Cost: Materials and Labor
	1 1/2" Galvanized hat channel @ Roof Parapet (Details @ A1-421)		LF					
	1 1/2" Galvanized hat channel @ Mechanical terrace parapet (Details @ A1-423)		LF					
	Non-Penetrative Protective Guardrail - 3'6" H (Details @ A1-421)		LF					
	4" x 3" Extruded alum angle w/ drip edge @ Roof Parapet (Details @ A1-421/13 & 14)		LF					
	Rooftop hatch & ladder		EA					
	4"x3" Extruded Aluminum angle w/ drip edge @ Roof Parapet		LF					
	Salt Shed							
	Overflow Scuppers @ Salt shed		EA					
	Subtotal							
07 8100	**SPRAYED FIRE RESISTIVE MATERIALS**							
	Main Building							
	Fireproofing - Spray		LS					
	8" closed cell spray foam insulation Fire stopping smoke seal and insulation		SF					
	PT-04 - Spray Fireproofing		LS					
	Subtotal							
07 8123	**INTUMESCENT FIREPROOFING**							
	Main Building							
	Fireproofing - Instuscement Paint		TN					
	PT-02 - Intumescent Paint on Steel		SF					
	Subtotal							

FMS ID: **S136-367**

THE CITY OF NEW YORK
DEPARTMENT OF DESIGN AND CONSTRUCTION
DIVISION OF PUBLIC BUILDINGS
30-30 THOMSON AVENUE LONG ISLAND CITY, NEW YORK 11101-3045
TELEPHONE (718) 391-1000 WEBSITE www.nyc.gov/buildnyc

Department of Design and Construction

Contract for Furnishing all Labor and Material Necessary and Required for:

CONTRACT NO. 1 **GENERAL CONSTRUCTION WORK**

Staten Island 1 & 3 Garage - Phase 2

LOCATION: **1000 West Service Road**
BOROUGH: **Staten Island, NY 10314**
CITY OF NEW YORK

Contractor

Dated _____ , 20____

Entered in the Comptroller's Office

First Assistant Bookkeeper

Dated _____ , 20____

Department of Design and Construction

PROJECT ID: S136-367

THE CITY OF NEW YORK
DEPARTMENT OF DESIGN AND CONSTRUCTION
DIVISION OF PUBLIC BUILDINGS

30-30 THOMSON AVENUE
LONG ISLAND CITY, NEW YORK 11101-3045
TELEPHONE (718) 391-1000
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VOLUME 2 OF 3

PROJECT LABOR AGREEMENT
INFORMATION FOR BIDDERS
CONTRACT
PERFORMANCE AND PAYMENT BONDS
SCHEDULE OF PREVAILING WAGES
GENERAL CONDITIONS

FOR FURNISHING ALL LABOR AND MATERIALS
NECESSARY AND REQUIRED FOR THE PROJECT

Staten Island 1 & 3 Garage - Phase 2

LOCATION: 1000 West Service Road
BOROUGH: Staten Island, NY 10314
CITY OF NEW YORK

CONTRACT NO. 1 **GENERAL CONSTRUCTION WORK**

DSNY

TEN Arquitectos

Date: November 20, 2019

20-026

Department of Design and Construction

THE CITY OF NEW YORK
DEPARTMENT OF DESIGN AND CONSTRUCTION
DIVISION OF PUBLIC BUILDINGS

30-30 THOMSON AVENUE
LONG ISLAND CITY, NEW YORK 11101-3045
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VOLUME 2 OF 3

PROJECT LABOR AGREEMENT
INFORMATION FOR BIDDERS
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GENERAL CONDITIONS

FOR FURNISHING ALL LABOR AND MATERIALS
NECESSARY AND REQUIRED FOR THE PROJECT

NOTICE TO BIDDERS

Please be advised the Project Labor Agreement (PLA) attached and incorporated in this Invitation for Bids has been extended to apply to contracts let prior to December 31, 2019, including this contract. Other than extending the expiration date, all other terms of the PLA continue to apply in full force and effect.

2015 "New Construction" Project Labor Agreement

NOTICE: THIS CONTRACT IS SUBJECT TO A NEW PROJECT LABOR AGREEMENT EXECUTED IN 2015

This contract is subject to the attached Project Labor Agreement ("PLA") entered into between the City and the Building and Construction Trades Council of Greater New York ("BCTC") affiliated Local Unions. By submitting a bid, the Contractor agrees that if awarded the Contract the PLA is binding on the Contractor and all subcontractors of all tiers. The bidder to be awarded the contract will be required to execute the attached Letter of Assent prior to award. Contractor shall include in any subcontract a requirement that the subcontractor, and sub-subcontractors of all tiers, become signatory to and bound to the PLA with respect to the subcontracted work. Contractor will also be required to have all subcontractors of all tiers execute the attached Letter of Assent prior to such subcontractors performing any work on the Project. Bidders are advised that the City of New York and City agencies have entered into multiple PLAs. The terms of individual PLAs, while similar, are not identical. All bidders should carefully read the entire PLA that governs this Contract.

In addition, please note that there are significant differences between the 2015 PLA attached to this bid and the Citywide Renovation PLA as well as previous new construction PLAs. The Contractor is urged to review the entire PLA. Significant changes include:

- **Grievances: The grievance procedure governing disputes under the PLA has been clarified. See PLA Article 9, Section 1.**

- **Delinquent Contractors: Contractors and Subcontractors who do not make required payments to union funds on a timely basis are subject to requirements to submit cancelled checks or another form of proof of payment in addition to certified payroll reports when requesting payment. See PLA Article 11, Section 2.**

- **Payment to Union Funds for Non-Union Workers: Non-union Contractors with bona fide private benefit plans that satisfy the requirements of Labor Law 220 will not be required to pay into union benefit funds for "core" non-union employees (working pursuant to Article 4, Section 2 of the PLA) who are already covered under such bona fide private benefit plans. See PLA Article 11, Section 2.**

- **Veterans Day: Veterans Day has been added to the list of standard holidays. See Article 12, Section 4.**

- **Reporting Pay for Weather Events: The usual reporting pay requirement of two hours for employees who report to their work location pursuant to their regular schedule does not apply when the National Weather Service issues a Weather Advisory and the Contractor speaks to the employee at least four hours before his/her shift starting time. See Article 12, Section 6.**

To the extent that the terms of the PLA conflict with any other terms of the invitation for bids, including the Standard Construction Contract, the terms of the PLA shall govern. Where, however, the invitation for bids, including the Standard Construction Contract, requires the approval of the City/Department, the PLA does not supersede or eliminate that requirement.

In addition to the various provisions regarding work rules, Contractors should take special note of the requirement that Contractors and Subcontractors make payments to designated employee benefit funds. See PLA Article 11, Section 2. The PLA also contains provisions for what occurs when a Contractor or a subcontractor fails to make required payments into the benefit funds, including potentially the direct payment by the City to the benefit fund of monies owed and corresponding withholding of payments to the Contractor. See PLA Article 11, Section 2. The City strongly advises Contractors to read these provisions carefully and to include appropriate provisions in subcontracts addressing these possibilities.

This Contract is subject to the apprenticeship requirements of Labor Law §222 and to apprenticeship requirements established by the Department pursuant to Labor Law §816-b. Please be advised that the involved trades have apprenticeship programs that meet the statutory requirements of Labor Law 222(e) and the requirements set by the Department pursuant to Labor Law §816-b, Contractors and subcontractors who agree to perform the Work pursuant to the PLA are participating in such apprenticeship programs within the meaning of Labor Law §222(e) and the Department's directive.

If this Contract is subject to the Minority-Owned and Women-Owned Business Enterprise ("M/WBE") program implemented pursuant to New York City Administrative Code §6-129, the specific requirements of M/WBE participation for this Contract are set forth in Schedule B entitled the "Subcontractor Utilization Plan," and are detailed in a separate Notice to Prospective Contractors included with this bid package. If such requirements are included with this Contract, the City strongly advises Contractors to read those provisions, as well as PLA Article 4, Section 2(C), carefully. A list of certified M/WBE firms may be obtained from the Department of Small Business Services (DSBS) website at www.nyc.gov/getcertified, by emailing DSBS at MWBE@sbs.nyc.gov, by calling the DSBS certification hotline at (212) 513-6311, or by visiting or writing DSBS at 110 William St., 7th floor, New York, New York, 10038.

The local collective bargaining agreements (CBAs) that are incorporated into the PLA as PLA Schedule A Agreements are available on computer disk from the Department's Contract Officer upon the request of any prospective bidder. Please note that the "PLA Schedule A" is distinct from the Department's Schedule A that is a part of this invitation for bids.

A contact list for the participating unions is set forth after the FAQs.

Below are answers to frequently asked questions (FAQs) about this PLA:

1. **Q.** Does a Contractor need to be signatory with the unions in the NYC Building and Construction Trades Council in order to bid on projects under the PLA?

A. No, any contractor may bid by signing and agreeing to the terms of the PLA. The contractor need not be signatory with these unions by any other labor agreement or for any other project.

2. **Q.** Does a Contractor agreeing to the PLA and signing the Letter of Assent create a labor agreement with these unions outside of the project covered by the PLA?
   A. No, the PLA applies only to those projects that the Contractor agrees to perform under the PLA and makes no labor agreement beyond those projects.

3. **Q.** Do the provisions of the PLA apply equally to subcontractors as well as contractors and how does the PLA affect the subcontractors that a bidder may utilize on the project?
   A. Yes, the PLA applies to subcontractors and all subcontractors must agree to become party to the PLA. See PLA Art. 2, Sec. 8. Subject to the Department's approval of subcontractors pursuant to Article 17 of the Standard Construction Contract, a Contractor may use any subcontractor, union or non-union, as long as the subcontractor signs and agrees to the terms of the PLA.

4. **Q.** Are bidders required to submit Letters of Assent signed by proposed subcontractors with their bid in order to be found responsive?
   A. No, bidders do not have to submit signed Letters of Assent from their subcontractors with their bid. Subcontractors, however, will be required to sign the Letter of Assent prior to being approved by the Department.

5. **Q.** May a Contractor or subcontractor use any of its existing employees to perform this work?
   A. Generally labor will be referred to the Contractor from the respective signatory local unions. See PLA Article 4. However, Contractors and subcontractors may continue to use up to 12% of their existing, qualifying labor force for this work, in accordance with the terms of PLA Article 4, Section 2B.

6. **Q.** Must the City set M/WBE participation goals for the particular project or contract in order for a certified M/WBE to utilize the provisions of PLA Article 4, Section 2C?
   A. No. PLA Article 4, Section 2(C) specifies what categories of M/WBEs are eligible to take advantage of this provision (i.e., those M/WBEs for which the City is authorized to set participation goals under §6-129). For purposes of section 2(C), it is not necessary for the project to be subject to §6-129 or for the City to have actually set participation goals for the particular contract or project. The result is the same where a project receives State funding and therefore is subject to the requirements of Article 15-A of the Executive Law.

7. **Q.** May a Contractor bring in union members from locals that are not signatory unions?
   A. Referrals will be from the respective signatory locals and/or locals listed in Schedule A of the PLA. Contractors may utilize 'traveler provisions' contained in the

local collective bargaining agreements (local CBAs) where such provisions exist and/or in accordance with the provisions of PLA Article 4, Section 2.

8. **Q.** Does a non-union employee working under the PLA automatically become a union member?
   A. No, the non-union employee does not automatically become a union member by working on a project covered by the PLA. Non-union employees working under the PLA are subject to the union security provisions (i.e., union dues/agency shop fees) of the local CBAs while on the project. These employees will be enrolled in the appropriate benefit plans and earn credit toward various union benefit programs except in certain circumstances as set forth in the PLA. See PLA Article 4, Section 6 and Article 11.

9. **Q.** When will the agency shop dues payer affiliate workers become eligible for union benefits?
   A. Union benefit plans have their own plan documents that determine eligibility and workers will become eligible for certain benefits at different points in time. Contractors who will have agency shop dues payer affiliate workers should speak with the respective union(s) as to benefit eligibility thresholds.

10. **Q.** Are all Contractors and subcontractors working under the PLA, including non-union Contractors and Contractors signatory to collective bargaining agreements with locals other than those that are signatories to the PLA, required to make contributions to designated employee benefit funds?
    A. Except in certain circumstances, as described in the following paragraph, Contractors and subcontractors working under the PLA will be required to contribute on behalf of all employees covered by the PLA to established jointly trusteed employee benefit funds designated in the Schedule A CBAs and required to be paid on public works under any applicable prevailing wage law. See PLA Article 11, Section 2. The Agency may withhold from amounts due to the Contractor any amounts required to be paid, but not actually paid into any such fund by the Contractor or a subcontractor. See PLA Article 11, Section 2 D.

    Non-union Contractors with bona fide private benefit plans that satisfy the requirements of Labor Law 220 will not be required to pay into union benefit funds for their employees working pursuant to Article 4, Section 2 (B) and (C) ("core" employees) who are already covered under their bona fide private benefit plans. Supplemental benefit funds in excess of the annualized value of the private benefit plans will be paid to workers as additional wages in compliance with Labor Law 220. At the time of contract award, the Contractor shall make available to the contracting Agency a complete set of plan documents for each private benefit plan into which contributions will be made and/or coverage provided. The Contractor shall also provide certification from a certified public accountant as to the annualized hourly value of such benefits consistent with the requirements of Section 220. See PLA Article 11, Section 2.

11. **Q.** What happens if a Contractor or subcontractor fails to make a required payment to a designated employee benefit fund?

A. The PLA sets forth a process for unions to address a contractor or a subcontractor's failure to make required payments. The process includes potentially the direct payment by the City to the benefit fund of monies owed and the corresponding withholding of payments to the Contractor. See PLA Article 11, Section 2.

Upon notification by a union or fringe benefit fund that a Contractor is delinquent in its payment of benefits and a determination by the Agency that the union or fund has submitted appropriate documentation of such delinquency, the Agency will thereafter require the Contractor to submit cancelled checks or other equivalent proof of payment of benefit contributions with certified payroll reports for work covered by this PLA on which the Contractor is engaged.

The City strongly advises Contractors to read these provisions carefully and to include appropriate provisions in subcontracts addressing these possibilities.

12. **Q.** Does signing on to the PLA satisfy the Apprenticeship Requirements established for this bid?
A. Yes. By agreeing to perform the Work subject to the PLA, the bidder demonstrates compliance with the apprenticeship requirements imposed by this Invitation for Bids.

13. **Q.** Who decides on the number of workers needed?
A. Except as expressly limited by a specific provision of the PLA, a Contractor retains full and exclusive authority for the management of their operations, including the determination as to the number of employees to be hired and the qualifications thereof and the promotion, transfer, and layoff of its employees. See PLA Article 6, Section 1.

14. **Q.** May a contractor discharge a union referral for lack of productivity?
A. Again, except as expressly limited by a specific provision of the PLA, a Contractor retains full and exclusive authority for the management of their operations, including the right to discipline or discharge, for just cause, its employees. See PLA Article 6, Section 1.

15. **Q.** May a contractor assign a management person to site?
A. Yes. Managers are not subject to the provisions of the PLA, so there is no restriction on management and/or other non-trade personnel, as long as such personnel do not perform trade functions. See Article 3, Section 1.

16. **Q.** Does the PLA provide a standard work day across all the signatory trades?
A. Yes, all signatory trades will work an eight (8) hour day, Monday through Friday with a day shift at straight time as the standard work week.

17. **Q.** Does the PLA create a common holiday schedule for all the signatory trades?
A. Yes, the PLA recognizes nine (9) common holidays, including Veterans Day. See PLA Article 12, Section 4.

18. **Q.** May the Contractor schedule overtime work, including work on a weekend?
A. Yes, the PLA permits the Contractor to schedule overtime work, including work on weekends. See PLA Article 12, Sections 2, 3, and 5. To the extent that the Agency's approval is required before a Contractor may schedule or be paid for overtime, that approval is still required notwithstanding the PLA language.

19. **Q.** Are overtime payments affected by the PLA?
A. Yes, all overtime pay incurred Monday through Saturday will be at time and one half (1 ½). There will be no stacking or pyramiding of overtime pay under any circumstances. See PLA Article 12, Section 2. Sunday and holiday overtime will be paid according to each trade's CBA.

20. **Q.** Are there special provisions for Saturday work when a day is 'lost' during the week due to weather, power failure or other emergency?
A. Yes, when this occurs the Contractor may schedule Saturday work at weekday rates. See PLA Article 12, Section 5.

21. **Q.** Does the PLA contain special provisions for the manning of Temporary Services?
A. Yes. Where temporary services are required by specific request of the Agency or construction manager, they shall be provided by the Contractor's existing employees during working hours in which a shift is scheduled for employees of the Contractor. The need for temporary services during non-working hours will be determined by the Agency or construction manager. There will be no stacking of trades on temporary services. See PLA Article 15.

22. **Q.** What do the workers get paid when work is terminated early in a day due to inclement weather or otherwise cut short of 8 hours?
A. The PLA provides that employees who report to work pursuant to regular schedule and not given work will be paid two hours of straight time. Work terminated early for severe weather or emergency conditions will be paid only for time actually worked. In other instances where work is terminated early, the worker will be paid for a full day. See PLA Article 12, Sections 6 and 8. The usual reporting pay requirement of two hours for employees who report to their work location pursuant to their regular schedule does not apply when the National Weather Service issues a Weather Advisory and the Contractor speaks to the employee at least four hours before their shift starting time. See PLA Article 12, Section 6.

23. **Q.** If a local collective bargaining agreement of a signatory union expires during the project will a work stoppage occur on a project subject to the PLA?
A. No. All the signatory unions are bound by the 'no strike' agreement as to the PLA work. Work will continue under the PLA and the otherwise expired local CBA(s) until the new local CBA(s) are negotiated and in effect. See PLA Articles 7 and 19.

24. **Q.** May a Contractor working under the PLA be subject to a strike or other boycott activity by a signatory union at another site while the Contractor is a signatory to the PLA?

A. Yes. The PLA applies ONLY to work under the PLA and does not regulate labor relations at other sites even if those sites are in close proximity to PLA work.

25. **Q.** If a Contractor has worked under other PLAs in the New York City area, are the provisions in this PLA generally the same as the others?

A. While Project Labor Agreements often look similar to each other, and particular clauses are often used in multiple agreements, each PLA is a unique document and should be examined accordingly.

26. **Q.** What happens if a dispute occurs between the Contractor and an employee during the project?

A. The PLA contains a grievance and arbitration process to resolve disputes between the Contractor and the employees. See PLA Article 9.

27. **Q.** What happens if there is a dispute between locals as to which local gets to provide employees for a particular project or a particular aspect of a project?

A. The PLA provides for jurisdictional disputes to be resolved in accordance with the NY Plan. See PLA Article 10. A copy of the NY Plan is available upon request from the Department. The PLA provides that work is not to be disrupted or interrupted pending the resolution of any jurisdictional dispute. The work proceeds as assigned by the Contractor until the dispute is resolved. See PLA Article 10, Section 3.

PROJECT LABOR AGREEMENT

COVERING NEW CONSTRUCTION

OF IDENTIFIED CITY OWNED

BUILDINGS AND STRUCTURES

2015 - 2018

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PROJECT LABOR AGREEMENT COVERING IDENTIFIED NEW CONSTRUCTION OF NEW YORK CITY OWNED FACILITIES & STRUCTURES

ARTICLE 1 - PREAMBLE

WHEREAS, the City of New York desires to provide for the cost efficient, safe, quality, and timely completion of certain new construction ("Program Work," as defined in Article 3) in a manner designed to afford the lowest costs to the Agencies covered by this Agreement, and the Public it represents, and the advancement of permissible statutory objectives;

WHEREAS, this Project Labor Agreement will foster the achievement of these goals, inter alia, by:

(1) providing a mechanism for responding to the unique construction needs associated with this Program Work and achieving the most cost effective means of construction, including direct labor cost savings, by the Building and Construction Trades Council of Greater New York and Vicinity and the signatory Local Unions and their members waiving various shift and other hourly premiums and other work and pay practices which would otherwise apply to Program Work;

(2) expediting the construction process and otherwise minimizing the disruption to the covered Agencies' ongoing operations at the facilities that are the subject of the Agreement;

(3) avoiding the costly delays of potential strikes, slowdowns, walkouts, picketing and other disruptions arising from work disputes, reducing jobsite friction on common situs worksites, and promoting labor harmony and peace for the duration of the Program Work;

(4) standardizing the terms and conditions governing the employment of labor on Program Work;

(5) permitting wide flexibility in work scheduling and shift hours and times to allow maximum work to be done during off hours yet at affordable pay rates;

(6) permitting adjustments to work rules and staffing requirements from those which otherwise might obtain;

(7) providing comprehensive and standardized mechanisms for the settlement of work disputes, including those relating to jurisdiction;

(8) ensuring a reliable source of skilled and experienced labor; and

(9) securing applicable New York State Labor Law exemptions.

WHEREAS, the Building and Construction Trades Council of Greater New York and Vicinity, its participating affiliated Local Unions and their members, desire to assist the City in meeting these operational needs and objectives as well as to provide for stability, security and work opportunities which are afforded by this Project Labor Agreement; and

WHEREAS, the Parties desire to maximize Program Work safety conditions for both workers and the community in the project area.

NOW, THEREFORE, the Parties enter into this Agreement:

SECTION 1. PARTIES TO THE AGREEMENT

This is a Project Labor Agreement ("Agreement") entered into by the City of New York, acting through the Department of Design and Construction, on behalf of itself and the Agencies covered herein, including in their capacity as construction manager of covered projects and/or on behalf of any third party construction manager which may be utilized, and the Building and Construction Trades Council of Greater New York and Vicinity ("Council") (on behalf of itself) and the signatory affiliated Local Union's ("Unions" or "Local Unions"). The Council and each signatory Local Union hereby warrants and represents that it has been duly authorized to enter into this Agreement.

ARTICLE 2 - GENERAL CONDITIONS

SECTION 1. DEFINITIONS

Throughout this Agreement, the various Union parties including the Building and Construction Trades Council of Greater New York and Vicinity and its participating affiliated Local Unions, are referred to singularly and collectively as "Union(s)" or "Local Unions"; the term "Contractor(s)" shall include any Construction Manager, General Contractor and all other contractors, and subcontractors of all tiers engaged in Program Work within the scope of this Agreement as defined in Article 3; "Agency" means means the New York City Department of Design and Construction (DDC) or such other City agency that executes an addendum pursuant to Article 3, Section 1 of this Agreement; the New York City Agency that awards a particular contract subject to this Agreement may be referred to hereafter as the "Agency"; when an Agency acts as Construction Manager, unless otherwise provided, it has the rights and obligations of a "Construction Manager" in addition to the rights and obligations of an Agency; the Building and Construction Trades Council of Greater New York and Vicinity is referred to as the ["BCTC" or "Council"]; and the work covered by this Agreement (as defined in Article 3) is referred to as "Program Work."

SECTION 2. CONDITIONS FOR AGREEMENT TO BECOME EFFECTIVE

This Agreement shall not become effective unless each of the following conditions are met: the Agreement is executed by (1) the Council, on behalf of itself, (2) the participating affiliated Local Unions; and (3) the Commissioner of the Department of Design and Construction or his designee.

SECTION 3. ENTITIES BOUND & ADMINISTRATION OF AGREEMENT

This Agreement shall be binding on all participating Unions and their affiliates, the Construction Manager (in its capacity as such) and all Contractors of all tiers performing Program Work, as defined in Article 3. The Contractors shall include in any subcontract that they let for performance during the term of this Agreement a requirement that their subcontractors, of all tiers, become signatory and bound by this Agreement with respect to that subcontracted work falling within the scope of Article 3 and all Contractors (including subcontractors) performing Program Work shall be required to sign a "Letter of Assent" in the form annexed hereto as Exhibit "A". This Agreement shall be administered by the applicable Agency or a Construction Manager or such other designee as may be named by the Agency or Construction Manager, on behalf of all Contractors.

SECTION 4. SUPREMACY CLAUSE

This Agreement, together with the local Collective Bargaining Agreements appended hereto as Schedule A, represents the complete understanding of all signatories and supersedes any national agreement, local agreement or other collective bargaining agreement of any type which would otherwise apply to this Program Work, in whole or in part, except that Program Work which falls within the jurisdiction of the Operating Engineers Locals 14 and 15 will be performed under the terms and conditions set out in the Schedule A agreements of Operating Engineers Locals 14 and 15. The Collective Bargaining Agreements of the affiliated local unions that cover the particular type of construction work to be performed by the contractor, and as set forth in the Schedule A list of Agreements, shall be deemed the Schedule A Collective Bargaining Agreements ("Schedule A CBA") under this Agreement. Where association and independent

Collective Bargaining Agreements for a particular type of construction work are both set forth in Schedule A, association members shall treat the applicable association agreement as the Schedule A CBA and independent contractors shall treat the applicable independent agreement as the Schedule A CBA. Subject to the foregoing, where a subject covered by the provisions of this Agreement is also covered by a Schedule A Collective Bargaining Agreement, the provisions of this Agreement shall prevail. It is further understood that no Contractor shall be required to sign any other agreement as a condition of performing Program Work. No practice, understanding or agreement between a Contractor and a Local Union which is not set forth in this Agreement shall be binding on this Program Work unless endorsed in writing by the Construction Manager or such other designee as may be designated by the Agency.

SECTION 5. LIABILITY

The liability of any Contractor and the liability of any Union under this Agreement shall be several and not joint. The Construction Manager and any Contractor shall not be liable for any violations of this Agreement by any other Contractor; and the Council and Local Unions shall not be liable for any violations of this Agreement by any other Union.

SECTION 6. THE AGENCY

The Agency (or Construction Manager where applicable) shall require in its bid specifications for all Program Work within the scope of Article 3 that all successful bidders, and their subcontractors of all tiers, become bound by, and signatory to, this Agreement. The Agency (or Construction Manager) shall not be liable for any violation of

this Agreement by any Contractor. It is understood that nothing in this Agreement shall be construed as limiting the sole discretion of the Agency or Construction Manager in determining which Contractors shall be awarded contracts for Program Work. It is further understood that the Agency or Construction Manager has sole discretion at any time to terminate, delay or suspend the Program Work, in whole or part, on any Program.

SECTION 7. AVAILABILITY AND APPLICABILITY TO ALL SUCCESSFUL BIDDERS

The Unions agree that this Agreement will be made available to, and will fully apply to, any successful bidder for (or subcontractor of) Program Work who becomes signatory thereto, without regard to whether that successful bidder (or subcontractor) performs work at other sites on either a union or non-union basis and without regard to whether employees of such successful bidder (or subcontractor) are, or are not, members of any unions. This Agreement shall not apply to the work of any Contractor which is performed at any location other than the site of Program Work.

SECTION 8. SUBCONTRACTING

Contractors will subcontract Program Work only to a person, firm or corporation who is or agrees to become party to this Agreement.

ARTICLE 3-SCOPE OF THE AGREEMENT

SECTION 1. WORK COVERED

Program Work shall be limited to construction contracts bid and let by the Agency (or its Construction Manager where applicable) after the effective date of this Agreement (and prior to December 31, 2018) for that new construction on any Project for which an

addendum has been issued pursuant to the provisions set forth below. Additional Projects may be added to this Agreement through a Project specific Addendum approved by an agency of the City of New York and by the BCTC on behalf of itself and its affiliated Local Unions. Each Project specific addendum is to outline and include a description of the project being undertaken, the project's location, and the general findings of the Feasibility Analysis used as the basis of the determination to utilize a PLA on the project.

It is understood that, except where the City specifically applies this Project Labor Agreement to such work in its bid documents, Program Work does not include, and this Project Labor Agreement shall not apply to, any other work, including:

1. Contracts let and work performed under contracts bid prior to the effective date of this Agreement and all contracts let after December 31, 2018;

2. Contracts procured on an emergency basis;

3. Contracts that do not exceed $250,000;

4. Contracts with electric utilities, gas utilities, telephone companies, and railroads, except that it is understood and agreed that these entities may only install their work to a demarcation point, e.g. a telephone closet or utility vault, the location of which is determined prior to construction and employees of such entities shall not be used to replace employees performing Program Work pursuant to this agreement;

5. Contracts for installation of information technology that are not otherwise Program Work; and

6. Contracts that do not exceed $1 Million that are awarded pursuant to

prequalified lists (PQLs) established by City agencies where entry on to the PQL is restricted to MWBEs, or a combination of MWBEs together with joint ventures which include at least one MWBE, or contractors who agree to subcontract at least 50% of the contract to MWBEs.

SECTION 2. TIME LIMITATIONS

In addition to falling within the scope of Article 3, Section 1, to be covered by this Agreement Program Work must be (1) advertised and let for bid after the effective date of this Agreement, and (2) let for bid prior to December 31, 2018, the expiration date of this Agreement. It is understood that this Agreement, together with all of its provisions, shall remain in effect for all such Program Work until completion, even if not completed by the expiration date of the Agreement. If Program Work otherwise falling within the scope of Article 3, Section 1 is not let for bid by the expiration date of this Agreement, this Agreement may be extended to that work by mutual agreement of the parties.

SECTION 3. EXCLUDED EMPLOYEES

The following persons are not subject to the provisions of this Agreement, even though performing Program Work:

A. Superintendents, supervisors (excluding general and forepersons specifically covered by a craft's Schedule A), engineers, professional engineers and/or licensed architects engaged in inspection and testing, quality control/assurance personnel, timekeepers, mail carriers, clerks, office workers, messengers, guards, technicians, non-manual employees, and all professional, engineering, administrative and management persons;

B. Employees of the Agency, New York City, or any other municipal or State agency, authority or entity, or employees of any other public employer, even though working on the Program site while covered Program Work is underway;

C. Employees and entities engaged in off-site manufacture, modifications, repair, maintenance, assembly, painting, handling or fabrication of project components, materials, equipment or machinery or involved in deliveries to and from the Program site, except to the extent they are lawfully included in the bargaining unit of a Schedule A agreement;

D. Employees of the Construction Manager (except that in the event the Agency engages a Contractor to serve as Construction Manager, then those employees of the Construction Manager performing manual, on site construction labor will be covered by this Agreement);

E. Employees engaged in on-site equipment warranty work unless employees are already working on the site and are certified to perform warranty work;

F. Employees engaged in geophysical testing other than boring for core samples;

G. Employees engaged in laboratory, specialty testing, or inspections, pursuant to a professional services agreement between the Agency, or any of the Agency's other professional consultants, and such laboratory, testing, inspection or surveying firm; and

H. Employees engaged in on-site maintenance of installed equipment or systems which maintenance is awarded as part of a contract that includes Program Work

but which maintenance occurs after installation of such equipment or system and is not directly related to construction services.

SECTION 4. NON-APPLICATION TO CERTAIN ENTITIES

This Agreement shall not apply to those parents, affiliates, subsidiaries, or other joint or sole ventures of any Contractor which do not perform Program Work. It is agreed that this Agreement does not have the effect of creating any joint employment, single employer or alter ego status among the Agency (including in its capacity as Construction Manager) or any Contractor. The Agreement shall further not apply to any New York City or other municipal or State agency, authority, or entity other than a listed Agency and nothing contained herein shall be construed to prohibit or restrict the Agency or its employees, or any State, New York City or other municipal or State authority, agency or entity and its employees, from performing on or off-site work related to Program Work.

As the contracts involving Program Work are completed and accepted, the Agreement shall not have further force or effect on such items or areas except where inspections, additions, repairs, modifications, check-out and/or warranty work are assigned in writing (copy to Local Union involved) by the Agency (or Construction Manager) for performance under the terms of this Agreement.

ARTICLE 4- UNION RECOGNITION AND EMPLOYMENT

SECTION 1. PRE-HIRE RECOGNITION

The Contractors recognize the signatory Unions as the sole and exclusive bargaining representatives of all employees who are performing on-site Program Work, with respect to that work.

SECTION 2. UNION REFERRAL

A. The Contractors agree to employ and hire craft employees for Program Work covered by this Agreement through the job referral systems and hiring halls established in the Local Unions' area collective bargaining agreements. Notwithstanding this, Contractors shall have sole right to determine the competency of all referrals; to determine the number of employees required; to select employees for layoff (subject to Article *5,* Section 3); and the sole right to reject any applicant referred by a Local Union, subject to the show-up payments. In the event that a Local Union is unable to fill any request for qualified employees within a 48 hour period after such requisition is made by a Contractor (Saturdays, Sundays and holidays excepted), a Contractor may employ qualified applicants from any other available source. In the event that the Local Union does not have a job referral system, the Contractor shall give the Local Union first preference to refer applicants, subject to the other provisions of this Article. The Contractor shall notify the Local Union of craft employees hired for Program Work within its jurisdiction from any source other than referral by the Union.

B. A Contractor may request by name, and the Local will honor, referral of persons who have applied to the Local for Program Work and who meet the following qualifications:

(1) possess any license required by New York State law for the Program Work to be performed;

(2) have worked a total of at least 1000 hours in the Construction field during the prior 3 years; and

(3) were on the Contractor's active payroll for at least 60 out of the 180 calendar days prior to the contract award.

No more than twelve per centum (12%) of the employees covered by this Agreement, per Contractor by craft, shall be hired through the special provisions above. Under this provision, name referrals begin with the eighth employee needed and continue on that same basis.

C. Notwithstanding Section 2(B), above, certified MWBE contractors for which participation goals are set forth in New York City Administrative Code §6-129, that are not signatory to any Schedule A CBAs, with contracts valued at or under five hundred thousand ($500,000), may request by name, and the Local will honor, referral of the second (2nd), fourth (4th), sixth (6th), and eighth (8th) employee, who have applied to the Local for Program Work and who meet the following qualifications:

(1) possess any license required by New York State law for the Program Work to be performed;

(2) have worked a total of at least 1000 hours in the Construction field during the prior 3 years; and

(3) were on the Contractor's active payroll for at least 60 out of the 180 work days prior to the contract award.

For such contracts valued at above $500,000 but less than $1 million, the Local will honor referrals by name of the second (2nd), fifth (5th), and eighth (8th) employee subject to the foregoing requirements. In both cases, name referrals will thereafter be in accordance with Section 2(B), above.

D. Where a certified MWBE Contractor voluntarily enters into a Collective Bargaining Agreement ("CBA") with a BCTC Union, the employees of such Contractor at the time the CBA is executed shall be allowed to join the Union for the

applicable trade subject to satisfying the Union's basic standards of proficiency for admission.

SECTION 3. NON-DISCRIMINATION IN REFERRALS

The Council represents that each Local Union hiring hall and referral system will be operated in a non-discriminatory manner and in full compliance with all applicable federal, state and local laws and regulations which require equal employment opportunities. Referrals shall not be affected in any way by the rules, regulations, bylaws, constitutional provisions or any other aspects or obligations of union membership, policies or requirements and shall be subject to such other conditions as are established in this Article. No employment applicant shall be discriminated against by any referral system or hiring hall because of the applicant's union membership, or lack thereof.

SECTION 4: MINORITY, FEMALE, LOCAL AND SECTION 3 REFERRALS

In the event a Local Union either fails, or is unable to refer qualified minority or female applicants in percentages equaling the workforce participation goals adopted by the City and set forth in the Agency's (or, if applicable, Construction Manager's) bid specifications, within 48 hours of the request for same, the Contractor may employ qualified minority or female applicants from any other available source.

In the event that the City or a City agency determines to adopt local workforce participation goals to be set forth in an Agency's (or, if applicable Construction Manager's) bid specifications, the City and BCTC will work together to seek agreement on appropriate goals to be set forth in applicable bid documents and to be subject to the provisions of this section.

For any Program Work that may become subject to requirements under Section 3 of the Housing and Urban Development Act of 1968, as amended by the Housing and Community Development Act of 1992, and any rules, including new or revised rules, that may be published thereunder, the Local Unions will acknowledge the Section 3 obligations of the Construction Manager or Contractor, as applicable, and agree to negotiate a method to implement this Article in a manner that would allow the Construction Manager or Contractor to meet its Section 3 obligations to the greatest extent feasible, and to post any required notices in the manner required by Section 3. The parties also acknowledge that the Construction Manager and Contractor may also fulfill its Section 3 requirements on Program Work by promoting opportunities for excluded employees, as defined by Article 3, Section 3 of this Agreement, on Program Work and, to the extent permitted by Section 3, by promoting opportunities for craft and other employees on non-Program Work.

SECTION 5. CROSS AND QUALIFIED REFERRALS

The Local Unions shall not knowingly refer to a Contractor an employee then employed by another Contractor working under this Agreement. The Local Unions will exert their utmost efforts to recruit sufficient numbers of skilled and qualified crafts employees to fulfill the requirements of the Contractor.

SECTION 6. UNION DUES

All employees covered by this Agreement shall be subject to the union security provisions contained in the applicable Schedule A local agreements, as amended from time to time, but only for the period of time during which they are performing on-site Program Work and only to the extent of tendering payment of the applicable union dues

and assessments uniformly required for union membership in the Local Unions which represent the craft in which the employee is performing Program Work. No employee shall be discriminated against at any Program Work site because of the employee's union membership or lack thereof. In the case of unaffiliated employees, the dues payment will be received by the Local Unions as an agency shop fee.

SECTION 7. CRAFT FOREPERSONS AND GENERAL FOREPERSONS

The selection of craft forepersons and/or general forepersons and the number of forepersons required shall be solely the responsibility of the Contractor except where otherwise provided by specific provisions of an applicable Schedule A, and provided that all craft forepersons shall be experienced and qualified journeypersons in their trade as determined by the appropriate Local Union. All forepersons shall take orders exclusively from the designated Contractor representatives. Craft forepersons shall be designated as working forepersons at the request of the Contractor, except when an existing local Collective Bargaining Agreement prohibits a foreperson from working when the craft persons he is leading exceed a specified number.

SECTION 8. ON CALL REPAIR REFERRALS

A. When an Agency awards a contract that requires the Contractor to have employees available on short notice to make time sensitive repairs with such contract requiring the Contractor to respond within as little as two hours from the time the Contractor is contacted by the Agency ("On Call, Repair Contract"), the Contractor will, within ten (10) days of being awarded an On Call Repair Contract subject to this agreement, notify the appropriate affiliated Union that it has been awarded such a contract

and immediately enter into good faith negotiations with such relevant affiliated Union to establish a procedure to receive time sensitive referrals from such affiliated Union(s).

B. In the event the Contractor and the relevant affiliated Union(s) are unable to negotiate a specific, mutually agreeable procedure for on call repair referral procedure within twenty (20) days of commencement of negotiations or prior to commencement of performance of the contract, whichever is earlier, the Contractor and the relevant affiliated Unions will follow the following procedure:

1. Upon notification by a Contractor that it has been awarded an On Call Repair Contract pursuant to paragraph A above, each relevant affiliate Union shall provide the Contractor with the name and twenty four (24) hour contact information of an On Call, Repair Contract contact person for urgent on call repair referrals.

2. The relevant affiliated Unions shall prepare a list of individuals eligible and prepared for referral on an immediate basis to respond to the on call repair contractor. Such list shall be provided to and in the possession of the designated on call repair contact person for the affiliated Union and available for immediate reference.

3. Individuals on such list must be able to comply with the Contractor's response time pursuant to contract requirements.

4. The Union's On Call, Repair Contract contact person shall respond to a contractor's request for referrals within a reasonable time of the request so that compliance with the contract shall be possible.

C. In the event that the Contractor makes a request for an on call referral that is compliant with this procedure and a Union is not able to respond to the

request, that Union will be deemed to have waived the forty-eight (48) hour referral rule contained in Section 2 above and the Contractor may employ qualified applicants from any other available source that can meet contract requirements for that time sensitive on call repair work only; provided, however, that any work related to the repair work that is not of a time sensitive nature under the contract shall comply with Section 2. If a Union fails to timely refer a worker and the Contractor employs other workers, the Contractor will e-mail the agency within 72 hours and the agency will forward that e-mail to the designated Labor Management Committee contacts.

ARTICLE 5- UNION REPRESENTATION

SECTION 1. LOCAL UNION REPRESENTATIVE

Each Local Union representing on-site employees shall be entitled to designate in writing (copy to Contractor involved and Construction Manager) one representative, and/or the Business Manager, who shall be afforded access to the Program Work site during such time as bargaining unit work is occurring and subject to otherwise applicable policies pertaining to visitors to the site.

SECTION 2. STEWARDS

A. Each Affiliated Union shall have the sole discretion to designate any journey person as a Steward and an alternate Steward. The Union shall notify the Owner and/or Construction Manager as well as the Contractor of the identity of the designated Steward (and alternate) prior to the assumption of such duties. Stewards shall not exercise supervisory functions and will receive the regular rate of pay for their craft classifications. All Stewards shall be working Stewards.

B. In addition to their work as an employee, the Steward shall have the right to receive complaints or grievances and to discuss and assist in their adjustment with the Contractor's appropriate supervisor. Each Steward shall be concerned with the employees of the Steward's trade and, if applicable, subcontractors of their Contractor, but not with the employees of any other trade Contractor. No Contractor shall discriminate against the Steward in the proper performance of Union duties.

C. The Stewards shall not have the right to determine when overtime shall be worked, or who shall work overtime except pursuant to a Schedule A provision providing procedures for the equitable distribution of overtime.

SECTION 3. LAYOFF OF A STEWARD

Contractors agree to notify the appropriate Union 24 hours prior to the layoff of a Steward, except in cases of discipline or discharge for just cause. If a Steward is protected against layoff by a Schedule A provision, such provision shall be recognized to the extent the Steward possesses the necessary qualifications to perform the work required. In any case in which a Steward is discharged or disciplined for just cause, the Local Union involved shall be notified immediately by the Contractor.

ARTICLE 6- MANAGEMENT'S RIGHTS

SECTION 1. RESERVATION OF RIGHTS

Except as expressly limited by a specific provision of this Agreement, Contractors retain full and exclusive authority for the management of their operations including, but not limited to, the right to: direct the work force, including determination as to the number of employees to be hired and the qualifications therefore; the promotion,

transfer, layoff of its employees; require compliance with the directives of the Agency including standard restrictions related to security and access to the site that are equally applicable to Agency employees, guests, or vendors; or the discipline or discharge for just cause of its employees; assign and schedule work; promulgate reasonable Program Work rules that are not inconsistent with this Agreement or rules common in the industry and are reasonably related to the nature of work; and, the requirement, timing and number of employees to be utilized for overtime work. No rules, customs, or practices which limit or restrict productivity or efficiency of the individual, as determined by the Contractor, Agency and/or Construction Manager and/or joint working efforts with other employees shall be permitted or observed.

SECTION 2. MATERIALS, METHODS & EQUIPMENT

There shall be no limitation or restriction upon the Contractor's choice of materials, techniques, methods, technology or design, or, regardless of source or location, upon the use and installation of equipment, machinery, package units, pre-cast, pre-fabricated, pre-finished, or pre-assembled materials or products, tools, or other labor-saving devices. Contractors may, without restriction, install or use materials, supplies or equipment regardless of their source; provided, however, that where there is a Schedule "A" that includes a lawful union standards and practices clauses, then such clause as set forth in Schedule A Agreements will be complied with, unless there is a lawful Agency specification (or specification issued by a Construction Manager which would be lawful if issued by the Agency directly) that would specifically limit or restrict the Contractor's choice of materials, techniques, methods, technology or design, or, regardless of source or location, upon the use and installation of equipment, machinery, package

units, pre-cast, pre-fabricated, pre-finished, or pre-assembled materials or products, tools, or other labor-saving devices, and which would prevent compliance with such Schedule A clause. The on-site installation or application of such items shall be performed by the craft having jurisdiction over such work; provided, however, it is recognized that other personnel having special qualifications may participate, in a supervisory capacity, in the installation, check-off or testing of specialized or unusual equipment or facilities as designated by the Contractor. There shall be no restrictions as to work which is performed off-site for Program Work.

ARTICLE 7- WORK STOPPAGES AND LOCKOUTS

SECTION 1. NO STRIKES-NO LOCK OUT

There shall be no strikes, sympathy strikes, picketing, work stoppages, slowdowns, hand billing, demonstrations or other disruptive activity at the Program Work site for any reason by any Union or employee against any Contractor or employer. There shall be no other Union, or concerted or employee activity which disrupts or interferes with the operation of the Program Work or the objectives of the Agency at any Program Work site. In addition, failure of any Union or employee to cross any picket line established by any Union, signatory or non-signatory to this Agreement, or the picket or demonstration line of any other organization, at or in proximity to a Program Work site where the failure to cross disrupts or interferes with the operation of Program Work is a violation of this Article. Should any employees breach this provision, the Unions will use their best efforts to try to immediately end that breach and return all employees to work. There shall be no lockout at a Program Work site by any signatory Contractor, Agency or Construction Manager.

SECTION 2. DISCHARGE FOR VIOLATION

A Contractor may discharge any employee violating Section 1, above, and any such employee will not be eligible thereafter for referral under this Agreement for a period of 100 days.

SECTION 3. NOTIFICATION

If a Contractor contends that any Union has violated this Article, it will notify the Local Union involved advising of such fact, with copies of the notification to the Council. The Local Union shall instruct and order, the Council shall request, and each shall otherwise use their best efforts to cause, the employees (and where necessary the Council shall use its best efforts to cause the Local Union), to immediately cease and desist from any violation of this Article. If the Council complies with these obligations it shall not be liable for the unauthorized acts of a Local Union or its members. Similarly, a Local Union and its members will not be liable for any unauthorized acts of the Council. Failure of a Contractor or the Construction Manager to give any notification set forth in this Article shall not excuse any violation of Section 1 of this Article.

SECTION 4. EXPEDITED ARBITRATION

Any Contractor or Union alleging a violation of Section 1 of this Article may utilize the expedited procedure set forth below (in lieu of, or in addition to, any actions at law or equity) that may be brought.

A. A party invoking this procedure shall notify J.J. Pierson or Richard Adelman; who shall alternate (beginning with Arbitrator J.J. Pierson) as Arbitrator under this expedited arbitration procedure. If the Arbitrator next on the list is not available to hear

the matter within 24 hours of notice, the next Arbitrator on the list shall be called. Copies of such notification will be simultaneously sent to the alleged violator and Council.

B. The Arbitrator shall thereupon, after notice as to time and place to the Contractor, the Local Union involved, the Council and the Construction Manager, hold a hearing within 48 hours of receipt of the notice invoking the procedure if it is contended that the violation still exists. The hearing will not, however, be scheduled for less than 24 hours after the notice required by Section 3, above.

C. All notices pursuant to this Article may be provided by telephone, telegraph, hand delivery, or fax, confirmed by overnight delivery, to the Arbitrator, Contractor, Construction Manager and Local Union involved. The hearing may be held on any day including Saturdays or Sundays. The hearing shall be completed in one session, which shall not exceed 8 hours duration (no more than 4 hours being allowed to either side to present their case, and conduct their cross examination) unless otherwise agreed. A failure of any Union or Contractor to attend the hearing shall not delay the hearing of evidence by those present or the issuance of an award by the Arbitrator.

D. The sole issue at the hearing shall be whether a violation of Section 1, above, occurred. If a violation is found to have occurred, the Arbitrator shall issue a Cease and Desist Award restraining such violation and serve copies on the Contractor and Union involved. The Arbitrator shall have no authority to consider any matter in justification, explanation or mitigation of such violation or to award damages (any damages issue is reserved solely for court proceedings, if any.) The Award shall be issued in writing within 3 hours after the close of the hearing, and may be issued without an

Opinion. If any involved party desires an Opinion, one shall be issued within 15 calendar days, but its issuance shall not delay compliance with, or enforcement of, the Award.

E. The Agency and Construction Manager (or such other designee of the Agency) may participate in full in all proceedings under this Article.

F. An Award issued under this procedure may be enforced by any court of competent jurisdiction upon the filing of this Agreement together with the Award. Notice of the filing of such enforcement proceedings shall be given to the Union or Contractor involved, and the Construction Manager.

G. Any rights created by statute or law governing arbitration proceedings which are inconsistent with the procedure set forth in this Article, or which interfere with compliance thereto, are hereby waived by the Contractors and Unions to whom they accrue.

H. The fees and expenses of the Arbitrator shall be equally divided between the involved Contractor and Union.

SECTION 5. ARBITRATION OF DISCHARGES FOR VIOLATION

Procedures contained in Article 9 shall not be applicable to any alleged violation of this Article, with the single exception that an employee discharged for violation of Section 1, above, may have recourse to the procedures of Article 9 to determine only if the employee did, in fact, violate the provisions of Section 1 of this Article; but not for the purpose of modifying the discipline imposed where a violation is found to have occurred.

ARTICLE 8 - LABOR MANAGEMENT COMMITTEE

SECTION 1. SUBJECTS

The Program Labor Management Committee will meet on a regular basis to: 1) promote harmonious relations among the Contractors and Unions; 2) enhance safety awareness, cost effectiveness and productivity of construction operations; 3) protect the public interests; 4) discuss matters relating to staffing and scheduling with safety and productivity as considerations; and 5) review efforts to meet applicable participation goals for MWBEs and workforce participation goals for minority and female employees.

SECTION 2. COMPOSITION

The Committee shall be jointly chaired by a designee of the Agency and the President of the Council. It may include representatives of the Local Unions and Contractors involved in the issues being discussed. The parties may mutually designate an MWBE representative to participate in appropriate Committee discussions. The Committee may conduct business through mutually agreed upon sub-committees.

ARTICLE 9- GRIEVANCE & ARBITRATION PROCEDURE

SECTION 1. PROCEDURE FOR RESOLUTION OF GRIEVANCES

Any question, dispute or claim arising out of, or involving the interpretation or application of this Agreement (other than jurisdictional disputes or alleged violations of Article 7, Section 1) shall be considered a grievance and shall be resolved pursuant to the exclusive procedure of the steps described below, provided, in all cases, that the question, dispute or claim arose during the term of this Agreement. Grievances shall include the City contract number and the Program Work address; such information is posted at the Program

Work Site if already commenced, and is available in the City Record and Notice to Proceed for projects not already commenced.

Grievances as to whether a scope of work is included or excluded from this Agreement shall be submitted to the Labor Management Committee (LMC) in the first instance rather than Step 1 below. To be timely, such notice must be given no later than ten days prior to a bid opening if the grievance is challenging a determination by an Agency that the contract is not subject to this Agreement. For other grievances as to contractor scope of work issues, notice of such challenges shall be submitted to the LMC within 7 calendar days after the act, occurrence or event giving rise to the grievance. If the scope of work grievance is not resolved within 21 days of its submission to the LMC, then the grievance may proceed directly to Step 3 below.

Step 1:

(a) When any employee covered by this Agreement feels aggrieved by a claimed violation of this Agreement, the employee shall, through the Local Union business representative or job steward give notice of the claimed violation to the work site representative of the involved Contractor and the Construction Manager. To be timely, such notice of the grievance must be given within 7 calendar days after the act, occurrence or event giving rise to the grievance. The business representative of the Local Union or the job steward and the work site representative of the involved Contractor shall meet and endeavor to adjust the matter within 7 calendar days after timely notice has been given. If they fail to resolve the matter within the prescribed period, the grieving party, may, within 7 calendar days thereafter, pursue Step 2 of the grievance procedure by serving the involved Contractor with written copies of the grievance setting forth a description of the

claimed violation, the date on which the grievance occurred, and the provisions of the Agreement alleged to have been violated. Grievances and disputes settled at Step 1 are non-precedential except as to the specific Local Union, employee and Contractor directly involved unless the settlement is accepted in writing by the Construction Manager (or designee) as creating a precedent.

(b) Should any signatory to this Agreement have a dispute (excepting jurisdictional disputes or alleged violations of Article 7, Section 1) with any other signatory to this Agreement and, if after conferring, a settlement is not reached within 7 calendar days, the dispute shall be reduced to writing and proceed to Step 2 in the same manner as outlined in subparagraph (a) for the adjustment of employee grievances.

Step 2:

A Step 2 grievance shall be filed with the Agency, the BCTC, the Contractor, and, if the grievance is against a subcontractor, the subcontractor. The Business Manager or designee of the involved Local Union, together with representatives of the involved Contractor, Council the Construction Manager (or designee), and, if the grievance is against a subcontractor, the subcontractor shall meet in Step 2 within 7 calendar days of service of the written grievance to arrive at a satisfactory settlement. The BCTC shall schedule the Step 2 meeting.

Step 3:

(a) If the grievance shall have been submitted but not resolved in Step 2, any of the participating Step 2 entities may, within 21 calendar days after the initial Step 2 meeting, submit the grievance in writing (copies to other participants, including the

Construction Manager or designee) to the BCTC. In the event the matter is not resolved at Step 2, either J.J. Pierson or Richard Adelman, who shall act, alternately (beginning with Arbitrator J.J. Pierson), as the Arbitrator under this procedure, shall be designated at the Step 2 hearing and the BCTC will notify the arbitrator of his designation. After such notification by the BCTC, the local demanding arbitration shall within a reasonable time request the arbitrator to schedule the matter for an arbitration hearing date. The Labor Arbitration Rules of the American Arbitration Association shall govern the conduct of the arbitration hearing, at which all Step 2 participants shall be parties. The decision of the Arbitrator shall be final and binding on the involved Contractor, Local Union and employees and the fees and expenses of such arbitrations shall be borne equally by the involved Contractor and Local Union.

(b) Failure of the grieving party to adhere to the time limits set forth in this Article shall render the grievance null and void. These time limits may be extended only by written consent of the Construction Manager (or designee), involved Contractor and involved Local Union at the particular step where the extension is agreed upon. The Arbitrator shall have authority to make decisions only on the issues presented to him and shall not have the authority to change, add to, delete or modify any provision of this Agreement.

SECTION 2. LIMITATION AS TO RETROACTIVITY

No arbitration decision or award, with the exception of those related to compliance with requirements to pay prevailing wages and supplements in accordance with federal or State law, may provide retroactivity of any kind exceeding 60 calendar days

prior to the date of service of the written grievance on the Construction Manager and the involved Contractor or Local Union.

SECTION 3. PARTICIPATION BY AGENCY AND/OR CONSTRUCTION MANAGER

The Agency and Construction Manager (or such other designee of the Agency) shall be notified by the involved Contractor of all actions at Steps 2 and 3 and, at its election, may participate in full in all proceedings at these Steps, including Step 3 arbitration.

ARTICLE 10 - JURISDICTIONAL DISPUTES

SECTION 1. NO DISRUPTIONS

There will be no strikes, sympathy strikes, work stoppages, slowdowns, picketing or other disruptive activity of any kind arising out of any jurisdictional dispute. Pending the resolution of the dispute, the work shall continue uninterrupted and as assigned by the Contractor. No jurisdictional dispute shall excuse a violation of Article 7.

SECTION 2. ASSIGNMENT

All Program Work assignments shall be made by the Contractor to unions affiliated with the BCTC consistent with the New York Plan for the Settlement of Jurisdictional Disputes ("New York Plan") and its Greenbook decisions, if any. Where there are no applicable Greenbook decisions, assignments shall be made in accordance with the provisions of the New York Plan and local industry practice.

SECTION 3. NO INTERFERENCE WITH WORK

There shall be no interference or interruption of any kind with the Program Work while any jurisdictional dispute is being resolved. The work shall proceed as assigned by the Contractor until finally resolved under the applicable procedure of this Article. The award shall be confirmed in writing to the involved parties. There shall be no strike, work stoppage or interruption in protest of any such award.

ARTICLE 11 - WAGES AND BENEFITS

SECTION 1. CLASSIFICATION AND BASE HOURLY RATE

All employees covered by this Agreement shall be classified in accordance with the work performed and paid the hourly wage rates applicable for those classifications as required by the applicable prevailing wage laws.

SECTION 2. EMPLOYEE BENEFITS

A. The Contractors agree to pay on a timely basis contributions on behalf of all employees covered by this Agreement to those established jointly trusteed employee benefit funds designated in the applicable Collective Bargaining Agreements in Schedule A (in the appropriate Schedule A amounts), provided that such benefits are required to be paid on public works under any applicable prevailing wage law. Bona fide jointly trusteed fringe benefit plans established or negotiated through collective bargaining during the life of this Agreement may be added if similarly required under applicable prevailing wage law. Contractors, not otherwise contractually bound to do so, shall not be required to contribute to benefits, trusts or plans of any kind which are not required by the prevailing wage law provided, however, that this provision does not relieve Contractors

signatory to local collective bargaining agreement with any affiliated union from complying with the fringe benefit requirements for all funds contained in the CBA.

B. 1. Notwithstanding Section 2 (A) above, and subject to 2 (B)(2) below, Contractors who designate employees pursuant to Article 4, Section 2 (B) and (C) ("core" employees) that are not signatory to a Schedule A Agreement and who maintain bona fide private benefit plans that satisfy the requirements of Section 220 of the Labor Law, may satisfy the above benefit obligation with respect to those employees by providing those employees with coverage under their private benefit plans (to the extent consistent with Section 220). The total benefit payments to be made on behalf of each such employee must be equal to the total Section 220 supplement amount and any shortfall must be paid by cash supplement to the employee.

2. A contractor that will satisfy its Section 220 obligations in accordance with subsection 2(B)(1) above shall make available to the Agency at the time of contract award a complete set of plan documents for each non-Schedule A benefit plan into which contributions will be made and/or coverage provided pursuant to the provisions of Section 2(B)(l) above. The Contractor shall also provide certification from a certified public accountant as to the annualized hourly value of such benefits consistent with the requirements of Section 220.

3. The City shall verify that the alternate benefit plan(s), together with any cash supplement to the employee, is compliant with Section 220 prior to awarding the Contractor a contract covered by this Agreement. In the event the Contractor's alternate benefit plan(s), together with any cash supplement to the employee, is determined to be

compliant with Section 220 and will be utilized by the Contractor on behalf of Article 4, Section 2(B) and (C) core employees, the Local Unions have no duty to enforce the Contractor's obligations on the alternate benefit plan(s) as they are not party to the alternate plan(s) or privy to the terms and conditions of the plan obligations. In the event the City determines the alternate benefit plan(s), together with any cash supplement to the employee, is not compliant with Section 220, the Contractor may, upon executing a Letter of Assent, satisfy its obligations for all employees, including core employees, by contributing to the Schedule A benefit plans in accordance with the terms of the Schedule A Agreements.

C. The Contractors agree to be bound by the written terms of the legally established jointly trusteed Trust Agreements specifying the detailed basis on which payments are to be paid into, and benefits paid out of, such Trust Funds but only with regard to Program Work done under this Agreement and only for those employees to whom this Agreement requires such benefit payments.

D. 1. To the extent consistent with New York City's Procurement Policy Board Rules with respect to prompt payment, as published at www.nyc.gov/ppb, §4-06(e), and in consideration of the unions' waiver of their rights to withhold labor from a contractor or subcontractor delinquent in the payment of fringe benefits contributions ("Delinquent Contractor"); the Agency agrees that where any such union and/or fringe benefit fund shall notify the Agency, the General Contractor, and the Delinquent Contractor in writing with back-up documentation that the Delinquent Contractor has

failed to make fringe benefit contributions to it as provided herein and the Delinquent Contractor shall fail, within ten (10) calendar days after receipt of such notice, to furnish either proof of such payment or notice that the amount claimed by the union and/or fringe benefit fund is in dispute, the Agency shall withhold from amounts then or thereafter becoming due and payable to the General Contractor an amount equal to that portion of such payment due to the General Contractor that relates solely to the work performed by the Delinquent Contractor which the union or fringe benefit fund claims to be due it, and shall remit the amount when and so withheld to the fringe benefit fund and deduct such payment from the amounts then otherwise due and payable to the General Contractor, which payment shall, as between the General Contractor and the Agency, be deemed a payment by the Agency to the General Contractor; provided however, that in any month, such withholding shall not exceed the amount contained in the General Contractor's monthly invoice for work performed by the Delinquent Contractor. The union or its employee benefit funds shall include in its notification of delinquent payment of fringe benefits only such amount it asserts the Delinquent Contractor failed to pay on the specific project against which the claim is made and the union or its employee benefit funds may not include in such notification any amount such Delinquent Contractor may have failed to pay on any other City or non-City project.

2. In addition, where a union or employee benefit fund gives notice to the City that a Contractor is Delinquent as defined in subsection 2(D)(1) above and the City determines that the notice includes appropriate back-up documentation that the Contractor is delinquent, the City will promptly, but not later than twenty (20) days after receipt of the

notice, provide a copy of said notice to City Agencies. In the event the City determines there is insufficient back-up documentation, it will notify the appropriate union and/or fringe benefit fund promptly, but not later than twenty (20) days after receipt of the Delinquency Notice, and shall include notice of what additional documentation is requested. Any determination by the City that there is insufficient back-up must be reasonable. This provision is intended to enhance compliance with the prevailing wage law and the PLA with respect to the payment of fringe benefits, and is not intended as a substitute for the resolution of a disputed claim pursuant to any applicable law or agreement.

The City and the relevant Agency(s) will thereafter require the Delinquent Contractor to provide cancelled checks or other equivalent proof of payment of benefit contributions that have come due, to be submitted with certified payroll reports for all Program Work covered by this Agreement on which the Delinquent Contractor is engaged, for at least a one-year period or such earlier period if the Contractor is ultimately determined not be a Delinquent Contractor. Such proof of payment when required is a condition of payment of the Delinquent Contractor's invoices by any entity, including, but not limited to, the City, the relevant Agency(s), Construction Manager, General Contractor, the prime or higher level subcontractor, as is appropriate under the Delinquent Contractor's engagement. The union and the funds shall upon request receive copies of the certified payrolls, cancelled checks, or other proof of payment from the City and/or the relevant Agency(s).

E. In the event the General Contractor or Delinquent Contractor shall notify the Agency as above provided that the claim of the union or fringe benefit fund is in

dispute, the Agency shall withhold from amounts then or thereafter becoming due and payable to the General Contractor an amount equal to that portion of such payment due to the General Contractor that relates solely to the work performed by the Delinquent Contractor that the union and/or employee benefit fund claims to be due it, pending resolution of the dispute pursuant to the union's Schedule A agreement, and the amount shall be paid to the party or parties ultimately determined to be entitled thereto, or held until the Delinquent Contractor and union or fringe benefit fund shall otherwise agree as to the disposition thereof; provided however, that such withholding shall not exceed the amount contained in the General Contractor's monthly invoice for work performed by the Delinquent Contractor. In the event the Agency shall be required to withhold amounts from a General Contractor for the benefit of more than one fringe benefit fund, the amounts so withheld in the manner and amount prescribed above shall be applied to or for such fund in the order in which the written notices of nonpayment have been received by the Agency, and if more than one such notice was received on the same day, proportionately based upon the amount of the union and/or fringe benefit fund claims received on such day. Nothing herein contained shall prevent the Agency from commencing an interpleader action to determine entitlement to a disputed payment in accordance with section one thousand six of the civil practice law and rules or any successor provision thereto.

F. Payment to a fringe benefit fund under this provision shall not relieve the General Contractor or Delinquent Contractor from responsibility for the work covered by the payment. Except as otherwise provided, nothing contained herein shall create any obligation on the part of the Agency to pay any union or fringe benefit fund, nor

shall anything provided herein serve to create any relationship in contract or otherwise, implied or expressed, between the union/fund and/or fringe benefit and the Agency.

ARTICLE 12- HOURS OF WORK, PREMIUM PAYMENTS, SHIFTS AND HOLIDAYS

SECTION 1. WORK WEEK AND WORK DAY

A. The standard work week shall consist of 40 hours of work at straight time rates, Monday through Friday, 8 hours per day, plus ½ hour unpaid lunch period.

B. In accordance with Program needs, there shall be flexible start times with advance notice from Contractor to the Union. The Day Shift shall commence between the hours of 6:00 a.m. and 9:00 a.m. and shall end between the hours of 2:30 p.m. and 5:30 p.m., for an 8 hour day. The Evening Shift shall commence between the hours of 3:00 p.m. and 6:00 p.m., unless different times are necessitated by the Agency's phasing plans on specific projects. The Night Shift shall commence between the hours of 11:00 p.m. and 2:00 a.m., unless different times are necessitated by the Agency's phasing plans on specific projects. Subject to the foregoing, starting and quitting times shall occur at the Program Work site designated by the Contractor.

C. Scheduling — Except as provided above, Monday through Friday is the standard work week; 8 hours of work plus ½ hour unpaid lunch.

D. Notice - Contractors shall provide not less than 5 days prior notice to the Local Union involved as to the work week and work hour schedules to be worked or such lesser notice as may be mutually agreed upon.

SECTION 2. OVERTIME

Overtime shall be paid for any work over eight (8) hours in a day and work over forty (40) hours in a week, at time and one half (1½) Monday through Saturday. All overtime work performed on Sunday and Holidays will be paid pursuant to the applicable Schedule A. There shall be no stacking or pyramiding of overtime pay under any circumstances. There will be no restriction upon the Contractor's scheduling of overtime or the nondiscriminatory designation of employees who shall be worked, including the use of employees, other than those who have worked the regular or scheduled work week, at straight time rates. The Contractor shall have the right to schedule work so as to minimize overtime or schedule overtime as to some, but not all, of the crafts and whether or not of a continuous nature.

SECTION 3. SHIFTS

A. Flexible Schedules - Scheduling of shift work, including Saturday and Sunday work, shall be within the discretion of the Contractor in order to meet Program Work schedules and existing Program Work conditions including the minimization of interference with the mission of the Agency. It is not necessary to work a day shift in order to schedule a second or third shift, or a second shift in order to schedule a third shift, or to schedule all of the crafts when only certain crafts or employees are needed. Shifts must have prior approval of the Agency or Construction Manager, and must be scheduled with not less than five work days notice to the Local Union or such lesser notice as may be mutually agreed upon.

B. Second and/or Third Shifts/Saturday and/or Sunday Work - - The second shift shall start between 3 p.m. and 6 p.m. and the third shift shall start between 11 p.m. and 2 a.m., subject to different times necessitated by the Agency phasing plans on specific projects. There shall be no reduction in shift hour work. All employees within a classification performing Program Work will be paid at the same wage rate regardless of the shift or work scheduled work, subject only to the foregoing provisions.

C. Flexible Starting Times - Shift starting times will be adjusted by the Contractor as necessary to fulfill Program Work requirements subject to the notice requirements of paragraph A.

SECTION 4. HOLIDAYS

A. Schedule - There shall be nine (9) recognized holidays on the Project:

New Year's Day	
Martin Luther King Day	President's Day
Memorial Day	Veteran's Day
Labor Day	Thanksgiving Day
Independence Day	Christmas Day

All said holidays shall be observed on the calendar date except those holidays which occur on Saturday shall be observed on the previous Friday and those that occur on Sunday shall be observed on the following Monday.

B. Payment - Regular holiday pay, if any, for work performed on such a recognized holiday shall be in accordance with the applicable Schedule A.

C. Exclusivity - No holidays other than those listed in Section 4(A) above shall be recognized or observed.

SECTION 5. SATURDAY WORK

The Contractor may schedule a Saturday work day and such time shall be scheduled and paid at time and one-half (1½) unless the applicable Schedule A permits a straight time rate.

SECTION 6. REPORTING PAY

A. Employees who report to the work location pursuant to their regular schedule and who are not provided with work shall be paid two hours reporting pay at straight time rates. An employee whose work is terminated early by a Contractor due to severe weather, power failure, fire or natural disaster of for similar circumstances beyond the Contractor's control, shall receive pay only for such time as is actually worked. In other instances in which an employee's work is terminated early (unless provided otherwise elsewhere in this Agreement), the employee shall be paid for his full shift. Contractors shall not be permitted to call, text or email or voicemail employees in advance of their regularly scheduled shift starting time to avoid reporting pay. Notwithstanding the above, in the event that the National Weather Service issues a weather advisory for the area in which the work location is situated, and the entire project is shut down as a result of the Weather Advisory, the contractor shall be permitted to speak to employees no less than four (4) hours in advance of their shift starting time, unless the Local Union consents to a shorter notice in writing, to advise them not to report to work due to the National Weather Service advisory, and employees who are so notified shall not receive two (2) hours

reporting pay if they report to the work location. The contractor shall make every effort to notify each employee directly and confirm that notification has been received. Voice, text, and email messages left for employees without confirmation of delivery and receipt by employee do not constitute sufficient notice under this provision.

B. When an employee, who has completed their scheduled shift and left the Program Work site, is "called out" to perform special work of a casual, incidental or irregular nature, the employee shall receive overtime pay at the rate of time and one-half of the employee's straight time rate for hours actually worked.

C. When an employee leaves the job or work location of their own volition or is discharged for cause or is not working as a result of the Contractor's invocation of Section 7 below, they shall be paid only for the actual time worked.

D. Except as specifically set forth in this Article there shall be no premiums, bonuses, hazardous duty, high time or other special premium payments or reduction in shift hours of any kind.

E. There shall be no pay for time not actually worked except as specifically set forth in this Article and except where an applicable Schedule A requires a full weeks' pay for forepersons.

SECTION 7. PAYMENT OF WAGES

A. Termination- Employees who are laid off or discharged for cause shall be paid in full for that which is due them at the time of termination. The Contractor shall also provide the employee with a written statement setting forth the date of lay off or discharge.

SECTION 8. EMERGENCY WORK SUSPENSION

A Contractor may, if considered necessary for the protection of life and/or safety of employees or others, suspend all or a portion of Program Work. In such instances, employees will be paid for actual time worked, except that when a Contractor requests that employees remain at the job site available for work, employees will be paid for that time at their hourly rate of pay.

SECTION 9. INJURY/DISABILITY

An employee who, after commencing work, suffers a work-related injury or disability while performing work duties, shall receive no less than 8 hours wages for that day. Further, the employee shall be rehired at such time as able to return to duties provided there is still Program Work available for which the employee is qualified and able to perform.

SECTION 10. TIME KEEPING

A Contractor may utilize brassing or other systems to check employees in and out. Each employee must check in and out. The Contractor will provide adequate facilities for checking in and out in an expeditious manner.

SECTION 11. MEAL PERIOD

A Contractor shall schedule an unpaid period of not more than 1/2 hour duration at the work location between the 3rd and 5th hour of the scheduled shift. A Contractor may, for efficiency of operation, establish a schedule which coordinates the meal periods of two or more crafts or which provides for staggered lunch periods within a

craft or trade. If an employee is required to work through the meal period, the employee shall be compensated in a manner established in the applicable Schedule A.

SECTION 12. BREAK PERIODS

There will be no rest periods, organized coffee breaks or other non-working time established during working hours. Individual coffee containers will be permitted at the employee's work location.

ARTICLE 13 - APPRENTICES

SECTION 1. RATIOS

Recognizing the need to maintain continuing supportive programs designed to develop adequate numbers of competent workers in the construction industry and to provide craft entry opportunities for minorities, women and economically disadvantaged non-minority males, Contractors will employ apprentices in their respective crafts to perform such work as is within their capabilities and which is customarily performed by the craft in which they are indentured. Contractors may utilize apprentices and such other appropriate classifications in the maximum ratio permitted by the New York State Department of Labor or the maximum allowed per trade. Apprentices and such other classifications as are appropriate shall be employed in a manner consistent with the provisions of the appropriate Schedule A. The parties encourage, as an appropriate source of apprentice recruitment consistent with the rules and operations of the affiliated unions' apprentice-programs, the use of the Edward J. Malloy Initiative for Construction Skills, Non-Traditional Employment for Women and Helmets to Hardhats.

ARTICLE 14-SAFETY PROTECTION OF PERSON AND PROPERTY

SECTION 1. SAFETY REQUIREMENTS

Each Contractor will ensure that applicable OSHA and safety requirements are at all times maintained on the Program Work site and the employees and Unions agree to cooperate fully with these efforts to the extent consistent with their rights and obligations under the law. Employees will cooperate with employer safety policies and will perform their work at all times in a safe manner and protect themselves and the property of the Contractor and Agency from injury or harm, to the extent consistent with their rights and obligations under the law. Failure to do so will be grounds for discipline, including discharge.

SECTION 2. CONTRACTOR RULES

Employees covered by this Agreement shall at all times be bound by the reasonable safety, security, and visitor rules as established by the Contractors and the Construction Manager for this Program Work. Such rules will be published and posted in conspicuous places throughout the Program Work sites. Any site security and access policies established by the Construction Manager or General Contractor intended for specific application to the construction workforce for Program Work and that are not established pursuant to an Agency directive shall be implemented only after notice to the BCTC and its affiliates and an opportunity for negotiation and resolution by the Labor Management Committee.

SECTION 3. INSPECTIONS

The Contractors and Construction Manager retain the right to inspect incoming shipments of equipment, apparatus, machinery and construction materials of every kind.

ARTICLE 15 - TEMPORARY SERVICES

Temporary services, i.e. all temporary heat, climate control, water, power and light, shall only be required upon the determination of the Agency or Construction Manager, and when used shall be staffed and assigned to the appropriate trade(s) with jurisdiction. Temporary services shall be provided by the appropriate Contractors' existing employees during working hours in which a shift is scheduled for employees of this Contractor. The Agency or Construction Manager may determine the need for temporary services requirements during non-working hours, and when used shall be staffed and assigned to the appropriate trades(s), and which may be limited to one person per applicable trade where practicable. There shall be no stacking of trades on temporary services, provided this does not constitute a waiver of primary trade jurisdiction. In the event a temporary system component is claimed by multiple trades, the matter shall be resolved through the New York Plan for Jurisdictional Disputes.

ARTICLE 16 - NO DISCRIMINATION

SECTION 1. COOPERATIVE EFFORTS

The Contractors and Unions agree that they will not discriminate against any employee or applicant for employment because of creed, race, color, religion, sex,

sexual orientation, national origin, marital status, citizenship status, disability, age or any other status provided by law, in any manner prohibited by law or regulation.

SECTION 2. LANGUAGE OF AGREEMENT

The use of the masculine or feminine gender in this Agreement shall be construed as including both genders.

ARTICLE 17- GENERAL TERMS

SECTION 1. PROJECT RULES

A. The Construction Manager and the Contractors shall establish such reasonable Program Work rules that are not inconsistent with this Agreement or rules common in the industry and are reasonably related to the nature of work. These rules will be explained at the pre-job conference and posted at the Program Work sites and may be amended thereafter as necessary. Notice of amendments will be provided to the appropriate Local Union. Failure of an employee to observe these rules and regulations shall be grounds for discipline, including discharge. The fact that no order was posted prohibiting a certain type of misconduct shall not be a defense to an employee disciplined or discharged for such misconduct when the action taken is for cause.

B. The parties adopt and incorporate the BCTC's Standards of Excellence as annexed hereto as Exhibit "B".

SECTION 2. TOOLS OF THE TRADE

The welding/cutting torch and chain fall are tools of the trade having jurisdiction over the work performed. Employees using these tools shall perform any of the work of the trade. There shall be no restrictions on the emergency use of any tools or

equipment by any qualified employee or on the use of any tools or equipment for the performance of work within the employee's jurisdiction.

SECTION 3. SUPERVISION

Employees shall work under the supervision of the craft foreperson or general foreperson.

SECTION 4. TRAVEL ALLOWANCES

There shall be no payments for travel expenses, travel time, subsistence allowance or other such reimbursements or special pay except as expressly set forth in this Agreement.

SECTION 5. FULL WORK DAY

Employees shall be at their work area at the starting time established by the Contractor, provided they are provided access to the work area. The signatories reaffirm their policy of a fair day's work for a fair day's wage.

SECTION 6. COOPERATION AND WAIVER

The Construction Manager, Contractors and the Unions will cooperate in seeking any NYS Department of Labor, or any other government, approvals that may be needed for implementation of any terms of this Agreement. In addition, the Council, on their own behalf and on behalf of its participating affiliated Local Unions and their individual members, intend the provisions of this Agreement to control to the greatest extent permitted by law, notwithstanding contrary provisions of any applicable prevailing wage, or other, law and intend this Agreement to constitute a waiver of any such prevailing wage, or other, law to the greatest extent permissible only for work within the scope of this

Agreement, including specifically, but not limited to those provisions relating to shift, night, and similar differentials and premiums. This Agreement does not, however, constitute a waiver or modification of the prevailing wage schedules applicable to work not covered by this Agreement.

ARTICLE 18. SAVINGS AND SEPARABILITY

SECTION 1. THIS AGREEMENT

In the event that the application of any provision of this Agreement is enjoined, on either an interlocutory or permanent basis, or is otherwise determined to be in violation of law, or if such application may cause the loss of Program funding or any New York State Labor Law exemption for all or any part of the Program Work, the provision or provisions involved (and/or its application to particular Program Work, as necessary) shall be rendered, temporarily or permanently, null and void, but where practicable the remainder of the Agreement shall remain in full force and effect to the extent allowed by law (and to the extent no funding or exemption is lost), unless the part or parts so found to be in violation of law or to cause such loss are wholly inseparable from the remaining portions of the Agreement and/or are material to the purposes of the Agreement. In the event a court of competent jurisdiction finds any portion of the Agreement to trigger the foregoing, the parties will immediately enter into negotiations concerning the substance affected by such decision for the purpose of achieving conformity with the court determination and the intent of the parties hereto for contracts to be let in the future.

SECTION 2. THE BID SPECIFICATIONS

In the event that the Agency's (or Construction Manager's) bid specifications, or other action, requiring that a successful bidder (and subcontractor) become signatory to this Agreement is enjoined, on either an interlocutory or permanent basis, or is otherwise determined to be in violation of law, or may cause the loss of Program funding or any New York State Labor Law exemption for all or any part of the Program Work, such requirement (and/or its application to particular Program Work, as necessary) shall be rendered, temporarily or permanently, null and void, but where practicable the Agreement shall remain in full force and effect to the extent allowed by law and to the extent no funding or exemption is lost). In such event, the Agreement shall remain in effect for contracts already bid and awarded or in construction only where the Agency and Contractor voluntarily accepts the Agreement. The parties will enter into negotiations as to modifications to the Agreement to reflect the court or other action taken and the intent of the parties for contracts to be let in the future.

SECTION 3. NON-LIABILITY

In the event of an occurrence referenced in Section 1 or Section 2 of this Article, neither the Agency, the Construction Manager, any Contractor, nor any Union shall be liable, directly or indirectly, for any action taken, or not taken, to comply with any court order or injunction, other determination, or in order to maintain funding or a New York State Labor Law exemption for Program Work. Bid specifications will be issued in conformance with court orders then in effect and no retroactive payments or other action will be required if the original court determination is ultimately reversed.

SECTION 4. NON-WAIVER

Nothing in this Article shall be construed as waiving the prohibitions of Article 7 as to signatory Contractors and signatory Unions.

ARTICLE 19 - FUTURE CHANGES IN SCHEDULE A AREA CONTRACTS

SECTION 1. CHANGES TO AREA CONTRACTS

A. Schedule A to this Agreement shall continue in full force and effect until the Contractor and/or Union parties to the Area Collective Bargaining Agreements that are the basis for the Schedule A notify the Agency and Construction Manager in writing of the changes agreed to in that Area Collective Bargaining which are applicable to work covered by this Agreement and their effective dates.

B. It is agreed that any provisions negotiated into Schedule A collective bargaining agreements will not apply to work under this Agreement if such provisions are less favorable to those uniformly required of contractors for construction work normally covered by those agreements; nor shall any provision be recognized or applied on Program Work if it may be construed to apply exclusively, or predominantly, to work covered by this Agreement.

C. Any disagreement between signatories to this Agreement over the incorporation into Schedule A of provisions agreed upon in the renegotiation of Area Collective Bargaining Agreements shall be resolved in accordance with the procedure set forth in Article 9 of this Agreement.

SECTION 2. LABOR DISPUTES DURING AREA CONTRACT NEGOTIATIONS

The Unions agree that there will be no strikes, work stoppages, sympathy actions, picketing, slowdowns or other disruptive activity or other violations of Article 7 affecting the Program Work by any Local Union involved in the renegotiation of Area Local Collective Bargaining Agreements nor shall there be any lock-out on such Program Work affecting a Local Union during the course of such renegotiations.

ARTICLE 20 - WORKERS' COMPENSATION ADR

SECTION 1.

An ADR program may be negotiated and participation in the ADR Program will be optional by trade.

ARTICLE 21 - HELMETS TO HARDHATS

SECTION 1.

The Contractors and the Unions recognize a desire to facilitate the entry into the building and construction trades of veterans who are interested in careers in the building and construction industry. The Contractors and Unions agree to utilize the services of the New York City Helmets to Hardhats Program to serve as a resource for preliminary orientation, assessment of construction aptitude, referral to apprenticeship programs or hiring halls, counseling and mentoring, support network, employment opportunities and other needs as identified by the parties.

SECTION 2.

The Unions and Contractors agree to coordinate with the Program to create and maintain an integrated database of veterans interested in working on this Project and of

apprenticeship and employment opportunities for this Project. To the extent permitted by law, the Unions will give credit to such veterans for bona fide, provable past experience.

IN WITNESS WHEREOF the parties have caused this Agreement to be executed and effective as of the ___ day of_____, _____

FOR BUILDING AND CONSTRUCTION TRADES COUNCIL
OF GREATER NEW YORK AND VICINITY

BY: _____
Gary LaBarbera
President

FOR NEW YORK CITY

BY: _____
Dr. Feniosky Peña-Mora
Commissioner, Department of Design & Construction

APPROVED AS TO FORM:

_____
ACTING CORPORATION COUNSEL
NEW YORK CITY

IN WITNESS WHEREOF the parties have caused this Agreement to be executed and effective as of the ___ day of_____, _____

FOR BUILDING AND CONSTRUCTION TRADES COUNCIL
OF GREATER NEW YORK AND VICINITY

BY: _____
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President

FOR NEW YORK CITY

BY: _____
Dr. Feniosky Peña-Mora
Commissioner, Department of Design & Construction

APPROVED AS TO FORM:

_____
ACTING CORPORATION COUNSEL
NEW YORK CITY

TM

SEP 23 2015

LIST OF SIGNATORY UNIONS
Boiler Makers Local No. 5
Carpenters District Council
Cement Masons No. 780
Concrete Workers, District Council No. 16
Derrickmen and Riggers, Local Union No. 197
Drywall Tapers 1974, District Council 9
Electrical Workers Local No. 3
Glaziers Local Union No. 1087 District Council 9
Heat & Frost Insulators, Local Union No. 12A
Heat & Frost Insulators, Local Union No. 12
Iron Workers District Council
Iron Workers Local Union No. 40
Iron Workers Local No. 361
Laborers Local No. 78, Asbestos & Lead Abatement
Laborers Local 1010 Pavers and Road Builders District Council
Laborers 79 Construction and General Building Laborers
Laborers Local No. 731 Excavators
Mason Tenders District Council
Metal Lathers Local No. 46
Metal Polishers District Council 9
Ornamental Iron Workers Local No. 580
Painters District Council 9
Plumbers Local No. 1
Painters, Decorators & Wallcoverers District Council 9
Painters Structural Steel No. 806
Plasterers Local Union No. 262
Roofers & Waterproofers Local 8
Steamfitters Local Union No. 638
Sheet Metal Workers Local No. 28
Sheet Metal Workers Local No. 137
Teamsters Local Union No. 282
Teamsters Local Union 814
Teamsters Local No. 813 Private Sanitation
Tile, Marble & Terrazzo B.A.C. Local Union No. 7

SCHEDULE "A"

Union	Current Agreement w/
Architectural and Ornamental Iron Workers Local Union 580, AFL-CIO	Allied Building Metal Industries, Inc.
Building, Concrete, Excavating & Common Laborers Local 731	Independent
Building, Concrete, Excavating & Common Laborers Local 731	Members of the General Contractors Association of New York, Inc.
District Council No. 9, I.U.P.A.T Glaziers Local 1087	Window and Plate Glass Dealers Association
Drywall Tapers and Pointers Local 1974, affiliated with International Union of Painters & Allied Trades and Drywall Taping Contractor's Association & Association of Wall-Ceiling & Carpentry Industries NY, Inc.	Independent
Enterprise Association of Steamfitters and Apprentices Local 638	Mechanical Contractors Association of NY, Inc.
Enterprise Association of Steamfitters and Apprentices Local 638	Independent
Highway Road and Street Laborers Local Union 1010 of the District Council of Pavers and Road Builders of the Laborers' International Union of North America AFL-CIO	Independent
Highway Road and Street Laborers Local Union 1010 of the District Council of Pavers and Road Builders of the Laborers' International Union of North America AFL-CIO	Member of the General Contractors Association of New York, Inc.
International Association of Heat and Frost Insulators and Allied Workers Local No. 12 of New York City	Independent
International Association of Heat and Frost Insulators and Allied Workers Local No. 12 of New York City	The Insulation Contractors Association of New York City, Inc.
International Association of Heat and Frost Insulators and Allied Workers Local No. 12A of New York City	Independent

International Association of Heat and Frost Insulators and Allied Workers Local No. 12A of New York City	Environmental Contractors Association, Inc.
International Brotherhood of Boilermakers, Iron Ship Builders, Blacksmiths, Forgers and Helpers, AFL-CIO, Local Lodge No. 5	Boilermakers Association of Greater New York
Local Union No. 3 International Brotherhood of Electrical Workers, AFL-CIO	New York Electrical Contractors Association
International Brotherhood of Teamsters, Local 282, High Rise contract	Building Contractors Association & Independents
Local 46 Metallic Lathers Union and Reinforcing Iron Workers of NY and Vicinity of the International Association of Bridge, Structural, Ornamental and Reinforcing Iron Workers	Cement League
Local 46 Metallic Lathers Union and Reinforcing Iron Workers of NY and Vicinity of the International Association of Bridge, Structural, Ornamental and Reinforcing Iron Workers	Independent
Local 8 Roofers, Waterproofers & Allied Workers	Roofing and Waterproofing Contractors Association of New York and Vicinity
Local Union 1 of the United Association of Journeymen and Apprentices of the Pipe Fitting Industry of the United States and Canada	Association of Contracting Plumbers of the City of New York
Local Union Number 40 & 361 of Bridge, Structural Ornamental and Reinforcing Iron Workers AFL-CIO	Independent
Operative Plasterers' and Cement Masons' International Association Local No. 262	Independent
Painters and Allied Trades AFL-CIO, District Council No. 9 (Painting and Protective Coatings CBA)	Independent

Painters and Allied Trades AFL-CIO, District Council No. 9 (Painting and Protective Coatings CBA)	The Association of Master Painters & Decorators of NY, Inc. and The Association of Wall, Ceiling & Carpentry Industries of NY, Inc. and The Window and Plate Glass Dealers Association
Sheet Metal Workers' International Association, Local 28	Sheet Metal & Air Conditioning Contractors Association of New York City, Inc.
Sheet Metal Workers' International Association, Local 137	The Greater New York Sign Association
Structural Steel and Bridge Painters Local 806, DC 9 International Union of Painters and Allied Trades, AFL-CIO	New York Structural Steel Painting Contractors Association
Teamsters Local 813	Independent
Teamsters Local 813	IESI NY Corporation
Teamsters Local 814	Greater New York Movers and Warehousemen's Bargaining Group
The Cement Masons' Union, Local 780	Cement League
The District Council of Cement and Concrete Workers (comprised of Local 6A; Local 18A and Local 20)	Cement League
The District Council of Cement and Concrete Workers (comprised of Local 6A; Local 18A and Local 20)	Independent

The District Council of New York City and Vicinity of the United Brotherhood of Carpenters and Joiners of America for Heavy Carpenters	GCA
The District Council of New York City and Vicinity of the United Brotherhood of Carpenters and Joiners of America for Dockbuilders Local No. 1556	Concrete Contractors of NY
The District Council of New York City and Vicinity of the United Brotherhood of Carpenters and Joiners of America for Dockbuilders Local 1556	Independent
The District Council of New York City and Vicinity of the United Brotherhood of Carpenters and Joiners of America for Millwright Local 740	Independent
The District Council of New York City and Vicinity of the United Brotherhood of Carpenters and Joiners of America for Timbermen Local 1556	Independent
The District Council of New York City and Vicinity of the United Brotherhood of Carpenters and Joiners of America for Timbermen Local 1556	GCA
The District Council of New York City and Vicinity of the United Brotherhood of Carpenters and Joiners of America for Heavy Carpenters	Independent
The District Council of New York City and Vicinity of the United Brotherhood of Carpenters and Joiners of America for Carpenters	Manufacturing Woodworkers Association of Greater New York Incorporated
The District Council of New York City and Vicinity of the United Brotherhood of Carpenters and Joiners of America	The Hoisting Trade Association of New York, Inc.
The District Council of New York City and Vicinity of the United Brotherhood of Carpenters and Joiners of America	The Test Boring Association

The District Council of New York City and Vicinity of the United Brotherhood of Carpenters and Joiners of America	Building Contractors Association
The District Council of New York City and Vicinity of the United Brotherhood of Carpenters and Joiners of America	The Association of Wall-Ceiling & Carpentry Industries of New York, Incorporated
The District Council of New York City and Vicinity of the United Brotherhood of Carpenters and Joiners	The Cement League
The District Council of NYC and Vicinity of the United Brotherhood of Carpenters and Joiners of America	New York City Millwright Association
The District Council of New York City and Vicinity of the United Brotherhood of Carpenters and Joiners	Greater New York Floor Covering Association
The District Council of New York City and Vicinity of the United Brotherhood of Carpenters and Joiners of America for Carpenters	Association of Architectural Metal & Glass
The District Council of New York City and Vicinity of the United Brotherhood of Carpenters and Joiners of America for Carpenters	Concrete Contractors of NY
The District Council of New York City and Vicinity of the United Brotherhood of Carpenters and Joiners of America for Building Construction Carpenters	Independent
The District Council of New York City and Vicinity of the United Brotherhood of Carpenters and Joiners of America for Local 2287	Independent
The District Council of New York City and Vicinity of the United Brotherhood of Carpenters and Joiners of America for Shop Carpenters	Independent
The Tile Setters and Tile Finishers Union of New York and New Jersey, Local 7 of the International Bricklayers and Allied Craftworkers	The Greater New York and New Jersey Contractors Association

United Derrickmen & Riggers Association, Local 197 of NY, LI, Westchester & Vicinity	Contracting Stonesetters Association Inc.
United Derrickmen & Riggers Association L 197 of NY, LI, Westchester and Vicinity	Building Stone and Pre-cast Contractors Association
International Union of Operating Engineers Local 14-14B	Building Contractors Association
International Union of Operating Engineers Local 14-14B	Contractors Association of Greater NY
International Union of Operating Engineers Local 14-14B	GCA
International Union of Operating Engineers Local 14-14B	The Cement League
International Union of Operating Engineers Local 14-14B	Allied Building Metal Industries, Inc.
International Union of Operating Engineers Local 14-14B	Brick Association
International Union of Operating Engineers Local 14-14B	Independent
International Union of Operating Engineers Local 15	Allied Building Metal Industries, Inc.
International Union of Operating Engineers Local 15-15A	General Contractors Association
International Union of Operating Engineers Local 15D	General Contractors Association
International Union of Operating Engineers Local 15D	Structural Steel Erectors

International Union of Operating Engineers Local 15-15A	Building Contractors Association
International Union of Operating Engineers Local 15D	Building Contractors Association
International Union of Operating Engineers Local 15-15A	Contractors Association of Greater NY
International Union of Operating Engineers Local 15D	Contractors Association of Greater NY
International Union of Operating Engineers Local 15-15A	The Cement League
International Union of Operating Engineers Local 15D	The Cement League

Project Labor Agreement - - Letter of Assent

Dear:

The undersigned party confirms that it agrees to be a party to and be bound by the New York Agency, Project Labor Agreement as such Agreement may, from time to time, be amended by the parties or interpreted pursuant to its terms. The terms of the Project Labor Agreement, its Schedules, Addenda and Exhibits are hereby incorporated by reference herein.

The undersigned, as a Contractor or Subcontractor (hereinafter Contractor) on the Project known as S136-367 and located at 1000 W. Service Rd S.I. NY 10314 (hereinafter PROJECT), for and in consideration of the award to it of a contract to perform work on said PROJECT, and in further consideration of the mutual promises made in the Project Labor Agreement, a copy of which was received and is acknowledged, hereby:

(1) Accepts and agrees to be bound by the terms and conditions of the Agreement, together with any and all schedules; amendments and supplements now existing or which are later made thereto:

(2) Agrees to be bound by the legally established collective bargaining agreements; local trust agreements for employee benefit funds; and trust documents for joint apprentice programs as well as apprentice program rules and procedures but only to the extent of Program Work and as required by the PLA.

(3) Authorizes the parties to such local trust agreements to appoint trustees and successor trustees to administer the trust funds and hereby ratifies and accepts the trustees so appointed as if made by the Contractor but only to the extent of Program Work as required by the PLA.

(4) Certifies that it has no commitments or agreements that would preclude its full and complete compliance with the terms and conditions of said Agreement. The Contractor agrees to employ labor that can work in harmony with all other labor on the Project and shall require labor harmony from every lower tier subcontractor it has engaged or may engage to work on the Project. Labor harmony disputes/issues shall be subject to the Labor Management Committee provisions.

(5) Agrees to secure from any Contractor(s) (as defined in said Agreement) which is or becomes a Subcontractor (of any tier), to it, a duly executed Agreement to be Bound in from identical to this document.

Provide description of the Work, identify craft jurisdiction(s) and all contract numbers below:

Dated: 2/28/2020

Prismatic Development Corp.
(Name of CM; GC; Contractor or Higher Level Subcontractor)

Prismatic Development Corp.
(Name of Contractor or subcontractor)

(Authorized Officer & Title)

60 Rt. 46 E Fairfield NJ 07004
(Address)

PH:973-882-1133 F:973-882-1132
(Phone) (Fax)

Contractor's State License
N/A

Sworn to before me this
28th day of February 2020

Notary Public

DORI L. ROBINSON
NOTARY PUBLIC - State of New Jersey
No. 2186826
Qualified in Hudson County
Commission Expires March 1, 2021

NEW YORK CITY BUILDING AND CONSTRUCTION TRADES COUNCIL STANDARDS OF EXCELLENCE

The purpose of this Standard of Excellence is to reinforce the pride of every construction worker and the commitment to be the most skilled, most productive and safest workforce available to construction employers and users in the City of New York. It is the commitment of every affiliated local union to use our training and skills to produce the highest quality work and to exercise safe and productive work practices.

The rank and file members represented by the affiliated local unions acknowledge and adopt the following standards:

- ***Provide a full days work for a full days pay;***
- ***Safely work towards the timely completion of the job;***
- ***Arrive to work on time and work until the contractual quitting time;***
- ***Adhere to contractual lunch and break times;***
- ***Promote a drug and alcohol free work site;***
- ***Work in accordance with all applicable safety rules and procedures;***
- ***Allow union representatives to handle job site disputes and grievances without resort to slowdowns, or unlawful job disruptions;***
- ***Respect management directives that are safe, reasonable and legitimate;***
- ***Respect the rights of co-workers;***
- ***Respect the property rights of the owner, management and contractors.***

The Unions affiliated with the New York City Building and Construction Trades Council will expect the signatory contractors to safely and efficiently manage their jobs and the unions see this as a corresponding obligation of the contractors under this Standard of Excellence. The affiliated unions will expect the following from its signatory contractors:

- ***Management adherence to the collective bargaining agreements;***
- ***Communication and cooperation with the trade foremen and stewards;***
- ***Efficient, safe and sanitary management of the job site;***
- ***Efficient job scheduling to mitigate and minimize unproductive time;***
- ***Efficient and adequate staffing by properly trained employees by trade;***
- ***Efficient delivery schedules and availability of equipment and tools to ensure efficient job progress;***
- ***Ensure proper blueprints, specifications and layout instructions and material are available in a timely manner***
- ***Promote job site dispute resolution and leadership skills to mitigate such disputes;***
- ***Treatment of all employees in a respectful and dignified manner acknowledging their contributions to a successful project.***

The affiliated unions and their signatory contractors shall ensure that both the rank and file members and the management staff shall be properly trained in the obligations undertaken in the Standard of Excellence.

BUILDSAFENYC

Codes of Conduct

BuildSafeNYC establishes that all BTEA member companies and BCTC member unions establish minimum safety standards on all building construction projects in NYC as follows:

1. **The workforce shall adhere to the minimum personal protective equipment (PPE) usage to include:**
   a. **ANSI compliant Hard Hats (with ratchet suspension) at all times (supplied by employer)**
   b. **Construction-type Work Boots at all times**
   c. **Long Pants and shirts with at least short sleeves at all times (no shorts or tank tops)**
   d. **ANSI compliant Eye Protection in their possession and used as needed (supplied by employer)**
   e. **Adequate Hearing Protection in their possession and used as needed (supplied by employer)**
   f. **High-vis traffic vests at street level and when around heavy equipment (supplied by employer)**
2. **CM and Subcontractor management shall implement a fair and consistent disciplinary policy for all site personnel regarding the adherence to site safety rules and requirements. Likewise, a joint labor / management team will periodically assess project wide implementation of these Codes.**
3. **CM firms shall maintain minimum standards for workforce restroom, hygiene facilities and housekeeping, initially and throughout the duration of the project.**
4. **All personnel shall adhere to a strict policy against drug and alcohol possession and use on sites and during hours of work.**
5. **All personnel shall attend a site safety orientation prior to beginning work. Worker certifications of safety training for specific tasks such as fire watch, flagmen, and safety attendant must be verified.**
6. **No cell phones, portable media devices, radios or other devices that limit hearing and attention shall be used while working on sites.**
7. **Ground Fault Circuit Interrupters (GFCI) will be used on all power tools and extension cords.**
8. **Union trade representatives shall participate in a regularly scheduled site safety meeting on all projects regardless of size.**
9. **Extreme effort shall be made to isolate the public from all construction activity. Specifically, systems shall be put in place to control falling materials and pedestrian exposure. This should be a top priority for the entire project workforce.**
10. **Workers shall honor security access control systems to establish entry to sites by authorized personnel only, where applicable.**
11. **Fall protection management shall be a top project priority. Workers shall maintain and use necessary fall protection systems and procedures where appropriate. Engineering controls and work methods which eliminate, guard, or otherwise control fall hazards shall take priority over personal fall arrest system usage.**
12. **Where hazardous materials are present, projects shall implement efforts to communicate and control potential exposure to the workforce.**

With Full Support and Endorsement of:

Louis J. Coletti, President & CEO
Building Trades Employers Association

BTEANYC

Edward J. Malloy, President
Building and Construction Trades Council

Construction Management Firms:

Trade Unions:

CITY OF NEW YORK

DEPARTMENT OF
DESIGN AND CONSTRUCTION
DIVISION OF PUBLIC BUILDINGS

INFORMATION FOR BIDDERS

December 2013

NOTICE TO BIDDERS

Please note that the Information for Bidders has been updated to include new Section 41, Viewing of Submitted Bid Documents.

(NO FURTHER TEXT ON THIS PAGE)

7/12/2019
DISCONTINUE THE USE OF THIS NOTICE ON 1/1/2020

(NO TEXT ON THIS PAGE)

CITY OF NEW YORK

DEPARTMENT OF
DESIGN AND CONSTRUCTION
DIVISION OF PUBLIC BUILDINGS

INFORMATION FOR BIDDERS

JULY 2019

CITY OF NEW YORK CITY
DEPARTMENT OF DESIGN AND CONSTRUCTION
INFORMATION FOR BIDDERS

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INFORMATION FOR BIDDERS

1. Description and Location of Work

The description and location of the work for which bids are requested are specified in Attachment 1, "Bid Information". Attachment 1 is included in the BID BOOKLET, VOLUME 1 OF 3.

2. Time and Place for Receipt of Bids

Sealed bids shall be received on or before the date and hour specified in Attachment 1, at which time they will be publicly opened and read aloud in the presence of the Commissioner or his or her representative, and any bidders who may desire to be present.

3. Definitions

The definitions set forth in the Procurement Policy Board Rules shall apply to this Invitation For Bids.

4. Invitation For Bids and Contract Documents

(A) Except for titles, sub-titles, headings, running headlines, tables of contents and indices (all of which are printed herein merely for convenience) the following, except for such portions thereof as may be specifically excluded, shall be deemed to be part of the Contract and the Invitation for Bids.

(1) All provisions required by law to be inserted in this Contract, whether actually inserted or not
(2) The Contract Drawings and Specifications
(3) The General Conditions, the General Requirements and the Special Conditions, if any
(4) The Contract
(5) The Information for Bidders; Request for Proposals; Notice of Solicitation and Proposal For Bids; Bid or Proposal, and, if used, the Bid Booklet
(6) The Budget Director's Certificate; all Addenda issued prior to the receipt of the bids; the Notice of Award; Performance and Payment Bonds, if required; and the Notice to Proceed with the Work.

(B) For particulars as to this procurement, including quantity and quality of the purchase, extent of the work or labor to be performed, delivery and performance schedule, and any other special instructions, prospective bidders are referred to the Invitation For Bids Documents. A copy of such documents can be obtained at the location set forth in Attachment 1.

(C) Deposit for Copy of Invitation For Bids Documents: Prospective bidders may obtain a copy of the Invitation For Bids Documents by complying with the conditions set forth in the Notice of Solicitation. The deposit must be in the form of a check or money order made payable to the City of New York, and drawn upon a state or national bank or trust company, or a check of such bank or trust company signed by a duly authorized officer thereof.

(D) Return of Invitation For Bids Documents: All Invitation For Bids Documents must be returned to the Department upon request. If the bidder elects not to submit a bid thereunder, the Invitation For Bids Documents shall be returned to the Department, along with a statement that no bid will be submitted.

(E) Return of Deposit: Such deposit will be returned within 30 days after the award of the contract or the rejection of all bids as set forth in the advertisement, provided the Invitation For Bids Documents are returned to the location specified in Attachment 1, in physical condition satisfactory to the Commissioner.

(F) Additional Copies: Additional copies of the Invitation For Bids Documents may be obtained, subject to the conditions set forth in the advertisement for bids.

5. Pre-Bid Conference

A pre-bid conference shall be held as set forth in Attachment 1. Nothing stated at the pre-bid conference shall change the terms or conditions of the Invitation For Bids Documents, unless a change is made by written amendment as provided in Section 9 below. Failure to attend a mandatory pre-bid conference shall constitute grounds for the rejection of the bid.

6. Agency Contact

Any questions or correspondence relating to this bid solicitation shall be addressed to the Agency Contact person specified in Attachment 1.

7. Bidder's Oath

(A) The bid shall be properly signed by an authorized representative of the bidder and the bid shall be verified by the written oath of the authorized representative who signed the bid, that the several matters stated and information furnished therein are in all aspects true.

(B) A materially false statement willfully or fraudulently made in connection with the bid or any of the forms completed and submitted with the bid may result in the termination of any Contract between the City and the Bidder. As a result, the Bidder may be barred from participating in future City contracts as well as be subject to possible criminal prosecution.

8. Examination and Viewing of Site, Consideration of Other Sources of Information and Changed Conditions

(A) Pre-Bidding (Investigation) Viewing of Site - Bidders must carefully view and examine the site of the proposed work, as well as its adjacent area, and seek other usual sources of information, for they will be conclusively presumed to have full knowledge of any and all conditions on, about or above the site relating to or affecting in any way the performance of the work to be done under the Contract which were or should have been indicated to a reasonably prudent bidder. To arrange a date for visiting the work site, bidders are to contact the Agency Contact person specified in Attachment 1.

(B) Should the contractor encounter during the progress of the work subsurface conditions at the site materially differing from any shown on the Contract Drawings or indicated in the Specifications or such subsurface conditions as could not reasonably have been anticipated by the contractor and were not anticipated by the City, which conditions will materially affect the cost of the work to be done under the Contract, the attention of the Commissioner must be called immediately to such conditions before they are disturbed. The Commissioner shall thereupon promptly investigate the conditions. If he finds that they do so materially differ, or that they could not reasonably have been anticipated by the contractor and were not anticipated by the City, the Contract may be modified with his written approval.

9. Examination of Proposed Contract

(A) Request for Interpretation or Correction: Prospective bidders must examine the Contract Documents carefully and before bidding must request the Commissioner in writing for an interpretation or correction of every patent ambiguity, inconsistency or error therein which should have been discovered by a reasonably prudent bidder. Such interpretation or correction, as well as any additional contract provisions the Commissioner may decide to include, will be issued in writing by the Commissioner as an addendum to the Contract, which will be transmitted to each person recorded as having received a copy of the Contract Documents from the Department. Transmission of such addendum will be by mail, e-mail, facsimile or hand delivery. Such addendum will also be posted at the place where the Contract Documents are available for the inspection of prospective bidders. Upon transmission as provided for herein, such addendum shall become a part of the Contract Documents, and binding on all bidders, whether or not actual notice of such addendum is shown.

(B) Only Commissioner's Interpretation or Correction Binding: Only the written interpretation or correction so given by the Commissioner shall be binding, and prospective bidders are warned that no other officer, agent or employee of the City is authorized to give information concerning, or to explain or interpret, the Contract.

(C) Documents given to a subcontractor for the purpose of soliciting the subcontractor's bid shall include either a copy of the bid cover sheet or a separate information sheet setting forth the project name, the Contract number (if available), the contracting agency and the Project's location.

10. Form of Bid

Each bid must be submitted upon the prescribed form and must contain: a) the name, residence and place of business of the person or persons making the same; b) the names of all persons interested therein, and if no other person is so interested, such fact must be distinctly stated; c) a statement to the effect that it is made without any connection with any other person making a bid for the same purpose and that it is in all respects fair and without collusion or fraud; d) a statement that no Council member or other officer or employee or person whose salary is payable in whole or part from the City Treasury is directly or indirectly interested therein or in the supplies, materials or equipment and work or labor to which it relates, or in any portion of the profits thereof; e) a statement that the bidder is not in arrears to the City or to any agency upon a debt or contract or taxes, and is not a defaulter as surety or otherwise upon any obligation to the City to any agency thereof, except as set forth in the bid.

THE BID SHALL BE TYPEWRITTEN OR WRITTEN LEGIBLY IN INK. THE BID SHALL BE SIGNED IN INK. ERASURES OR ALTERATIONS SHALL BE INITIALED BY THE SIGNER IN INK. FAILURE TO CONFORM TO THE REQUIREMENTS OF THIS SECTION 10 SHALL RESULT IN THE REJECTION OF THE BID.

11. Irrevocability of Bid

The prices set forth in the bid cannot be revoked and shall be effective until the award of the Contract, unless the bid is withdrawn as provided for in Sections 15 and 18 below.

12. Acknowledgment of Amendments

The receipt of any amendment to the Contract Documents shall be acknowledged by the bidder in its bid submission.

13. Bid Samples and Descriptive Literature

Bid samples and descriptive literature shall not be submitted by the bidder, unless expressly requested elsewhere in the Contract or Contract Documents. Any unsolicited bid samples or descriptive literature which are submitted shall not be examined or tested and shall not be deemed to vary any of the provisions of this Contract.

14. Proprietary Information/Trade Secrets

(A) The bidder shall identify those portions of the bid which it deems to be confidential, proprietary information or trade secrets, and provide justification why such materials shall not be disclosed by the City. All such materials shall be clearly indicated by stamping the pages on which such information appears, at the top and bottom thereof with the word "Confidential". Such materials stamped "Confidential" must be easily separable from the non-confidential sections of the bid.

(B) All such materials so indicated shall be reviewed by the Agency and any decision not to honor a request for confidentiality shall be communicated in writing to the bidder. For those bids which are unsuccessful, all such confidential materials shall be returned to the bidder. Prices, makes and model or catalog numbers of the items offered, deliveries, and terms of payment shall be publicly available after bid opening, regardless of any designation of confidentiality made by the bidder.

15. Pre-Opening Modification or Withdrawal of Bids

Bids may be modified or withdrawn by written notice received in the office designated in Attachment 1, before the time and date set for the bid opening. If a bid is withdrawn in accordance with this Section, the bid security, if any, shall be returned to the bidder.

16. Bid Evaluation and Award

In accordance with the New York City Charter, the Procurement Policy Board Rules and the terms and conditions of this Invitation For Bids, this Contract shall be awarded, if at all, to the responsible bidder whose bid meets the requirements and evaluation criteria set forth in the Invitation For Bids, and whose bid price is either the most favorable bid price or, if the Invitation For Bids so states, the most favorable evaluated bid price. A bid may not be evaluated for any requirement or criterion that is not disclosed in the Invitation For Bids.

Restriction: No negotiations with any bidder shall be allowed to take place except under the circumstances and in the manner set forth in Section 21. Nothing in this Section shall be deemed to permit a contract award to a bidder submitting a higher quality item than that designated in the Invitation For Bids, if that bid is not also the most favorable bid.

17. Late Bids, Late Withdrawals and Late Modifications

Any bid received at the place designated in the solicitation after the time and date set for receipt of bids is late and shall not be considered. Any request for withdrawal or modification received at the place designated in the solicitation after the time and date set for receipt of bids is late and shall not be considered. The exception to this provision is that a late modification of a successful bid that makes the bid terms more favorable to the City shall be considered at any time it is received.

18. Withdrawal of Bids.

Except as provided for in Section 15, above, a bidder may not withdraw its bid before the expiration of forty-five (45) days after the date of the opening of bids; thereafter, a bidder may withdraw its bid only in writing and in advance of an actual award. If within sixty (60) days after the execution of the Contract, the Commissioner fails to fix the date for commencement of work by written notice to the bidder, the bidder, at his option, may ask to be relieved of his obligation to perform the work called for by written notice to the Commissioner. If such notice is given to the Commissioner, and the request to withdraw is granted, the bidder waives all claims in connection with this Contract.

19. Mistake in Bids

(A) Mistake Discovered Before Bid Opening: A bidder may correct mistakes discovered before the time and date set for bid opening by withdrawing or correcting the bid as provided in Section 15 above.

(B) Mistakes Discovered Before Award

(1) In accordance with General Municipal Law (Section 103, subdivision 11), where a unilateral error or mistake is discovered in a bid, such bid may be withdrawn upon written approval of the Agency Chief Contracting Officer if the following conditions are met:

(a) The mistake is known or made known to the agency prior to the awarding of the Contract or within 3 days after the opening of the bid, whichever period is shorter; and

(b) The price bid was based upon an error of such magnitude that enforcement would be unconscionable; and

(c) The bid was submitted in good faith and the bidder submits credible evidence that the mistake was a clerical error as opposed to a judgment error; and

(d) The error in the bid is actually due to an unintentional and substantial arithmetic error or an unintentional omission of a substantial quantity of work, labor, material or services made directly

in the compilation of the bid, which unintentional arithmetic error pr unintentional omission can be clearly shown by objective evidence drawn from inspection of the original work paper, documents, or materials used in the preparation of the bid sought to be withdrawn; and

(e) It is possible to place the agency in the same position as existed prior to the bid.

(2) Unless otherwise required by law, the sole remedy for a bid mistake in accordance with this Article shall be withdrawal of the bid, and the return of the bid bond or other security, if any, to the bidder. Thereafter, the agency may, in its discretion, award the Contract to the next lowest bidder or rebid the Contract. Any amendment to or reformation of a bid or a Contract to rectify such an error or mistake therein is strictly prohibited.

(3) If the mistake and the intended correct bid are clearly evident on the face of the bid document, the bid shall be corrected to the intended correct bid and may not be withdrawn. Examples of mistakes that may be corrected are typographical errors, errors in extending unit prices, transposition errors and arithmetical errors.

20. Low Tie Bids

(A) When two or more low responsive bids from responsible bidders are identical in price, meeting all the requirements and criteria set forth in the Invitation For Bids, the Agency Chief Contracting Officer will break the tie in the following manner and order of priority:

(1) Award to a certified New York City small, minority or woman-owned business entity bidder;
(2) Award to a New York City bidder;
(3) Award to a certified New York State small, minority or woman-owned business bidder;
(4) Award to a New York State bidder.

(B) If two or more bidders still remain equally eligible after application of paragraph (A) above, award shall be made by a drawing by lot limited to those bidders. The bidders involved shall be invited to attend the drawing. A witness shall be present to verify the drawing and shall certify the results on the bid tabulation sheet.

21. Rejection of Bids

(A) Rejection of Individual Bids: The Agency may reject a bid if:

(1) The bidder fails to furnish any of the information required pursuant to Section 24 or 28 hereof; or if
(2) The bidder is determined to be not responsible pursuant to the Procurement Policy Board Rules; or if
(3) The bid is determined to be non-responsive pursuant to the Procurement Policy Board Rules; or if
(4) The bid, in the opinion of the Agency Chief Contracting Officer, contains unbalanced bid prices and is thus non-responsive, unless the bidder can show that the prices are not unbalanced for the probable required quantity of items, or if the imbalance is corrected pursuant to Section 15.

(B) Rejection of All Bids: The Agency, upon written approval by the Agency Chief Contracting Officer, may reject all bids and may elect to resolicit bids if in its sole opinion it shall deem it in the best interest of the City so to do.

(C) Rejection of All Bids and Negotiation With All Responsible Bidders: The Agency Head may determine that it is appropriate to cancel the Invitation For Bids after bid opening and before award and to complete the acquisition by negotiation. This determination shall be based on one of the following reasons:

(1) All otherwise acceptable bids received are at unreasonable prices, or only one bid is received and the Agency Chief Contracting Officer cannot determine the reasonableness of the bid price, or no responsive bid has been received from a responsible bidder; or
(2) In the judgment of the Agency Chief Contracting Officer, the bids were not independently arrived at in open competition, were collusive, or were submitted in bad faith.

(D) When the Agency has determined that the Invitation for Bids is to be canceled and that use of negotiation is appropriate to complete the acquisition, the contracting officer may negotiate and award the Contract

without issuing a new solicitation, subject to the following conditions:

(1) prior notice of the intention to negotiate and a reasonable opportunity to negotiate have been given by the contracting officer to each responsible bidder that submitted a bid in response to the Invitation for Bids;
(2) the negotiated price is the lowest negotiated price offered by a responsible bidder; and
(3) the negotiated price is lower than the lowest rejected bid price of a responsible bidder that submitted a bid in response to the Invitation for Bids.

22. Right to Appeal Determinations of Non-Responsiveness or Non-Responsibility and Right to Protest Solicitations and Award

The bidder has the right to appeal a determination of non-responsiveness or non-responsibility and has the right to protest a solicitation and award. For further information concerning these rights, the bidder is directed to the Procurement Policy Board Rules.

23. Affirmative Action and Equal Employment Opportunity

This Invitation For Bids is subject to applicable provisions of Federal, State and Local Laws and executive orders requiring affirmative action and equal employment opportunity.

24. PASSPort COMPLIANCE

All vendors that intend to do business with the City of New York must complete a disclosure process in order to be considered for a contract. This disclosure process was formerly completed using Vendor Information Exchange System (VENDEX) paper-based forms. The City of New York has moved collection of vendor disclosure information online. In early August 2017, the New York City Mayor's Office of Contract Services (MOCS) launched the Procurement and Sourcing Solutions Portal (PASSPort), a new online procurement system that replaced the paper-VENDEX process. In anticipation of awards, all bidders must create online accounts in the new PASSPort system, and file all disclosure information using PASSPort. Paper submissions, including certifications of no changes to existing VENDEX packages, will not be accepted in lieu of complete online filings using PASSPort.

All vendors that intend to do business with the City, but specifically those that fall into any of the following categories, are required to enroll:

- Have a pending award with a City Agency; or
- Hold a current contract with a City Agency and have either an expiring VENDEX or expiring Certificate of No Change.

The Department of Design and Construction (DDC) and MOCS hereby notifies all proposers that the PASSPort system is available, and that disclosure filing completion is required prior to any award through this competitive bid.

To enroll in PASSPort and to access the PASSPort website (including online training), please visit www.nyc.gov/passport. Contact MOCS at passport@mocs.nyc.gov for additional information and technical support.

25. Complaints About the Bid Process

The New York City Comptroller is charged with the audit of contracts in New York City. Any vendor who believes that there has been unfairness, favoritism or impropriety in the bid process should inform the Comptroller, Office of Contract Administration, One Centre Street, Room 835, New York, New York; telephone number (212)669-2323.

26. Bid, Performance and Payment Security

(A) Bid Security: Each bid must be accompanied by bid security in an amount and type specified in Attachment 1 (BID BOOKLET, VOLUME 1 OF 3). The bid security shall assure the City of New York of the

adherence of the bidder to its proposal, the execution of the Contract, and the furnishing of Performance and Payment Bonds by the bidder, if required in Attachment 1. Bid security shall be returned to the bidder as follows:

(1) Within ten (10) days after the bid opening, the Comptroller will be notified to return the deposits of all but the three (3) lowest bidders. Within five (5) days after the award, the Comptroller will be notified to return the deposits of the remaining two unsuccessful bidders.

(2) Within five (5) days after the execution of the Contract and acceptance of the Contractor's bonds, the Comptroller will be notified to return the bid security of the successful bidder or, if performance and payment bonds are not required, only after the sum retained under Article 21 of the Contract equals the amount of the bid security.

(3) Where all bids are rejected, the Comptroller will be notified to return the deposit of the three (3) lowest bidders at the time of rejection.

(B) Performance and Payment Security: Performance and Payment Security must be provided in an amount and type specified in Attachment 1. The performance and payment security shall be delivered by the contractor prior to or at the time of execution of the Contract. If a contractor fails to deliver the required performance and payment security, its bid security shall be enforced, and an award of Contract may be made to the next lowest responsible and responsive bidder, or the contract may be rebid.

(C) Acceptable Types of Security: Acceptable types of security for bids, performance, and payment shall be limited to the following:

(1) a one-time bond in a form satisfactory to the City;
(2) a bank certified check or money order;
(3) obligations of the City of New York; or
(4) other financial instruments as determined by the Office of Construction in consultation with the Comptroller.

Whenever the successful bidder deposits obligations of the City of New York as performance and payment security, the Comptroller may sell and use the proceeds thereof for any purpose for which the principal or surety on such bond would be liable under the terms of the Contract. If the money is deposited with the Comptroller, the successful bidder shall not be entitled to receive interest on such money from the City.

(D) Form of Bonds: Security provided in the form of bonds must be prepared on the form of bonds authorized by the City of New York. Forms for bid, performance, and payment bonds are included in the Invitation for Bids Documents. Such bonds must have as surety thereunder such surety company or companies as are: (1) approved by the City of New York; (2) authorized to do business in the State of New York, and (3) approved by the Department of the Treasury of the United States. Premiums for any required bonds must be included in the base bid.

The bidder is advised that submission of a bid bond where the surety on such bond fails to meet the criteria set forth herein, shall result in the rejection of the bid as non-responsive.

The Department of the Treasury of the United States advises that information concerning approved surety companies may be obtained as follows: (1) from the Government Printing Office at 215-364-6465; (2) through the Internet at https://www.fiscal.treasury.gov/surety-bonds/.

(E) Power of Attorney: Attorneys in fact who sign bid, performance, or payment bonds must file with each bond a certified copy of their power of attorney to sign said bonds.

27. Failure to Execute Contract

In the event of failure of the successful bidder to execute the Contract and furnish the required security within ten (10) days after notice of the award of the Contract, the deposit of the successful bidder or so much thereof as shall be applicable to the amount of the award made shall be retained by the City, and the successful bidder shall be liable for and hereby agrees to pay on demand the difference between the price bid and the price for which such Contract shall be subsequently awarded, including the cost of any required reletting and less the amount of such deposit. No plea of mistake in such accepted bid shall be available to the bidder for the recovery of the deposit or as a defense to any action based upon such accepted bid. Further, should the bidder's failure to comply with this Section cause any funding agency, body or group (Federal, State, City, Public, Private, etc.) to terminate, cancel or reduce the funding on this project, the bidder in such event shall be liable also to the City for the amount of actual funding withdrawn by such agency on this project, less the amount of the forfeited deposit.

28. Bidder Responsibilities and Qualifications

(A) Bidders must include with their bids all information necessary for a determination of bidder responsibility, as set forth in the Specifications.

(B) The Agency may require any bidder or prospective bidder to furnish all books of account, records, vouchers, statements or other information concerning the bidder's financial status for examination as may be required by the Agency to ascertain the bidder's responsibility and capability to perform the Contract. If required, a bidder must also submit a sworn statement setting forth such information as the Agency may require concerning present and proposed plant and equipment, the personnel and qualifications of his working organizations, prior experience and performance record.

(C) Oral Examination on Qualifications: In addition thereto, and when directed by the Agency, the bidder, or a responsible officer, agent or employee of the bidder, must submit to an oral examination to be conducted by the Agency in relation to his proposed tentative plan and schedule of operations, and such other matters as the Agency may deem necessary in order to determine the bidder's ability and responsibility to perform the work in accordance with the Contract. Each person so examined must sign and verify a stenographic transcript of such examination noting thereon such corrections as such person may desire to make.

(D) If the bidder fails or refuses to supply any of the documents or information set forth in paragraph (B) hereof or fails to comply with any of the requirements thereof, the Agency may reject the bid.

29. Employment Report

In accordance with Executive Order No. 50 (1980) as modified by Executive Order 108 (1986), the filing of a completed Employment Report (ER) is a requirement of doing business with the City of New York for construction contractors with contracts of $1,000,000 or more and subcontractors with construction subcontracts of $750,000 or more. The required forms and information are included in the Bid Booklet.

30. Labor Law Requirements

(A) General: The successful bidder will be required to comply strictly with all Federal, State and local labor laws and regulations.

(B) New York State Labor Law: This Contract is subject to New York State Labor Law Section 220, which requires that construction workers on the site be paid prevailing wages and supplements. The Contractor is reminded that all wage provisions of this Contract will be enforced strictly and failure to comply will be considered when evaluating performance. Noncompliance may result in the contractor being debarred by the City from future contracts. Complaints filed with the Comptroller may result in decisions which may debar a contractor from bidding contracts with any state governmental entity and other political subdivisions.

(C) Records: The Contractor is expected to submit accurate payroll reports and other required documents and verify attendance and job classifications being utilized in compliance with the law, Contract provisions and agency procedures.

31. Insurance

(A) Bidders are advised that the insurance requirements contained herein are regarded as material terms of the Contract. As required by Article 22 of the Contract, the contractor must effect and maintain with companies licensed and authorized to do business in the State of New York, the types of insurance set forth therein, when required by and in the amounts set forth in Schedule A of the General Conditions. Such required insurance must be provided from the date the contractor is ordered to commence work and up to the date of final acceptance of all required work.

(B) The contractor must, within ten days of receipt of the notice of award, submit the following insurance documentation: (a) original certificate of insurance for general liability in the amount required by Schedule A of the General Conditions, and (b) original certificates of insurance or other proof of coverage for workers' compensation and disability benefits, as required by Section 57 of the New York State Workers' Compensation Law and Section 220 of the Disability Benefits Law.

32. Lump Sum Contracts

(A) Comparison of Bids: Bids on Lump Sum Contracts will be compared on the basis of the lump sum price bid, adjusted for alternate prices bid, if any.

(B) Lump Sum Bids for "General Construction Work" which include excavation shall include all necessary excavation work defined in the Specifications as being included in the lump sum bid. The bidder shall also bid a unit price for the additional cost of excavating material which is defined in the Specifications as excavation for which additional payment will be made. The total estimated additional cost of removing such material will be taken as the quantity set forth in the Engineer's Estimate multiplied by the unit price bid. This total estimated cost of additional excavation shall be added to the lump sum bid for the General Construction Work for the purpose of comparing bids to determine the low bidder.

(C) Variations from Engineer's Estimate: The Engineer's Estimate of the quantity of excavation for which additional payment will be made is approximate only and is given solely to be used as a uniform basis for the comparison of bids and such estimate is not to be considered as part of this contract. The quantities actually required to complete the contract work may be more or less than the quantities in the Engineer's Estimate and, if so, no action for damages or for loss of profits shall accrue to the contractor by reason thereof.

33. Unit Price Contracts

(A) Comparison of Bids: Bids on Unit Price Contracts will be compared on the basis of a total estimated price, arrived at by taking the sum of the estimated quantities of such items, in accordance with the Engineer's Estimate of Quantities set forth in the Bid Form, multiplied by the corresponding unit prices, and including any lump sum bids on individual items.

(B) Variations from Engineer's Estimate: Bidders are warned that the Engineer's Estimate of Quantities on the various items of work and materials is approximate only, given solely to be used as a uniform basis for the comparison of bids, and is not be considered part of this contract. The quantities actually required to complete the contract work may be less or more than so estimated, and if so, no action for damages or for loss of profits shall accrue to the contractor by reason thereof.

(C) Overruns: The terms and conditions applicable to overruns of unit price items are set forth in Article 26 of the Contract.

34. Excise Tax

Bidders are referred to the Specifications for information on Federal Excise Tax exemptions.

35. Licenses and Permits

The successful bidder will be required to obtain all necessary licenses and permits necessary to perform the work.

36. Multiple Prime Contractors

If more than one prime contractor will be involved on this project, all contractors are required to examine the Invitation for Bid packages for all other parts of the project.

37. Locally Based Enterprise Requirements (LBE)

This Contract is subject to the requirements of Administrative Code, Section 6-108.1, and the regulations promulgated thereunder. No construction contract will be awarded unless and until these requirements have been complied with in their entirety. The bidder is advised of the provisions set forth below, as well as the provisions with respect to the Locally Based Enterprise Program contained in Article 67 of the Contract. The contractor is advised that:

(A) If any portion of the Contract is subcontracted, not less than ten percent of the total dollar amount of the contract shall be awarded to locally based enterprises ("LBEs"); except, where less than ten percent of the total dollar amount of the Contract is subcontracted, such lesser percentage shall be so awarded.

(B) No contractor shall require performance and payment bonds from LBE subcontractors.

(C) No Contract shall be awarded unless the contractor first identifies in its bid:

(1) the percentage, dollar amount and type of work to be subcontracted; and
(2) the percentage, dollar amount and type of work to be subcontracted to LBEs.

(D) Within ten calendar days after notification of low bid, the apparent low bidder shall submit an "LBE Participation Schedule" to the contracting agency. If such schedule does not identify sufficient LBE subcontractors to meet the requirements of Administrative Code Section 6-108.1, the apparent low bidder shall submit documentation of its good faith efforts to meet such requirements.

(1) The "LBE Participation Schedule" shall include:

(a) the name and address of each LBE that will be given a subcontract,
(b) the percentage, dollar amount and type of work to be subcontracted to the LBE, and
(c) the dates when the LBE subcontract work will commence and end.

(2) The following documents shall be attached to the "LBE Participation Schedule":

(a) verification letters from each subcontractor listed in the "LBE Participation Schedule" stating that the LBE will enter into a formal agreement for work,
(b) certification documents of any proposed LBE subcontractor which is not on the LBE certified list, and
(c) copies of the certification letter of any proposed subcontractor which is an LBE.

(3) Documentation of good faith efforts to achieve the required LBE percentage shall include as appropriate but not limited to the following:

(a) attendance at prebid meetings, when scheduled by the agency, to advise bidders of contract requirements;

(b) advertisement where appropriate in general circulation media, trade association publications and small business media of the specific subcontracts that would be at least equal to the percentage goal for LBE utilization specified by the contractor;

(c) written notification to association of small, minority and women contractors soliciting specific subcontractors;

(d) written notification by certified mail to LBE firms that their interest in the contract is solicited for specific work items and their estimated values;

(e) demonstration of efforts made to select portions of the work for performance by LBE firms in order to increase the likelihood of achieving the stated goal;

(f) documented efforts to negotiate with LBE firms for specific subcontracts, including at a minimum:

(i) The names, address and telephone numbers of LBE firms that are contacted;

(ii) A description of the information provided to LBE firms regarding the plans and specifications for portions of the work to be performed;

(iii) Documentation showing that no reasonable price can be obtained from LBE firms;

(iv) A statement of why agreements with LBE firms were not reached;

(g) a statement of the reason for rejecting any LBE firm which the contractor deemed to be unqualified; and

(h) documentation of efforts made to assist the LBE firms contacted that needed assistance in obtaining required insurance.

(E) Unless otherwise waived by the Commissioner with the approval of the Office of Economic and Financial Opportunity, failure of a proposed contractor to provide the information required by paragraphs (C) and (D) above may render the bid non-responsive and the Contract may not be awarded to the bidder. If the contractor states that it will subcontract a specific portion of the work, but can demonstrate despite good faith efforts it cannot achieve its required LBE percentage for subcontracted work until after award of Contract, the Contract may be awarded, subject to a letter of compliance from the contractor stating that it will comply with Administrative Code Section 6-108.1 and subject to approval by the Commissioner. If the contractor has not met its required LBE percentage prior to award, the contractor shall demonstrate that a good faith effort has been made subsequent to award to obtain LBEs on each subcontract until its meets the required percentage.

(F) When a bidder indicates prior to award that no work will be subcontracted, no work may be subcontracted without the prior written approval of the Commissioner, which shall be granted only if the contractor in good faith seeks LBE subcontractors at least six weeks prior to the start of work.

(G) The contractor may not substitute or change any LBE which was identified prior to award of the contract without the written permission of the Commissioner. The contractor shall make a written application to the Commissioner for permission to make such substitution or change, explaining why the contractor needs to change its LBE subcontractor and how the contractor will meet its LBE subcontracting requirement. Copies of such application must be served on the originally identified LBE by certified mail return receipt requested, as well as the proposed substitute LBE. The Commissioner shall determine whether or not to grant the contractor's request for substitution.

38. Bid Submission Requirements

The Bid Submission Requirements are set forth in the BID BOOKLET, VOLUME 1 OF 3.

39. Comptroller's Certificate

This Contract shall not be binding or of any force unless it is registered by the Comptroller in accordance with Section 328 of the City Charter and the Procurement Policy Board Rules. This Contract shall continue in force only after annual appropriation of funds by the City of New York and certification as hereinabove set forth.

40. Procurement Policy Board Rules

This Invitation For Bids is subject to the Rules of the Procurement Policy Board of the City of New York. In the event of a conflict between said Rules and a provision of this Invitation For Bids, the Rules shall take precedence.

41. Viewing of Submitted Bid Documents

In accordance with NYC Procurement and Policy Board Rules, Section 3-02, the submitted bid documents will be available to view immediately after completion of the bid opening and by appointment for up to 72 hours after the bid opening.

42. DDC Safety Requirements

The DDC Safety Requirements apply to the work to be performed pursuant to the Contract. The DDC Safety Requirements are set forth on the following pages.

CITY OF NEW YORK
DEPARTMENT OF DESIGN AND CONSTRUCTION
SAFETY REQUIREMENTS FOR CONSTRUCTION CONTRACTS

February 2019

THE DDC SAFETY REQUIREMENTS FOR CONSTRUCTION CONTRACTS INCLUDE THE FOLLOWING SECTIONS:

I. POLICY ON SITE SAFETY

II. PURPOSE

III. DEFINITIONS

IV. RESPONSIBILITIES

V. SAFETY QUESTIONNAIRE

VI. SITE SAFETY PLAN

VII. KICK-OFF/PRE-CONSTRUCTION MEETINGS AND SAFETY REVIEW

VIII. EVALUATION DURING WORK IN PROGRESS

IX. SAFETY PERFORMANCE EVALUATION

I. POLICY ON SITE SAFETY

The City of New York Department of Design and Construction (DDC) is committed to a policy of injury and illness prevention and risk management for construction work that will ensure the safety and health of the workers engaged in the projects and the protection of the general public. Therefore, it is DDC's policy that work carried out by Contractors on DDC contracts must, at a minimum, comply with the most current versions of all applicable federal, state and city laws, rules, and regulations, including without limitation:

- Code of Federal Regulations, Title 29, Part 1926 (29 CFR 1926) and applicable Sub-parts of Part 1910 – U.S. Occupational Safety and Health Administration (OSHA);
- Federal Highway Administration – Manual on Uniform Traffic Control Devices (MUTCD);
- New York Codes, Rules and Regulations (NYCRR), Title 12, Part 23 – Protection in Construction, Demolition and Excavation Operations;
- New York Codes, Rules and Regulations (NYCRR), Title 16, Part 753 – Protection of Underground Facilities;
- New York City Administrative Code, Title 28 – New York City Construction Codes;
- Rules of the City of New York, Title 15, Chapter 13 – Rules Pertaining To the Prevention of the Emission of Dust from Construction Related Activities;
- Rules of the City of New York, Title 15, Chapter 28 – Citywide Construction Noise Mitigation;
- Rules of the City of New York, Title 34 Chapter 2 – NYCDOT Highway Rules.

The Contractor will be required to comply with all new and/or revised federal, state and city laws, rules, and regulations, issued during the course of the project, at the expense of the Contractor without any additional costs to the DDC.

II. PURPOSE

The purpose of this policy is to ensure that Contractors perform their work and supervise their employees in accordance with all applicable federal, state and city rules and regulations. Further, Contractors will be expected to minimize or eliminate jobsite and public hazards, through a planning, inspection, auditing and corrective action process. The goal is to control risks so that injuries, illnesses, and accidents to contractors' employees, DDC employees and the general public, as well as damage to city-owned and private property, are reduced to the lowest level feasible.

III. DEFINITIONS

Agency Chief Contracting Officer (ACCO): The ACCO will mean the person delegated authority by the Commissioner to organize and supervise the procurement activity of subordinate Agency staff in conjunction with the City Chief Procurement Officer (CCPO).

Competent Person: As defined by OSHA, an individual who is capable of identifying existing and predictable hazards in the surroundings or working conditions that are unsanitary, hazardous, or dangerous to employees or the general public, and who has authorization to take prompt corrective measures to eliminate them. This individual will have completed, at a minimum an authorized 30-hour OSHA Construction Safety Course. The Contractor may be required to provide more than one competent person due to construction operations and based on the number of active work sites.

Construction Safety Auditor: A representative of the Construction Safety Unit who provides inspection and assessment services to enhance health and safety on all DDC construction projects. The activities of the Construction Safety Auditor include performing site audits, reviewing safety plans, reviewing construction permits, drawings, verifying Contractor's compliance with applicable federal, state and city laws, rules, regulations, and DDC Contract Safety Requirements, etc. and rendering technical advice and assistance to DDC Resident Engineers and Project Managers.

Construction Safety Unit: A unit of DDC Safety and Site Support that assesses contractor's safety on DDC jobsites and advises responsible parties of needed corrective actions.

Registered Construction Superintendent: For certain projects, as defined in New York City Construction Codes – Title 28, the contractor will provide a Construction Superintendent registered with the NYC Department of Buildings and responsible for all duties as defined in Chapter 33 of Title 1 of the Rules of the City of New York.

Contractor: For purposes of these Safety Requirements, the term "Contractor" will mean any person or entity that enters into a contract for the performance of construction work on a DDC project. The term "Contractor" will include any person or entity which enters into any of the following types of contracts: (1) a prime construction contract for a specific project, (2) a prime construction contract using the Job Order Contracting System ("JOCS Contract"), and (3) a subcontract with a CM/Builder ("First Tier Subcontract").

Daily Safety Job Briefing: Daily jobsite safety briefings, given to all jobsite personnel at project site by the Contractor before work begins and/or if hazards or potential hazards are discovered while working, with the purpose of discussing the scheduled activities for the day, the hazards related to these activities, activity specific safety procedures, and Job Hazard Analysis associated with the scheduled construction work. Daily jobsite briefings will be documented, available at the jobsite, and will include at a minimum, topics, name and signature of the person conducting the briefing session, names and signatures of attendants, name of the designated competent person, contactor's name, DDC Project ID, date, time, and location.

Director - Construction Safety: Responsible for the operations of the Construction Safety Unit and the DDC Site Safety management programs.

Job Hazard Analysis (JHA): A process of identifying the major job tasks and any potential site-specific hazards that may be present during construction and establishing the means and methods to eliminate or control those hazards. A JHA will be documented, available at the jobsite and will include at a minimum work tasks, being performed, identified hazards, control methods for the identified hazards, contractor's name, DDC Project ID, location, date, name and signature of certifying person. A JHA is a living document that will be re-evaluated and revised to address new hazards and tasks that may develop and will be present at the worksite and produced upon request.

Qualified Person: As defined by OSHA, an individual who, by possession of a recognized degree, certificate, license, or professional standing, or who by extensive knowledge, training, and experience, has successfully demonstrated his or her ability to solve problems relating to the subject matter, the work, or the project. Qualified Persons are required under regulation to address issues pertaining, but without limit, to fall protection, scaffold design, maintenance and protection of traffic, and excavation protective system, among others.

Project Site: Those areas indicated in the Contract Documents where the Work is to be performed.

Project Safety Representative: The designated Project Safety Representative will have at a minimum an OSHA 30-hour Construction Safety Course and other safety training applicable to Contractor's/subcontractor's project work. This individual will be responsible to oversee safety performance of the required construction work, conduct documented daily safety inspections, and implement corrective actions to maintain a safe work site. The Project Safety Representative must have sufficient experience and skills necessary to thoroughly understand the health and safety hazards and controls and must have authority to undertake corrective actions. A dedicated full-time Project Safety Representative may be required on large projects and projects deemed by DDC to be particularly high risk. DDC reserves the right to request a dedicated full-time Project Safety Representative for any reason at any time during the course of the project at the expense of the Contractor without any additional costs to the DDC. The full-time Project Safety Representative will be present at the site during all work activities.

Resident Engineer ("RE"): Representative of the Commissioner duly designated by the Commissioner to be his/her representative at the site of the work. The RE may be a consultant retained by DDC, including a Construction Management (CM) or Resident Engineer Inspection (REI) firm. If DDC has retained a CM, REI or other consultant firm to perform management and oversite for the Project (e.g., CM-Builder, CM-Design-Builder, Project Manager, Program Manager), that CM, REI or other consultant is the Resident Engineer for purposes of these Safety Requirements.

Safety Questionnaire: Used by DDC to evaluate Contractor's current and past safety performance. It is required to be completed by all Contractors initially when submitting bids for Construction work, or when being pre-qualified and updated annually or as requested by the DDC.

Site Safety Manager: For certain projects, as defined in New York City Construction Codes – Title 28, the Contractor will provide a Site Safety Manager with a Site Safety Manager License issued by the New York City Department of Building.

Site Safety Plan: A site-specific safety plan developed by the Contractor for a DDC project. The Site Safety Plan will identify hazards associated with the project work and include project specific safety procedures and training appropriate and necessary to complete the work. The Site Safety Plan will be submitted within 30 days from the Award Date or as otherwise directed and is subject to review and acceptance by the Construction Safety Unit prior to the commencement of work at the site.

Unsafe or Unhealthy Condition: A condition that could be potentially hazardous to the health and safety of personnel or the public, and/or damaging to equipment, machinery, property, or the environment.

Weekly Safety Meetings: Weekly jobsite safety meetings, given to all jobsite personnel by Contractor, with the purpose of discussing general safety topics and job specific requirements encountered at the DDC work site. Weekly safety meetings will be documented and will include at a minimum, topics, name and signature of the person conducting the meeting, names and signatures of attendees, contractor's name, DDC Project ID, date, and location.

Work: The construction required by the Contractor's Contract Documents whether completed or partially completed, performed by the Contractor/ subcontractors. Work refers to the furnishing of labor, furnishing and incorporating materials and equipment into the construction and providing any service required by the Contract Documents to fulfill the Contractor's obligation to complete the Project.

IV. RESPONSIBILITIES

All persons who manage, perform, and provide support for construction projects will conduct operations in compliance with the requirements identified in this Policy and all applicable governing regulatory agency requirements and guidelines pertaining to safety in construction.

A. Resident Engineer

1. Review and facilitate Contractor(s) Site Safety Plan submittals to DDC for acceptability.
2. Notify the Construction Safety Unit of the commencement of construction work.
3. Develop and implement a training verification process to ensure that all CM/REI, consultant, Contractor, and subcontractor employees are properly trained. Maintain all applicable initial and refresher training records and assures documentation availability on site.
4. Maintain documentation of and attend weekly safety meetings and daily safety job briefings.
5. Assure that Contractor(s) JHA's are current to reflect the work tasks being performed, hazards, and control methods to mitigate the identified hazards. Verify that all employees at the job site are trained on the JHAs and maintain supporting documentation on site.
6. Assure adequate planning for all critical construction activities (crane operation, excavation, confined space entry, etc.) including coordination between Contractor(s) /DDC/ other Agencies as required.
7. Maintain custody of all construction related permits, plans, approvals, drawings, etc., related to the project and assure their availability on site.
8. Recognize, minimize, or eliminate jobsite and public hazards, through required planning, inspection, verification, and corrective action process.
9. Monitor the conditions at the site for conformance with the Contractor's Site Safety Plan, DDC policies, permits, and all applicable regulations and documentation that pertain to construction safety.
10. Notify the Contractor and DDC immediately upon determination of any condition or activity existing which is not in compliance with the Contractor's Site Safety Plan, applicable federal, state or local codes or any condition that presents a potential risk of injury to the public or workers or possible damage to property. Direct the Contractor to provide such labor, materials, equipment, and supervision to remedy such conditions.

11. Notify the Construction Safety Unit and the ACCO's Insurance and Risk Management Unit of project-related accidents, incidents, and near misses as per DDC's Construction Safety Emergency and Accident Notification and Response Procedure within two (2) hours.
12. In case of an accident, incident, or near miss, RE is responsible to protect the integrity of the accident site including but not limited to: the safeguarding of all evidence, documentation of all personnel on site at the time of the accident, gather facts related to all accidents, incidents, or near miss, and prepare required DDC Construction Accident Report as per DDC's Construction Safety Emergency and Accident Notification and Response Procedure. Maintain all records pertaining to accidents, incidents, and near miss and have them available upon request.
13. Notify the Construction Safety Unit within two (2) hours of the start of an inspection by any outside/ regulatory agency personnel, including NYS, OSHA, NYC DOB or any other City/State/Federal oversight entity and forward a copy of the inspection report within one business day of its receipt.
14. Escort and assist Construction Safety Auditors during all field and record audits.
15. Report any emergency conditions to the Construction Safety Unit immediately.

Note: In addition to the responsibilities listed above, if the Resident Engineer is a CM/REI or other non-City party hired by the City to manage the Project, the Resident Engineer is also required to do the following:

16. Provide personnel who are certified and or trained appropriately for the requirements of the project.
17. Perform an investigation for any project-related accidents, incidents, and near misses. Within 24-hours of the time of the accident, incident, or near miss, the CM/REI will submit an investigation report to the Construction Safety Unit. Such report will include proposed remedial measures and implementation of corrective actions to prevent recurrence.

DDC reserves the right to request that the CM/REI replace any CM/REI personnel for any reason at any time during the project.

B. Construction Contractors

Note: For CM-Build and CM-Design-Build Projects, the CM will meet all requirements listed in this section, as well as the Resident Engineer section above.

1. Submit a completed Safety Questionnaire and other safety performance related documentation with its bid or as part of a pre-qualification package.
2. Submit a Site Safety Plan within 30 days from the Award Date or as otherwise directed. The Site Safety Plan is subject to review and acceptance by the Construction Safety Unit prior to the commencement of work at the site. The Site Safety Plan will be revised and updated as necessary during the course of the project.
3. Designate and identify a Project Safety Representative in the Site Safety Plan. The Contractor will immediately notify the Construction Safety Unit, in a form and manner acceptable to the Construction Safety Unit, of any permanent change to the designated Project Safety Representative. In the event the primary designated Project Safety Representative is temporary unable to perform his or her duties, an alternate Project Safety Representative will be provided. Resumes, outlining the qualification and experience for the Project Safety Representative (s) will be included in the Site Safety Plan and available upon request. DDC reserves the right to request the Contractor to replace a Project Safety Representative for any reason at any time during the course of the project.
4. Designate and identify a Competent Person(s) in the Site Safety Plan. Contractor/subcontractor may be required to provide more than one competent person due to construction operations and based on a number of work tasks/areas. DDC reserves the right to request the Contractor to replace a Competent Person or provide additional Competent Person(s) for any reason at any time during the course of the project. The Competent Person will be present at the site during all work activities.
5. For certain projects, as defined in New York City Construction Codes – Title 28, designate and identify the Licensed Site Safety Manager or Registered Construction Superintendent. Resumes, outlining the qualification and experience for the Licensed Site Safety Manager or Registered Construction Superintendent will be included in the Site Safety Plan and available upon request. The Contractor will immediately notify the Construction Safety Unit, in a form and manner acceptable to the Construction Safety Unit, of any permanent change to the designated Site Safety Manager and/or Construction Superintendent. In the event the primary designated Site Safety Manager or Construction Superintendent is temporarily unable to perform his

or her duties, an alternate Licensed Site Safety Manager and/or Registered Construction Superintendent will be provided. The Construction Safety Unit must be informed of such change. DDC reserves the right to request the Contractor to replace Site Safety Manager or Construction Superintendent for any reason at any time during the course of the project.

6. Develop a written Job Hazard Analysis (JHA) that identifies safety hazards and control methods for project specific work tasks. A preliminary JHA will be included in the Site Safety Plan submitted by the Contractor. A JHA is a living document that will be re-evaluated and revised to address new hazards and tasks that may develop during the course of the project and will be present at the worksite and produced upon request.
7. Develop project specific safety procedures to protect employees, general public, and property during all construction activities for the duration of the project.
8. Ensure that all employees are aware of the hazards associated with the project through documented formal and informal training and/or other communications. Conduct and document new employee and site-specific safety orientation for all Contractor and subcontractor personnel to review the hazards associated with the project as identified in the Site Safety Plan and the specific safety procedures and controls that will be used to protect workers, the general public and property. The Project Safety Representative will conduct this training prior to mobilization and if necessary during the course of the project. Documentation will be provided to the RE.
9. Prior to performing any work on DDC project all Contractor's and subcontractor's employees will have successfully completed, within the previous five calendar years, an OSHA 10-hour construction safety course. All training records (OSHA 10-hour, flagger, scaffold, fall protection, confined space, etc.) will be provided to the RE prior to mobilization, included in the Site Safety Plan, kept current during the course of the project, and available for review.
10. Conduct and document weekly safety meetings and daily job briefing sessions for the duration of the project. Attendance at weekly safety meetings and daily job briefing sessions is mandatory. A written record of weekly safety meetings will be available upon request and job briefing sessions will be available at the worksite.
11. As part of the Site Safety Plan, prepare site specific procedures, such as maintenance and protection of traffic plan, steel erection plan, confined space program, fall protection plan, demolition plan, site specific emergency evacuation plan, etc. (if not otherwise provided in the contract documents) and comply with all of its provisions.
12. Have immediately available for review at the project site where actual construction activities are being performed all applicable documentation, including but not limited to: JHAs for work tasks being performed, all required training records, MPT plan (where applicable), Noise and Dust Mitigation Plans, excavation protective system drawings (where applicable), Emergency Evacuation plan, fall protection program (where applicable), confined space program (where applicable), all required permits, daily job briefing records, all required documentation for crane operation (where applicable), daily inspection checklist, scaffold and sidewalk drawings (when applicable), safety data sheets for chemicals in use.
13. Comply with all federal, state and local safety and health rules, laws, and regulations.
14. Comply with all provisions of the Site Safety Plan.
15. Provide, replace, and adequately maintain at or around the project site, suitable and sufficient signage, lights, barricades and enclosures (fences, sidewalk sheds, netting, bracing, etc.). The project specific MPT plan will be developed, implemented, and reviewed during the course of the project.
16. The Project Safety Representative will conduct daily safety inspections, document the inspection results, implement corrective actions for the identified hazards. Maintain the inspection records and have them available upon request.
17. **Report unsafe or unhealthy conditions to the RE as soon as practical, but no more than 24 hours after discovery, and take prompt actions to remove or abate such conditions. Should an imminent dangerous condition be discovered, Contractor will stop all work in the area of danger until corrections are made.**
18. Report all accidents, incidents and near misses involving injuries to workers or the general public, as well as property damage, to the RE within one (1) hour.
19. Following an accident or incident, unless otherwise directed, the Contractor will not remove or alter any equipment, structure, material, or evidence related to the accident or incident. Exception: Immediate emergency procedures taken to secure structures, temporary construction, operations, or equipment that pose a continued imminent danger or facilitate assistance for persons who are trapped or who have sustained

bodily injury. Take additional measures as necessary to secure the accident or incident site and to protect against any further injury or property damage.

20. The Contractor will perform an investigation into the root cause of the accident, incident, or near miss. Within 24 hours of an accident, incident, or near miss, the Contractor will prepare and submit to the RE a written investigation report detailing findings, corrective actions, and hazard mitigation implementation to prevent recurrence.
21. Notify the RE within two (2) hours of the start of an inspection by any outside regulatory agency personnel, including OSHA, NYC DOB, or others.
22. Maintain all records pertaining to all required safety compliance documents, accidents and incidents reports. DDC reserves the right to request copy of any records pertaining to the safety of the project and required by DDC and other federal, state, and city agencies, including but not limited to permits, training records, safety inspection records, drawings, equipment records, etc.
23. Cooperate with DDC Construction Safety Unit/ RE and address DDC recommendations on safety, which will in no way relieve the Contractor of its responsibilities for safety on the project. The Contractor has sole responsibility for safety.

V. SAFETY QUESTIONNAIRE

DDC requires that all Contractors provide information regarding their current and past safety performance and programs. This will be accomplished by the use of the DDC Safety Questionnaire. As a part of the bid submittal package, the contractor will submit a completed DDC Safety Questionnaire listing company workers' compensation experience modification rating and OSHA Incident Rates for the three (3) years prior to the date of the bid opening. DDC may request a Contractor to update its Questionnaire at any time or to provide more detailed information. The Contractor will provide the requested information within 15 days.

The following criteria will be used by DDC in reviewing the Contractor's responsibility, which will be based on the information provided on the questionnaire:

Criteria 1: OSHA Injury and Illness Rates (I&IR) are no greater than the average for the industry (based on the most current Bureau of Labor Statistics data for the Contractors SIC code); and

Criteria 2: Insurance workers compensation Experience Modification Rate (EMR) equal to or less than 1.0; and

Criteria 3: Any willful violations issued by OSHA or NYC DOB within the last three (3) years; and

Criteria 4: A fatality (worker or member of public) and injuries, requiring OSHA notification, experienced on or near Contractor's worksite within the last three (3) years; and

Criteria 5: Past safety performance on DDC projects (accidents; status of site safety plan submittals; etc.)

Criteria 6: OSHA violation history for the last three (3) years;

Criteria 7: Contractor will provide OSHA Injury and Illness Records (currently OSHA 300 and 300A Logs) for the last three (3) years.

If the Contractor fails to meet the basic criteria listed above, the Construction Safety Unit may request, through the ACCO, more details concerning the Contractor's safety experience. DDC may request the Contractor to provide copies of, among other things, accident investigation reports, OSHA records, OSHA and NYC DOB citations, EPA citations and written corrective action plan.

VI. SITE SAFETY PLAN

Within thirty (30) days from the Award Date or as otherwise directed, the Contractor will submit the Site Safety Plan. The Site Safety Plan will identify project work scope, safety hazards associated with the project tasks, and include specific safety procedures and training appropriate and necessary to complete the work. The Site Safety Plan is subject to review and acceptance by the Construction Safety Unit prior to the commencement of work at the site. Due to the project work scope and project duration, the Construction Safety Unit may grant a conditional acceptance

for a Site Safety Plan without all sections being complete. In a case of a "Conditional Acceptance" of a Site Safety Plan, the Contractor will provide the remaining sections previously incomplete and/or not submitted for review and acceptance by the Construction Safety Unit prior to the commencement of the construction activities. The Construction Safety Unit reserves the right to withdraw the initial "Conditional Acceptance" if the Contractor fails to provide the remaining sections of a Site Safety Plan. Failure by the Contractor to submit an acceptable Site Safety Plan will be grounds for default.

Site Safety Plan requirements: The Site Safety Plan will be a written document and will apply to all project specific Contractor and subcontractor operations, and will have at a minimum, the following elements with each described in a separate section (It may be necessary to modify the basic format for certain unique or high-risk projects, such as tunnels or high-rise construction). All Site Safety Plan sections will be numbered in the order listed below. For sections, which are not applicable for the type of the work being performed by the Contractor on DDC project, the Contractor will in writing indicate "Not applicable based on the project work scope." The Site Safety Plan will include Contractor's name, DDC project ID, project location (s), and development and revision dates. The Site Safety Plan will include the sections, attachments, and appendixes provided in the Site Safety Plan. All pages of the Site Safety Plan will be numbered.

1. Project Work Scope – Detailed information regarding work tasks that will be performed by Contractor and subcontractors under the project.
2. Responsibility and Organization – Contractor's organization chart with responsible personnel for the project, including titles, names, contact information, roles, and responsibilities. All Contractor's personnel required by the DDC Safety Requirements will be identified.
3. Safety Training and Education – OSHA 10 Hours training, requirements for daily safety briefings and weekly safety meetings, any work task specific training, responsible staff for implementation of training program for the project.
4. Job Hazard Analysis (JHA) – Project specific Job Hazard Analysis including work tasks, identified hazards, hazard control methods (administrative, engineering, PPE) to protect workers, property and general public, Contractor's name, project id, location, name and signature of a certifying person, hazard assessment date.
5. Protection of Public – Project specific procedures covering safety of the general public during all project construction activities.
6. Hazard Corrective Actions - Procedures for hazard identification, including responsible person(s), frequency of safety inspections, implementation of corrective actions, safety inspection checklist.
7. Accident/Exposure Investigation – Project specific procedures for accident/incident/near miss investigation and implementation of corrective actions. Accident/incident/near miss notification procedure of DDC project staff (timer frame and responsible personnel).
8. Recording and Reporting Injuries – Procedures to meet 29 CFR 1904 requirements.
9. First Aid and Medical Attention – Responsible staff, location and inspection of First Aid kit, directions to local hospitals; emergency telephone numbers.
10. Project Specific Fire Protection and Prevention Program – Project specific procedures, including responsible staff, fire alarm system/methods, hot work procedures, etc.
11. Housekeeping Procedure.
12. Project Specific Illumination Procedure.
13. Project Specific Sanitation Procedure.
14. Personal Protective Equipment (PPE), including Respiratory Protection Program and Hearing Conservation Program, if required.
15. Hazard Communication Program – Contractor's Hazard Communication Program, responsible staff; training; SDS records, project specific list of chemicals; location of the program and SDS records.
16. Means of Egress – Information regarding free and unobstructed egress from all parts of the building or structure; exit marking; maintenance of means of egress, etc.
17. Employee Emergency Action Plan – Project specific: responsible staff, emergency alarm system/devices, evacuation procedure, procedure to account for employees after evacuation, etc.
18. Evacuation Plan – Project specific evacuation plan (drawing/scheme) with exists and evacuation routes.
19. Ionizing/Nonionizing Radiation – Competent person, license and qualification requirements, type of radiation, employee's exposure and protection, safety procedures, etc.

20. Material Handling, Storage, Use and Disposal – Project specific information regarding material storage, disposal, and handling: procedures, plan/drawings, etc.
21. Signs, Signals, and Barricades – Use of danger/warning signs, safety instruction signs, sidewalk closure and pedestrian fencing and barricades (if not included in the MPT plan), etc.
22. Tools – Hand and Power – Safety procedures for the type of tools to be used.
23. Scaffold – Project specific scaffold types, procedures, training requirements, scaffold drawings, designed, sealed, and signed by NYS Licensed Professional Engineer, or as otherwise directed; competent person, criteria for project specific scaffold, falling object protection, procedures for aerial lifts/scissor lifts.
24. Welding and Cutting – Project specific procedure for welding and cutting, including all necessary safety requirements such as fire prevention, personal protective equipment, hot work permits (if not covered by Contractor's Fire Prevention and Protection program, FDNY certificate requirements).
25. Electrical Safety – Project specific procedures, including lock out-tag out.
26. Fall Protection – Project specific information regarding selected fall protection systems, fall protection plan, responsible staff.
27. Cranes, Derrick, Hoists, Elevators, Conveyors – project specific equipment information including type, rated load capacity, manufacture specification requirements, competent person, exposure to falling load, inspection, recordkeeping, clearance requirements, communication procedure, ground lines, permits.
28. Excavation Safety – Competent person; excavation procedures; project specific protective system, including drawings, designed, sealed, and signed by NYS Licensed Professional Engineer, or as otherwise directed.
29. Protection of Underground Facilities and Utilities Procedure, including responsible staff and responsibilities.
30. Concrete and Masonry Construction Procedures
31. Maintenance and Protection of Traffic Plan – Project specific MPT plan, designed, sealed, and signed by NYS Licensed Professional Engineer, or as otherwise directed; flagmen training, public safety, etc.
32. Steel Erection – Site specific erection plan, requirements for applicable written notifications, competent person, fall protection plan, training requirements, etc.
33. Demolition – Engineering survey, including written evidence, disconnection of all effected utilities, identification of all hazardous chemicals, materials, gases, etc., floor openings, chutes, inspection and maintenance of all stairs/passageways, removal of materials/debris/structural elements, lock out/tag out, competent person.
34. Blasting and the Use of Explosives – Project specific safety procedures, warning signs, training/qualification, transportation, storage and use of explosives, inspection.
35. Stairways and Ladders – Types of stairs and ladders, safety procedures, training requirements.
36. Alcohol and Drug Abuse Policy
37. Rodents and Vermin Controls
38. Toxic and Hazardous Substances – Safety procedures for substances that Contractor's and subcontractor's employees can be exposed on project.
39. Noise Mitigation Plan – Completed project specific Noise Mitigation Plan, and noise mitigation procedures.
40. Confined Space Program – Project specific Confined Space Program, responsible staff, training records, equipment information, rescue procedure, list of project specific confined spaces, forms.
41. Construction Vehicles/Heavy Equipment – Type of construction vehicles/heavy equipment to be used on site, procedures
42. Dust Mitigation Plan – Completed project specific Dust Mitigation Plan, and dust mitigation procedures.
43. Working Over and Near Water. Diving Operations – safety procedures including personal protective equipment, fall protection, rescue services, etc.

The most critical component of the Site Safety Plan is the Job Hazard Analysis (JHA) section. The JHA form is a written document prepared by the Contractor. The Contractor will conduct a site and task assessment to identify the tasks and any potential safety or environmental hazards related to performance of the work, eliminate or implement controls for the potential hazards, and identify proper personal protective equipment for the task. The JHA will be communicated to all Contractor/subcontractor personnel on site. The JHA will include safety hazard identification and controls to protect employees, general public, and property.

The initial JHA will be included in the Contractor's Site Safety Plan and the current JHA form will be available at the construction site for reference. A JHA is a living document that will be re-evaluated and revised to address new hazards and tasks that may develop and will be present at the worksite and produced upon request.

VII. KICK-OFF MEETINGS/PRE-CONSTRUCTION AND SAFETY REVIEW

Prior to the start of construction activities on all DDC projects, RE will invite the Construction Safety Unit to the construction kick-off meeting. The Construction Safety Unit representative(s) will participate in this meeting with the Contractor and RE for the purpose of:

A. Reviewing DDC Contract Safety Requirements
B. Reviewing site-specific safety issues based on a project work scope, location, and any other factors which may impact safety of workers and general public.
C. Reviewing the Site Safety Plan and JHA requirements.
D. Reviewing Accident/Incident reporting and investigation procedures.
E. Reviewing designated safety contacts, roles, and responsibilities.
F. Discussing planned inspections and audits of the site by Construction Safety Unit personnel.

VIII. EVALUATION DURING WORK IN PROGRESS

The Contractor's adherence to these Safety Requirements will be monitored throughout the project. This will be accomplished by the following:

A. Use of a safety checklist by a representative of the Construction Safety Unit (or other designated DDC representative) and the RE during regular inspections and comprehensive audits of the job site. Field Exit Conferences will be held with the RE and Contractor Project Safety Representatives.
B. The RE will continually monitor the safety and environmental performance of the Contractor's employees and work methods. Deficiencies will be brought to the attention of the Contractor's Project Safety Representative on site for immediate correction. The RE will maintain a written record of these deficiencies and have these records available upon request. Any critical deficiencies will be immediately reported to the Construction Safety Unit via telephone (718)391-1911.
C. If the Contractor's safety performance during the project is not up to DDC standards (safety performance measure, accident/incident rate, etc.) the Director – Construction Safety, or his/her designee will meet with the Contractor's Project Safety Representative and other representatives, the RE, and the DDC Environmental Specialist (if environmental issues are involved). The purpose of this meeting is to 1) determine the level of non-compliance; 2) explain and clarify the safety/environmental provisions; 3) agree on a future course of action to correct the deficiencies.
D. If the deficiencies continue, the Commissioner may, without limitation, declare the Contractor in default.
E. The Contractor will within 1 hour inform the RE of all accidents/incidents/near misses including all fatalities, any injuries to employees or members of the general public, and property damage (e.g., structural damage, equipment rollovers, utility damage, loads dropped from crane). The RE will notify the Construction Safety Unit as per DDC's Construction Safety Emergency and Accident Notification and Response Procedure and will maintain a record of all Contractor accidents/incidents for the project.
F. The Contractor and the RE will notify the Construction Safety Unit within two (2) hours of the start of any NYS-DOL/ NYC-COSH/ OSHA/ EPA inspections.

IX. SAFETY PERFORMANCE EVALUATION

The Contractor's safety record, including accident/incident history and DDC safety inspection results, will be considered as part of the Contractor's performance evaluation at the conclusion of the project. Poor safety performance during the course of the project will be a reason to rate a Contractor unsatisfactory which may be reflected in the City's PASSPort system and will be considered for future procurement actions as set forth in the City's Procurement Policy Board Rules.

CITY OF NEW YORK

STANDARD CONSTRUCTION CONTRACT

March 2017

CITY OF NEW YORK
STANDARD CONSTRUCTION CONTRACT

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WITNESSETH:

The parties, in consideration of the mutual agreements contained herein, agree as follows:

CHAPTER I: THE CONTRACT AND DEFINITIONS

ARTICLE 1. THE CONTRACT

1.1 Except for titles, subtitles, headings, running headlines, tables of contents and indices (all of which are printed herein merely for convenience), the following, except for such portions thereof as may be specifically excluded, shall be deemed to be part of this **Contract**:

1.1.1 All provisions required by law to be inserted in this **Contract**, whether actually inserted or not;

1.1.2 The Contract Drawings and Specifications;

1.1.3 The General Conditions and Special Conditions, if any;

1.1.4 The **Contract**;

1.1.5 The Information for Bidders; Request for Proposals; Notice of Solicitation and Proposal For Bids; Bid or Proposal, and, if used, the Bid Booklet;

1.1.6 All Addenda issued prior to the receipt of the bids; the Notice of Award; Performance and Payment Bonds, if required; and the Notice to Proceed or the Order to Work.

1.2 Should any conflict occur in or between the Drawings and Specifications, the **Contractor** shall be deemed to have estimated the most expensive way of doing the **Work**, unless the **Contractor** shall have asked for and obtained a decision in writing from the **Commissioner** of the **Agency** that is entering into this **Contract**, before the submission of its bid, as to what shall govern.

ARTICLE 2. DEFINITIONS

2.1 The following words and expressions, or pronouns used in their stead, shall, wherever they appear in this Contract, be construed as follows, unless a different meaning is clear from the context:

2.1.1 **"Addendum"** or **"Addenda"** shall mean the additional Contract provisions and/or technical clarifications issued in writing by the Commissioner prior to the receipt of bids.

2.1.2 **"Agency"** shall mean a city, county, borough or other office, position, department, division, bureau, board or commission, or a corporation, institution or agency of government, the expenses of which are paid in whole or in part from the City treasury.

2.1.3 **"Agency Chief Contracting Officer" (ACCO)** shall mean a person delegated authority by the Commissioner to organize and supervise the procurement activity of subordinate Agency staff in conjunction with the CCPO, or his/her duly authorized representative.

2.1.4 **"Allowance"** shall mean a sum of money which the Agency may include in the total amount of the Contract for such specific contingencies as the Agency believes may be necessary to complete the Work, *e.g.*, lead or asbestos remediation, and for which the Contractor will be paid on the basis of stipulated unit prices or a formula set forth in the Contract or negotiated between the parties provided, however, that if the Contractor is not directed to use the Allowance, the Contractor shall have no right to such money and it shall be deducted from the total amount of the Contract.

2.1.5 **"City"** shall mean the City of New York.

2.1.6 **"City Chief Procurement Officer" (CCPO)** shall mean a person delegated authority by the Mayor to coordinate and oversee the procurement activity of Mayoral agency staff, including the ACCO and any offices which have oversight responsibility for the procurement of construction, or his/her duly authorized representative.

2.1.7 **"Commissioner"** shall mean the head of the Agency that has entered into this Contract, or his/her duly authorized representative.

2.1.8 **"Comptroller"** shall mean the Comptroller of the City of New York.

2.1.9 **"Contract"** or **"Contract Documents"** shall mean each of the various parts of the contract referred to in Article 1 hereof, both as a whole and severally.

2.1.10 **"Contract Drawings"** shall mean only those drawings specifically entitled as such and listed in the Specifications or in any Addendum, or any drawings furnished by the Commissioner, pertaining or supplemental thereto.

2.1.11 **"Contract Work"** shall mean everything required to be furnished and done by the Contractor by any one or more of the parts of the Contract referred to in Article 1, except Extra Work as hereinafter defined.

2.1.12 **"Contractor"** shall mean the entity which executed this Contract, whether a corporation, firm, partnership, joint venture, individual, or any combination thereof, and its, their, his/her successors, personal representatives, executors, administrators, and assigns, and any person, firm, partnership, joint venture, individual, or corporation which shall at any time be substituted in the place of the Contractor under this Contract.

2.1.13 **"Days"** shall mean calendar days, except where otherwise specified.

2.1.14 **"Engineer"** or **"Architect"** or **"Project Manager"** shall mean the person so designated in writing by the Commissioner in the Notice to Proceed or the Order to Work to act as such in relation to this Contract, including a private Architect or Engineer or Project Manager, as the case may be. Subject to written approval by the Commissioner, the Engineer, Architect or Project Manager may designate an authorized representative.

2.1.15 **"Engineering Audit Officer" (EAO)** shall mean the person so designated by the Commissioner to perform responsible auditing functions hereunder.

2.1.16 **"Extra Work"** shall mean Work other than that required by the Contract at the time of award which is authorized by the Commissioner pursuant to Chapter VI of this Contract.

2.1.17 **"Federal-Aid Contract"** shall mean a contract in which the United States (federal) Government provides financial funding as so designated in the Information for Bidders.

2.1.18 **"Final Acceptance"** shall mean final written acceptance of all the Work by the Commissioner, a copy of which shall be sent to the Contractor.

2.1.19 **"Final Approved Punch List"** shall mean a list, approved pursuant to Article 14.2.2, specifying those items of Work to be completed by the Contractor after Substantial Completion and dates for the completion of each item of Work.

2.1.20 **"Law"** or **"Laws"** shall mean the Constitution of the State of New York, the New York City Charter, the New York City Administrative Code, a statute of the United States or of the State of New York, a local law of the City of New York, any ordinance, rule or regulation having the force of law, or common law.

2.1.21 **"Materialman"** shall mean any corporation, firm, partnership, joint venture, or individual, other than employees of the Contractor, who or which contracts with the Contractor or any Subcontractor, to fabricate or deliver, or who actually fabricates or delivers, plant, materials or equipment to be incorporated in the Work.

2.1.22 **"Means and Methods of Construction"** shall mean the labor, materials, temporary structures, tools, plant, and construction equipment, and the manner and time of their use, necessary to accomplish the result intended by this Contract.

2.1.23 **"Notice to Proceed" or "Order to Work"** shall mean the written notice issued by the Commissioner specifying the time for commencement of the Work and the Engineer, Architect or Project Manager.

2.1.24 **"Other Contractor(s)"** shall mean any contractor (other than the entity which executed this Contract or its Subcontractors) who or which has a contract with the City for work on or adjacent to the building or Site of the Work.

2.1.25 **"Payroll Taxes"** shall mean State Unemployment Insurance (SUI), Federal Unemployment Insurance (FUI), and payments pursuant to the Federal Insurance Contributions Act (FICA).

2.1.26 **"Project"** shall mean the public improvement to which this Contract relates.

2.1.27 **"Procurement Policy Board" (PPB)** shall mean the Agency of the City of New York whose function is to establish comprehensive and consistent procurement policies and rules which shall have broad application throughout the City.

2.1.28 **"Required Quantity"** in a unit price Contract shall mean the actual quantity of any item of Work or materials which is required to be performed or furnished in order to comply with the Contract.

2.1.29 **"Resident Engineer"** shall mean the representative of the Commissioner duly designated by the Commissioner to be his/her representative at the site of the Work.

2.1.30 **"Site"** shall mean the area upon or in which the Contractor's operations are carried on, and such other areas adjacent thereto as may be designated as such by the Engineer.

2.1.31 **"Small Tools"** shall mean items that are ordinarily required for a worker's job function, including but not limited to, equipment that ordinarily has no licensing, insurance or substantive storage costs associated with it; such as circular and chain saws, impact drills, threaders, benders, wrenches, socket tools, etc.

2.1.32 **"Specifications"** shall mean all of the directions, requirements, and standards of performance applying to the Work as hereinafter detailed and designated under the Specifications.

2.1.33 **"Subcontractor"** shall mean any person, firm or corporation, other than employees of the Contractor, who or which contracts with the Contractor or with its subcontractors to furnish, or actually furnishes labor, or labor and materials, or labor and equipment, or superintendence, supervision and/or management at the Site. Wherever the word Subcontractor appears, it shall also mean sub-Subcontractor.

2.1.34 **"Substantial Completion"** shall mean the written determination by the Engineer that the Work required under this Contract is substantially, but not entirely, complete and the approval of the **Final Approved Punch List**.

2.1.35 **"Work"** shall mean all services required to complete the Project in accordance with the Contract Documents, including without limitation, labor, material, superintendence, management, administration, equipment, and incidentals, and obtaining any and all permits, certifications and licenses as may be necessary and required to complete the Work, and shall include both Contract Work and Extra Work.

CHAPTER II: THE WORK AND ITS PERFORMANCE

ARTICLE 3. CHARACTER OF THE WORK

3.1 Unless otherwise expressly provided in the **Contract Drawings**, **Specifications,** and **Addenda**, the **Work** shall be performed in accordance with the best modern practice, utilizing, unless otherwise specified in writing, new and unused materials of standard first grade quality and workmanship and design of the highest quality, to the satisfaction of the **Commissioner**.

ARTICLE 4. MEANS AND METHODS OF CONSTRUCTION

4.1 Unless otherwise expressly provided in the **Contract Drawings**, **Specifications,** and **Addenda**, the **Means and Methods of Construction** shall be such as the **Contractor** may choose; subject, however, to the **Engineer's** right to reject the **Means and Methods of Construction** proposed by the **Contractor** which in the opinion of the **Engineer**:

4.1.1 Will constitute or create a hazard to the **Work**, or to persons or property; or

4.1.2 Will not produce finished **Work** in accordance with the terms of the **Contract**; or

4.1.3 Will be detrimental to the overall progress of the **Project**.

4.2 The **Engineer's** approval of the **Contractor's Means and Methods of Construction**, or his/her failure to exercise his/her right to reject such means or methods, shall not relieve the **Contractor**

of its obligation to complete the **Work** as provided in this **Contract**; nor shall the exercise of such right to reject create a cause of action for damages.

ARTICLE 5. COMPLIANCE WITH LAWS

5.1 The **Contractor** shall comply with all **Laws** applicable to this **Contract** and to the **Work** to be done hereunder.

5.2 Procurement Policy Board Rules: This **Contract** is subject to the Rules of the **PPB** ("**PPB** Rules") in effect at the time of the bid opening for this **Contract**. In the event of a conflict between the **PPB** Rules and a provision of this **Contract**, the **PPB** Rules shall take precedence.

5.3 Noise Control Code provisions.

5.3.1 In accordance with the provisions of Section 24-216(b) of the Administrative Code of the **City** ("Administrative Code"), Noise Abatement Contract Compliance, devices and activities which will be operated, conducted, constructed or manufactured pursuant to this **Contract** and which are subject to the provisions of the **City** Noise Control Code shall be operated, conducted, constructed, or manufactured without causing a violation of the Administrative Code. Such devices and activities shall incorporate advances in the art of noise control development for the kind and level of noise emitted or produced by such devices and activities, in accordance with regulations issued by the **Commissioner** of the **City** Department of Environmental Protection.

5.3.2 The **Contractor** agrees to comply with Section 24-219 of the Administrative Code and implementing rules codified at 15 Rules of the City of New York ("RCNY") Section 28-100 *et seq*. In accordance with such provisions, the **Contractor**, if the **Contractor** is the responsible party under such regulations, shall prepare and post a Construction Noise Mitigation Plan at each **Site**, in which the **Contractor** shall certify that all construction tools and equipment have been maintained so that they operate at normal manufacturers operating specifications. If the **Contractor** cannot make this certification, it must have in place an Alternative Noise Mitigation Plan approved by the **City** Department of Environmental Protection. In addition, the **Contractor**'s certified Construction Noise Mitigation Plan is subject inspection by the **City** Department of Environmental Protection in accordance with Section 28-101 of Title 15 of RCNY. No **Contract Work** may take place at a **Site** unless there is a Construction Noise Mitigation Plan or approved Alternative Noise Mitigation Plan in place. In addition, the **Contractor** shall create and implement a noise mitigation training program. Failure to comply with these requirements may result in fines and other penalties pursuant to the applicable provisions of the Administrative Code and RCNY.

5.4 Ultra Low Sulfur Diesel Fuel: In accordance with the provisions of Section 24-163.3 of the Administrative Code, the **Contractor** specifically agrees as follows:

5.4.1 Definitions. For purposes of this Article 5.4, the following definitions apply:

5.4.1(a) "Contractor" means any person or entity that enters into a Public Works Contract with a **City Agency**, or any person or entity that enters into an agreement with such person or entity, to perform work or provide labor or services related to such Public Works Contract.

5.4.1(b) "Motor Vehicle" means any self-propelled vehicle designed for transporting persons or property on a street or highway.

5.4.1(c) "Nonroad Engine" means an internal combustion engine (including the fuel system) that is not used in a Motor Vehicle or a vehicle used solely for competition, or that is not subject to standards promulgated under Section 7411 or Section 7521 of Title 42 of the United States Code, except that this term shall apply to internal combustion engines used to power generators, compressors or similar equipment used in any construction program or project.

5.4.1(d) "Nonroad Vehicle" means a vehicle that is powered by a Nonroad Engine, fifty (50) horsepower and greater, and that is not a Motor Vehicle or a vehicle used solely for competition, which shall include, but not be limited to, excavators, backhoes, cranes, compressors, generators, bulldozers, and similar equipment, except that this term shall not apply to horticultural maintenance vehicles used for landscaping purposes that are powered by a Nonroad Engine of sixty-five (65) horsepower or less and that are not used in any construction program or project.

5.4.1(e) "Public Works Contract" means a contract with a **City Agency** for a construction program or project involving the construction, demolition, restoration, rehabilitation, repair, renovation, or abatement of any building, structure, tunnel, excavation, roadway, park or bridge; a contract with a **City Agency** for the preparation for any construction program or project involving the construction, demolition, restoration, rehabilitation, repair, renovation, or abatement of any building, structure, tunnel, excavation, roadway, park or bridge; or a contract with a **City Agency** for any final work involved in the completion of any construction program or project involving the construction, demolition, restoration, rehabilitation, repair, renovation, or abatement of any building, structure, tunnel, excavation, roadway, park or bridge.

5.4.1(f) "Ultra Low Sulfur Diesel Fuel" means diesel fuel that has a sulfur content of no more than fifteen parts per million (15 ppm).

5.4.2 Ultra Low Sulfur Diesel Fuel

5.4.2(a) All **Contractors** shall use Ultra Low Sulfur Diesel Fuel in diesel-powered Nonroad Vehicles in the performance of this **Contract**.

5.4.2(b) Notwithstanding the requirements of Article 5.4.2(a), **Contractors** may use diesel fuel that has a sulfur content of no more than thirty parts per million (30 ppm) to fulfill the requirements of this Article 5.4.2, where the Commissioner of the **City** Department of Environmental Protection ("DEP Commissioner") has issued a determination that a sufficient quantity of Ultra Low Sulfur Diesel Fuel is not available to meet the needs of **Agencies** and **Contractors**. Any such determination shall expire after six (6) months unless renewed.

5.4.2(c) **Contractors** shall not be required to comply with this Article 5.4.2 where the **City Agency** letting this **Contract** makes a written finding, which is approved, in writing, by the DEP Commissioner, that a sufficient quantity of Ultra Low Sulfur Diesel Fuel, or diesel fuel that has a sulfur content of no more than thirty parts per million (30 ppm) is not available to meet the requirements of Section 24-163.3 of the Administrative Code, provided that such **Contractor** in its fulfillment of the

requirements of this **Contract**, to the extent practicable, shall use whatever quantity of Ultra Low Sulfur Diesel Fuel or diesel fuel that has a sulfur content of no more than thirty parts per million (30 ppm) is available. Any finding made pursuant to this Article 5.4.2(c) shall expire after sixty (60) **Days**, at which time the requirements of this Article 5.4.2 shall be in full force and effect unless the **City Agency** renews the finding in writing and such renewal is approved by the DEP Commissioner.

5.4.2(d) **Contractors** may check on determinations and approvals issued by the DEP Commissioner pursuant to Section 24-163.3 of the Administrative Code, if any, at www.dep.nyc.gov or by contacting the **City Agency** letting this **Contract**.

5.4.2(e) The requirements of this Article 5.4.2 do not apply where they are precluded by federal or State funding requirements or where the **Contract** is an emergency procurement.

5.4.3 Best Available Technology

5.4.3(a) All **Contractors** shall utilize the best available technology for reducing the emission of pollutants for diesel-powered Nonroad Vehicles in the performance of this **Contract**. For determinations of best available technology for each type of diesel-powered Nonroad Vehicle, **Contractors** shall comply with the regulations of the **City** Department of Environmental Protection, as and when adopted, Chapter 14 of Title 15 of the Rules of the City of New York (RCNY). The **Contractor** shall fully document all steps in the best available technology selection process and shall furnish such documentation to the **City Agency** or the DEP Commissioner upon request. The **Contractor** shall retain all documentation generated in the best available technology selection process for as long as the selected best available technology is in use.

5.4.3(b) No **Contractor** shall be required to replace best available technology for reducing the emission of pollutants or other authorized technology utilized for a diesel-powered Nonroad Vehicle in accordance with the provisions of this Article 5.4.3 within three (3) years of having first utilized such technology for such vehicle.

5.4.3(c) This Article 5.4.3 shall not apply to any vehicle used to satisfy the requirements of a specific Public Works Contract for fewer than twenty (20) **Days**.

5.4.3(d) The **Contractor** shall not be required to comply with this Article 5.4.3 with respect to a diesel-powered Nonroad Vehicle under the following circumstances:

5.4.3(d)(i) Where the **City Agency** makes a written finding, which is approved, in writing, by the DEP Commissioner, that the best available technology for reducing the emission of pollutants as required by this Article 5.4.3 is unavailable for such vehicle, the **Contractor** shall use whatever technology for reducing the emission of pollutants, if any, is available and appropriate for such vehicle.

5.4.3(d)(ii) Where the DEP Commissioner has issued a written waiver based upon the **Contractor** having demonstrated to the DEP Commissioner that the use of the best available technology for reducing the emission of pollutants might endanger the operator of such vehicle or those working near such vehicle, due to engine malfunction, the **Contractor** shall use whatever technology for

reducing the emission of pollutants, if any, is available and appropriate for such vehicle, which would not endanger the operator of such vehicle or those working near such vehicle.

5.4.3(d)(iii) In determining which technology to use for the purposes of Articles 5.4.3(d)(i) and 5.4.3(d)(ii) above, the **Contractor** shall primarily consider the reduction in emissions of particulate matter and secondarily consider the reduction in emissions of nitrogen oxides associated with the use of such technology, which shall in no event result in an increase in the emissions of either such pollutant.

5.4.3(d)(iv) The **Contractor** shall submit requests for a finding or a waiver pursuant to this Article 5.4.3(d) in writing to the DEP Commissioner, with a copy to the **ACCO** of the **City Agency** letting this **Contract**. Any finding or waiver made or issued pursuant to Articles 5.4.3(d)(i) and 5.4.3(d)(ii) above shall expire after one hundred eighty (180) **Days**, at which time the requirements of Article 5.4.3(a) shall be in full force and effect unless the **City Agency** renews the finding, in writing, and the DEP Commissioner approves such finding, in writing, or the DEP Commissioner renews the waiver, in writing.

5.4.3(e) The requirements of this Article 5.4.3 do not apply where they are precluded by federal or State funding requirements or where the **Contract** is an emergency procurement.

5.4.4 Section 24-163 of the Administrative Code. The **Contractor** shall comply with Section 24-163 of the Administrative Code related to the idling of the engines of motor vehicles while parking.

5.4.5 Compliance

5.4.5(a) The **Contractor's** compliance with Article 5.4 may be independently monitored. If it is determined that the **Contractor** has failed to comply with any provision of Article 5.4, any costs associated with any independent monitoring incurred by the **City** shall be reimbursed by the **Contractor**.

5.4.5(b) Any **Contractor** who violates any provision of Article 5.4, except as provided in Article 5.4.5(c) below, shall be liable for a civil penalty between the amounts of one thousand ($1,000) and ten thousand ($10,000) dollars, in addition to twice the amount of money saved by such **Contractor** for failure to comply with Article 5.4.

5.4.5(c) No **Contractor** shall make a false claim with respect to the provisions of Article 5.4 to a **City Agency**. Where a **Contractor** has been found to have done so, such **Contractor** shall be liable for a civil penalty of twenty thousand ($20,000) dollars, in addition to twice the amount of money saved by such **Contractor** in association with having made such false claim.

5.4.6 Reporting

5.4.6(a) For all Public Works Contracts covered by this Article 5.4, the **Contractor** shall report to the **City Agency** the following information:

5.4.6(a)(i) The total number of diesel-powered Nonroad Vehicles used to fulfill the requirements of this Public Works Contract;

5.4.6(a)(ii) The number of such Nonroad Vehicles that were powered by Ultra Low Sulfur Diesel Fuel;

5.4.6(a)(iii) The number of such Nonroad Vehicles that utilized the best available technology for reducing the emission of pollutants, including a breakdown by vehicle model and the type of technology;

5.4.6(a)(iv) The number of such Nonroad Vehicles that utilized such other authorized technology in accordance with Article 5.4.3, including a breakdown by vehicle model and the type of technology used for each such vehicle;

5.4.6(a)(v) The locations where such Nonroad Vehicles were used; and

5.4.6(a)(vi) Where a determination is in effect pursuant to Article 5.4.2(b) or 5.4.2(c), detailed information concerning the **Contractor's** efforts to obtain Ultra Low Sulfur Diesel Fuel or diesel fuel that has a sulfur content of no more than thirty parts per million (30 ppm).

5.4.6(b) The **Contractor** shall submit the information required by Article 5.4.6(a) at the completion of **Work** under the Public Works Contract and on a yearly basis no later than August 1 throughout the term of the Public Works Contract. The yearly report shall cover **Work** performed during the preceding fiscal year (July 1 - June 30).

5.5 Ultra Low Sulfur Diesel Fuel. In accordance with the Coordinated Construction Act for Lower Manhattan, as amended:

5.5.1 Definitions. For purposes of this Article 5.5, the following definitions apply:

5.5.1(a) "Lower Manhattan" means the area to the south of and within the following lines: a line beginning at a point where the United States pierhead line in the Hudson River as it exists now or may be extended would intersect with the southerly line of West Houston Street in the Borough of Manhattan extended, thence easterly along the southerly side of West Houston Street to the southerly side of Houston Street, thence easterly along the southerly side of Houston Street to the southerly side of East Houston Street, thence northeasterly along the southerly side of East Houston Street to the point where it would intersect with the United States pierhead line in the East River as it exists now or may be extended, including tax lots within or immediately adjacent thereto.

5.5.1(b) "Lower Manhattan Redevelopment Project" means any project in Lower Manhattan that is funded in whole or in part with federal or State funding, or any project intended to improve transportation between Lower Manhattan and the two air terminals in the **City** known as LaGuardia Airport and John F. Kennedy International Airport, or between Lower Manhattan and the air terminal in Newark known as Newark Liberty International Airport, and that is funded in whole or in part with federal funding.

5.5.1(c) "Nonroad Engine" means an internal combustion engine (including the fuel system) that is not used in a Motor Vehicle or a vehicle used solely for competition, or that is not subject to standards promulgated under Section 7411 or Section 7521 of Title 42 of the United States Code, except that this term shall apply to internal combustion engines used to power generators, compressors or similar equipment used in any construction program or project.

5.5.1(d) "Nonroad Vehicle" means a vehicle that is powered by a Nonroad Engine, fifty (50) horsepower (HP) and greater, and that is not a Motor Vehicle or a vehicle used solely for competition, which shall include, but not be limited to, excavators, backhoes, cranes, compressors, generators, bulldozers, and similar equipment, except that this terms shall not apply to horticultural maintenance vehicles used for landscaping purposes that are powered by a Nonroad Engine of sixty-five (65) HP or less and that are not used in any construction program or project.

5.5.1(e) "Ultra Low Sulfur Diesel Fuel" means diesel fuel that has a sulfur content of no more than fifteen parts per million (15 ppm).

5.5.2 Requirements. **Contractors** and **Subcontractors** are required to use only Ultra Low Sulfur Diesel Fuel to power the diesel-powered Nonroad Vehicles with engine HP rating of fifty (50) HP and above used on a Lower Manhattan Redevelopment Project and, where practicable, to reduce the emission of pollutants by retrofitting such Nonroad Vehicles with oxidation catalysts, particulate filters, or technology that achieves lowest particulate matter emissions.

5.6 Pesticides. In accordance with Section 17-1209 of the Administrative Code, to the extent that the **Contractor** or any **Subcontractor** applies pesticides to any property owned or leased by the **City**, the **Contractor,** and any **Subcontractor** shall comply with Chapter 12 of the Administrative Code.

5.7 Waste Treatment, Storage, and Disposal Facilities and Transporters. In connection with the **Work**, the **Contractor** and any **Subcontractor** shall use only those waste treatment, storage, and disposal facilities and waste transporters that possess the requisite license, permit or other governmental approval necessary to treat, store, dispose, or transport the waste, materials or hazardous substances.

5.8 Environmentally Preferable Purchasing. The **Contractor** shall ensure that products purchased or leased by the **Contractor** or any **Subcontractor** for the **Work** that are not specified by the **City** or are submitted as equivalents to a product specified by the **City** comply with the requirements of the New York City Environmentally Preferable Purchasing Program contained in Chapter 11 of Title 43 of the RCNY, pursuant to Chapter 3 of Title 6 of the Administrative Code.

ARTICLE 6. INSPECTION

6.1 During the progress of the **Work** and up to the date of **Final Acceptance**, the **Contractor** shall at all times afford the representatives of the **City** every reasonable, safe, and proper facility for inspecting all **Work** done or being done at the **Site** and also for inspecting the manufacture or preparation of materials and equipment at the place of such manufacture or preparation.

6.2 The **Contractor's** obligation hereunder shall include the uncovering or taking down of finished **Work** and its restoration thereafter; provided, however, that the order to uncover, take down and restore shall be in writing, and further provided that if **Work** thus exposed proves satisfactory, and if the **Contractor** has complied with Article 6.1, such uncovering or taking down and restoration shall be

considered an item of **Extra Work** to be paid for in accordance with the provisions of Article 26. If the **Work** thus exposed proves unsatisfactory, the **City** has no obligation to compensate the **Contractor** for the uncovering, taking down or restoration.

6.3 Inspection and approval by the **Commissioner**, the **Engineer**, **Project Manager**, or **Resident Engineer**, of finished **Work** or of **Work** being performed, or of materials and equipment at the place of manufacture or preparation, shall not relieve the **Contractor** of its obligation to perform the **Work** in strict accordance with the **Contract**. Finished or unfinished **Work** not found to be in strict accordance with the **Contract** shall be replaced as directed by the **Engineer**, even though such **Work** may have been previously approved and paid for. Such corrective **Work** is **Contract Work** and shall not be deemed **Extra Work**.

6.4 Rejected **Work** and materials shall be promptly taken down and removed from the **Site**, which must at all times be kept in a reasonably clean and neat condition.

ARTICLE 7. PROTECTION OF WORK AND OF PERSONS AND PROPERTY; NOTICES AND INDEMNIFICATION

7.1 During the performance of the **Work** and up to the date of **Final Acceptance**, the **Contractor** shall be under an absolute obligation to protect the finished and unfinished **Work** against any damage, loss, injury, theft and/or vandalism and in the event of such damage, loss, injury, theft and/or vandalism, it shall promptly replace and/or repair such **Work** at the **Contractor's** sole cost and expense, as directed by the **Resident Engineer**. The obligation to deliver finished **Work** in strict accordance with the **Contract** prior to **Final Acceptance** shall be absolute and shall not be affected by the **Resident Engineer's** approval of, or failure to prohibit, the **Means and Methods of Construction** used by the **Contractor**.

7.2 During the performance of the **Work** and up to the date of **Final Acceptance**, the **Contractor** shall take all reasonable precautions to protect all persons and the property of the **City** and of others from damage, loss or injury resulting from the **Contractor's**, and/or its **Subcontractors'** operations under this **Contract.** The **Contractor's** obligation to protect shall include the duty to provide, place or replace, and adequately maintain at or about the **Site** suitable and sufficient protection such as lights, barricades, and enclosures.

7.3 The **Contractor** shall comply with the notification requirements set forth below in the event of any loss, damage or injury to **Work**, persons or property, or any accidents arising out of the operations of the **Contractor** and/or its **Subcontractors** under this **Contract**.

7.3.1 The **Contractor** shall make a full and complete report in writing to the **Resident Engineer** within three (3) **Days** after the occurrence.

7.3.2 The **Contractor** shall also send written notice of any such event to all insurance carriers that issued potentially responsive policies (including commercial general liability insurance carriers for events relating to the **Contractor**'s own employees) no later than twenty (20) days after such event and again no later than twenty (20) days after the initiation of any claim and/or action resulting therefrom. Such notice shall contain the following information: the number of the insurance policy, the name of the Named Insured, the date and location of the incident, and the identity of the persons injured or property damaged. For any policy on which the **City** and/or the **Engineer**, **Architect**, or **Project Manager** are Additional Insureds, such notice shall expressly specify that "this notice is

being given on behalf of the City of New York as Additional Insured, such other Additional Insureds, as well as the Named Insured."

7.3.2(a) Whenever such notice is sent under a policy on which the **City** is an Additional Insured, the **Contractor** shall provide copies of the notice to the **Comptroller,** the **Commissioner** and the **City** Corporation Counsel. The copy to the **Comptroller** shall be sent to the Insurance Unit, NYC Comptroller's Office, 1 Centre Street – Room 1222, New York, New York, 10007. The copy to the **Commissioner** shall be sent to the address set forth in Schedule A of the General Conditions. The copy to the **City** Corporation Counsel shall be sent to Insurance Claims Specialist, Affirmative Litigation Division, New York City Law Department, 100 Church Street, New York, New York 10007.

7.3.2(b) If the **Contractor** fails to provide any of the foregoing notices to any appropriate insurance carrier(s) in a timely and complete manner, the **Contractor** shall indemnify the **City** for all losses, judgments, settlements, and expenses, including reasonable attorneys' fees, arising from an insurer's disclaimer of coverage citing late notice by or on behalf of the **City**.

7.4 To the fullest extent permitted by law, the **Contractor** shall defend, indemnify, and hold the **City**, its employees, and officials (the "Indemnitees") harmless against any and all claims (including but not limited to claims asserted by any employee of the **Contractor** and/or its **Subcontractors**) and costs and expenses of whatever kind (including but not limited to payment or reimbursement of attorneys' fees and disbursements) allegedly arising out of or in any way related to the operations of the **Contractor** and/or its **Subcontractors** in the performance of this **Contract** or from the **Contractor's** and/or its **Subcontractors'** failure to comply with any of the provisions of this **Contract** or of the **Law**. Such costs and expenses shall include all those incurred in defending the underlying claim and those incurred in connection with the enforcement of this Article 7.4 by way of cross-claim, third-party claim, declaratory action or otherwise. The parties expressly agree that the indemnification obligation hereunder contemplates (1) full indemnity in the event of liability imposed against the Indemnitees without negligence and solely by reason of statute, operation of **Law** or otherwise; and (2) partial indemnity in the event of any actual negligence on the part of the Indemnitees either causing or contributing to the underlying claim (in which case, indemnification will be limited to any liability imposed over and above that percentage attributable to actual fault whether by statute, by operation of **Law**, or otherwise). Where partial indemnity is provided hereunder, all costs and expenses shall be indemnified on a pro rata basis.

7.4.1 Indemnification under Article 7.4 or any other provision of the **Contract** shall operate whether or not **Contractor** or its **Subcontractors** have placed and maintained the insurance specified under Article 22.

7.5 The provisions of this Article 7 shall not be deemed to create any new right of action in favor of third parties against the **Contractor** or the **City**.

CHAPTER III: TIME PROVISIONS

ARTICLE 8. COMMENCEMENT AND PROSECUTION OF THE WORK

8.1 The **Contractor** shall commence the **Work** on the date specified in the **Notice to Proceed** or the **Order to Work**. The time for performance of the **Work** under the **Contract** shall be computed from

the date specified in the **Notice to Proceed** or the **Order to Work. TIME BEING OF THE ESSENCE** to the **City**, the **Contractor** shall thereafter prosecute the **Work** diligently, using such **Means and Methods of Construction** as are in accord with Article 4 herein and as will assure its completion not later than the date specified in this Contract, or on the date to which the time for completion may be extended.

ARTICLE 9. PROGRESS SCHEDULES

9.1 To enable the **Work** to be performed in an orderly and expeditious manner, the **Contractor**, within fifteen (15) **Days** after the **Notice to Proceed** or **Order to Work**, unless otherwise directed by the **Engineer**, shall submit to the **Engineer** a proposed progress schedule based on the Critical Path Method in the form of a bar graph or in such other form as specified by the **Engineer**, and monthly cash flow requirements, showing:

9.1.1 The anticipated time of commencement and completion of each of the various operations to be performed under this **Contract**; and

9.1.2 The sequence and interrelation of each of these operations with the others and with those of other related contracts; and

9.1.3 The estimated time required for fabrication or delivery, or both, of all materials and equipment required for the **Work**, including the anticipated time for obtaining required approvals pursuant to Article 10; and

9.1.4 The estimated amount in dollars the **Contractor** will claim on a monthly basis.

9.2 The proposed schedule shall be revised as directed by the **Engineer**, until finally approved by the **Engineer**, and after such approval, subject to the provisions of Article 11, shall be strictly adhered to by the **Contractor**.

9.3 If the **Contractor** shall fail to adhere to the approved progress schedule, or to the schedule as revised pursuant to Article 11, it shall promptly adopt such other or additional **Means and Methods of Construction**, at its sole cost and expense, as will make up for the time lost and will assure completion in accordance with the approved progress schedule. The approval by the **City** of a progress schedule which is shorter than the time allotted under the **Contract** shall not create any liability for the **City** if the approved progress schedule is not met.

9.4 The **Contractor** will not receive any payments until the proposed progress schedule is submitted.

ARTICLE 10. REQUESTS FOR INFORMATION OR APPROVAL

10.1 From time to time as the **Work** progresses and in the sequence indicated by the approved progress schedule, the **Contractor** shall submit to the **Engineer** a specific request in writing for each item of information or approval required by the **Contractor**. These requests shall state the latest date upon which the information or approval is actually required by the **Contractor**, and shall be submitted in a reasonable time in advance thereof to provide the **Engineer** a sufficient time to act upon such submissions, or any necessary re-submissions thereof.

10.2 The **Contractor** shall not have any right to an extension of time on account of delays due to the **Contractor's** failure to submit requests for the required information or the required approval in accordance with the above requirements.

ARTICLE 11. NOTICE OF CONDITIONS CAUSING DELAY AND DOCUMENTATION OF DAMAGES CAUSED BY DELAY

11.1 After the commencement of any condition which is causing or may cause a delay in completion of the **Work**, including conditions for which the **Contractor** may be entitled to an extension of time, the following notifications and submittals are required:

11.1.1 Within fifteen (15) **Days** after the **Contractor** becomes aware or reasonably should be aware of each such condition, the **Contractor** must notify the **Resident Engineer** or **Engineer**, as directed by the **Commissioner**, in writing of the existence, nature and effect of such condition upon the approved progress schedule and the **Work**, and must state why and in what respects, if any, the condition is causing or may cause a delay. Such notice shall include a description of the construction activities that are or could be affected by the condition and may include any recommendations the **Contractor** may have to address the delay condition and any activities the **Contractor** may take to avoid or minimize the delay.

11.1.2 If the **Contractor** shall claim to be sustaining damages for delay as provided for in this Article 11,within forty-five (45) **Days** from the time such damages are first incurred for each such condition, the **Contractor** shall submit to the **Commissioner** a verified written statement of the details and estimates of the amounts of such damages, including categories of expected damages and projected monthly costs, together with documentary evidence of such damages as the **Contractor** may have at the time of submission ("statement of delay damages"), as further detailed in Article 11.6. The **Contractor** may submit the above statement within such additional time as may be granted by the **Commissioner** in writing upon written request therefor.

11.1.3 Articles 11.1.1 and 11.1.2 do not relieve the **Contractor** of its obligation to comply with the provisions of Article 44.

11.2 Failure of the **Contractor** to strictly comply with the requirements of Article 11.1.1 may, in the discretion of the **Commissioner**, be deemed sufficient cause to deny any extension of time on account of delay arising out of such condition. Failure of the **Contractor** to strictly comply with the requirements of both Articles 11.1.1 and 11.1.2 shall be deemed a conclusive waiver by the **Contractor** of any and all claims for damages for delay arising from such condition and no right to recover on such claims shall exist.

11.3 When appropriate and directed by the **Engineer**, the progress schedule shall be revised by the **Contractor** until finally approved by the **Engineer**. The revised progress schedule must be strictly adhered to by the **Contractor**.

11.4 Compensable Delays

11.4.1 The **Contractor** agrees to make claim only for additional costs attributable to delay in the performance of this **Contract** necessarily extending the time for completion of the **Work** or resulting from acceleration directed by the **Commissioner** and required to maintain the progress schedule, occasioned solely by any act or omission to act of the **City** listed below. The **Contractor** also agrees that delay from any other cause shall be

compensated, if at all, solely by an extension of time to complete the performance of the **Work**.

11.4.1.1 The failure of the **City** to take reasonable measures to coordinate and progress the **Work** to the extent required by the **Contract**, except that the City shall not be responsible for the **Contractor's** obligation to coordinate and progress the **Work** of its **Subcontractors**.

11.4.1.2 Unreasonable delays attributable to the review of shop drawings, the issuance of change orders, or the cumulative impact of change orders that were not brought about by any act or omission of the **Contractor**.

11.4.1.3 The unavailability of the **Site** caused by acts or omissions of the **City**..

11.4.1.4 The issuance by the **Engineer** of a stop work order that was not brought about through any act or omission of the **Contractor**.

11.4.1.5 Differing site conditions or environmental hazards that were neither known nor reasonably ascertainable on a pre-bid inspection of the **Site** or review of the bid documents or other publicly available sources, and that are not ordinarily encountered in the **Project**'s geographical area or neighborhood or in the type of **Work** to be performed.

11.4.1.6 Delays caused by the **City's** bad faith or its willful, malicious, or grossly negligent conduct;

11.4.1.7 Delays not contemplated by the parties;

11.4.1.8 Delays so unreasonable that they constitute an intentional abandonment of the **Contract** by the **City**; and

11.4.1.9 Delays resulting from the **City's** breach of a fundamental obligation of the **Contract**.

11.4.2 No claim may be made for any alleged delay in **Substantial Completion** of the **Work** if the **Work** will be or is substantially completed by the date of **Substantial Completion** provided for in Schedule A unless acceleration has been directed by the **Commissioner** to meet the date of **Substantial Completion** set forth in Schedule A, or unless there is a provision in the **Contract** providing for additional compensation for early completion.

11.4.3 The provisions of this Article 11 apply only to claims for additional costs attributable to delay and do not preclude determinations by the **Commissioner** allowing reimbursements for additional costs for **Extra Work** pursuant to Articles 25 and 26 of this **Contract**. To the extent that any cost attributable to delay is reimbursed as part of a change order, no additional claim for compensation under this Article 11 shall be allowed.

11.5 Non-Compensable Delays. The **Contractor** agrees to make no claim for, and is deemed to have included in its bid prices for the various items of the **Contract**, the extra/additional costs attributable to any delays caused by or attributable to the items set forth below. For such items, the **Contractor** shall be compensated, if at all, solely by an extension of time to complete the performance of the **Work**, in accordance with the provisions of Article 13. Such extensions of time will be granted, if at all, pursuant to the grounds set forth in Article 13.3.

11.5.1 The acts or omissions of any third parties, including but not limited to **Other Contractors**, public/ governmental bodies (other than **City Agencies**), utilities or private enterprises, who are disclosed in the **Contract Documents** or are ordinarily encountered or generally recognized as related to the **Work**;

11.5.2 Any situation which was within the contemplation of the parties at the time of entering into the **Contract**, including any delay indicated or disclosed in the **Contract Documents** or that would be generally recognized by a reasonably prudent contractor as related to the nature of the **Work**, and/or the existence of any facility or appurtenance owned, operated or maintained by any third party, as indicated or disclosed in the **Contract Documents** or ordinarily encountered or generally recognized as related to the nature of the **Work**;

11.5.3 Restraining orders, injunctions or judgments issued by a court which were caused by a Contractor's submission, action or inaction or by a Contractor's **Means and Methods of Construction**, or by third parties, unless such order, injunction or judgment was the result of an act or omission by the **City**;

11.5.4 Any labor boycott, strike, picketing, lockout or similar situation;

11.5.5 Any shortages of supplies or materials, or unavailability of equipment, required by the **Contract Work**;

11.5.6 Climatic conditions, storms, floods, droughts, tidal waves, fires, hurricanes, earthquakes, landslides or other catastrophes or acts of God, or acts of war or of the public enemy or terrorist acts, including the **City's** reasonable responses thereto; and

11.5.7 **Extra Work** which does not significantly affect the overall completion of the **Contract**, reasonable delays in the review or issuance of change orders or field orders and/or in shop drawing reviews or approvals.

11.6 Required Content of Submission of Statement of Delay Damages

11.6.1 In the verified written statement of delay damages required by Article 11.1.2, the following information shall be provided by the **Contractor**:

11.6.1.1 For each delay, the start and end dates of the claimed periods of delay and, in addition, a description of the operations that were delayed, an explanation of how they were delayed, and the reasons for the delay, including identifying the applicable act or omission of the City listed in Article 11.4.

11.6.1.2 A detailed factual statement of the claim providing all necessary dates, locations and items of **Work** affected by the claim.

11.6.1.3 The estimated amount of additional compensation sought and a breakdown of that amount into categories as described in Article 11.7.

11.6.1.4 Any additional information requested by the **Commissioner**.

11.7 Recoverable Costs

11.7.1 Delay damages may be recoverable for the following costs actually and necessarily incurred in the performance of the **Work**:

11.7.1.1 Direct labor, including payroll taxes (subject to statutory wage caps) and supplemental benefits, based on time and materials records;

11.7.1.2 Necessary materials (including transportation to the **Site**), based on time and material records;

11.7.1.3 Reasonable rental value of necessary plant and equipment other than small tools, plus fuel/energy costs according to the applicable formula set forth in Articles 26.2.4 and/or 26.2.8, based on time and material records;

11.7.1.4 Additional insurance and bond costs;

11.7.1.5 Extended **Site** overhead, field office rental, salaries of field office staff, on-site project managers and superintendents, field office staff vehicles, **Project**-specific storage, field office utilities and telephone, and field office consumables;

11.7.1.6 Labor escalation costs based on actual costs;

11.7.1.7 Materials and equipment escalation costs based on applicable industry indices unless documentation of actual increased cost is provided;

11.7.1.8 Additional material and equipment storage costs based on actual documented costs and additional costs necessitated by extended manufacturer warranty periods; and

11.7.1.9 Extended home office overhead calculated based on the following formula:

(1) Subtract from the original **Contract** amount the amount earned by original contractual **Substantial Completion** date (not including change orders);

(2) Remove 15% overhead and profit from the calculation in item (1) by dividing the results of item (1) by 1.15;

(3) Multiply the result of item (2) by 7.25% for the total home office overhead;

(4) Multiply the result of item (3) by 7.25% for the total profit; and

(5) The total extended home office overhead will be the total of items (3) and (4).

11.7.2 Recoverable Subcontractor Costs. When the **Work** is performed by a **Subcontractor**, the **Contractor** may be paid the actual and necessary costs of such subcontracted **Work** as outlined above in Articles 11.7.1.1 through 11.7.1.8, and an additional overhead of 5% of the costs outlined in Articles 11.7.1.1 through 11.7.1.3.

11.7.3 Non-Recoverable Costs. The parties agree that the **City** will have no liability for the following items and the **Contractor** agrees it shall make no claim for the following items:

11.7.3.1 Profit, or loss of anticipated or unanticipated profit, except as provided in Article 11.7.1.9;

11.7.3.2 Consequential damages, including, but not limited to, construction or bridge loans or interest paid on such loans, loss of bonding capacity, bidding opportunities, or interest in investment, or any resulting insolvency;

11.7.3.3 Indirect costs or expenses of any nature except those included in Article 11.7.1;

11.7.3.4 Direct or indirect costs attributable to performance of **Work** where the **Contractor**, because of situations or conditions within its control, has not progressed the **Work** in a satisfactory manner; and

11.7.3.5 Attorneys' fees and dispute and claims preparation expenses.

11.8 Any claims for delay under this Article 11 are not subject to the jurisdiction of the Contract Dispute Resolution Board pursuant to the dispute resolution process set forth in Article 27.

11.9 Any compensation provided to the **Contractor** in accordance with this Article 11 will be made pursuant to a claim filed with the **Comptroller**. Nothing in this Article 11 extends the time for the **Contractor** to file an action with respect to a claim within six months after **Substantial Completion** pursuant to Article 56.

ARTICLE 12. COORDINATION WITH OTHER CONTRACTORS

12.1 During the progress of the **Work**, **Other Contractors** may be engaged in performing other work or may be awarded other contracts for additional work on this **Project**. In that event, the **Contractor** shall coordinate the **Work** to be done hereunder with the work of such **Other Contractors** and the **Contractor** shall fully cooperate with such **Other Contractors** and carefully fit its own **Work** to that provided under other contracts as may be directed by the **Engineer**. The **Contractor** shall not commit or permit any act which will interfere with the performance of work by any **Other Contractors**.

12.2 If the **Engineer** determines that the **Contractor** is failing to coordinate its **Work** with the work of **Other Contractors** as the **Engineer** has directed, then the **Commissioner** shall have the right to withhold any payments otherwise due hereunder until the **Contractor** completely complies with the **Engineer's** directions.

12.3 The **Contractor** shall notify the **Engineer** in writing if any **Other Contractor** on this **Project** is failing to coordinate its work with the **Work** of this **Contract**. If the **Engineer** finds such charges to be true, the **Engineer** shall promptly issue such directions to the **Other Contractor** with respect thereto as the situation may require. The **City** shall not, however, be liable for any damages suffered by any **Other Contractor's** failure to coordinate its work with the **Work** of this **Contract** or by reason of the **Other Contractor's** failure to promptly comply with the directions so issued by the **Engineer**, or by reason of any **Other Contractor's** default in performance, it being understood that the **City** does not guarantee the responsibility or continued efficiency of any contractor. The **Contractor** agrees to make no claim against the **City** for any damages relating to or arising out of any directions issued by the **Engineer** pursuant to this Article 12 (including but not limited to the failure of any **Other Contractor** to comply or promptly comply with such directions), or the failure of any **Other Contractor** to coordinate its work, or the default in performance of any **Other Contractor**.

12.4 The **Contractor** shall indemnify and hold the **City** harmless from any and all claims or judgments for damages and from costs and expenses to which the **City** may be subjected or which it may suffer or incur by reason of the **Contractor's** failure to comply with the **Engineer's** directions promptly; and the **Comptroller** shall have the right to exercise the powers reserved in Article 23 with respect to any claims which may be made for damages due to the **Contractor's** failure to comply with the **Engineer's** directions promptly. Insofar as the facts and **Law** relating to any claim would preclude the **City** from being completely indemnified by the **Contractor**, the **City** shall be partially indemnified by the **Contractor** to the fullest extent provided by **Law**.

12.5 Should the **Contractor** sustain any damage through any act or omission of any **Other Contractor** having a contract with the **City** for the performance of work upon the **Site** or of work which may be necessary to be performed for the proper prosecution of the **Work** to be performed hereunder, or through any act or omission of a subcontractor of such **Other Contractor**, the **Contractor** shall have no claim against the **City** for such damage, but shall have a right to recover such damage from the **Other**

Contractor under the provision similar to the following provisions which apply to this **Contract** and have been or will be inserted in the contracts with such **Other Contractors**:

12.5.1 Should any **Other Contractor** having or who shall hereafter have a contract with the **City** for the performance of work upon the **Site** sustain any damage through any act or omission of the **Contractor** hereunder or through any act or omission of any **Subcontractor** of the **Contractor**, the **Contractor** agrees to reimburse such **Other Contractor** for all such damages and to defend at its own expense any action based upon such claim and if any judgment or claim (even if the allegations of the action are without merit) against the **City** shall be allowed the **Contractor** shall pay or satisfy such judgment or claim and pay all costs and expenses in connection therewith and agrees to indemnify and hold the **City** harmless from all such claims. Insofar as the facts and **Law** relating to any claim would preclude the **City** from being completely indemnified by the **Contractor**, the **City** shall be partially indemnified by the **Contractor** to the fullest extent provided by **Law**.

12.6 The **City's** right to indemnification hereunder shall in no way be diminished, waived or discharged by its recourse to assessment of liquidated damages as provided in Article 15, or by the exercise of any other remedy provided for by **Contract** or by **Law**.

ARTICLE 13. EXTENSION OF TIME FOR PERFORMANCE

13.1 If performance by the **Contractor** is delayed for a reason set forth in Article 13.3, the **Contractor** may be allowed a reasonable extension of time in conformance with this Article 13 and the **PPB** Rules.

13.2 Any extension of time may be granted only by the **ACCO** or by the Board for the Extension of Time (hereafter "Board") (as set forth below) upon written application by the **Contractor**.

13.3 Grounds for Extension: If such application is made, the **Contractor** shall be entitled to an extension of time for delay in completion of the **Work** caused solely:

13.3.1 By the acts or omissions of the **City**, its officials, agents or employees; or

13.3.2 By the act or omissions of **Other Contractors** on this **Project**; or

13.3.3 By supervening conditions entirely beyond the control of either party hereto (such as, but not limited to, acts of God or the public enemy, excessive inclement weather, war or other national emergency making performance temporarily impossible or illegal, or strikes or labor disputes not brought about by any act or omission of the **Contractor**).

13.3.4 The **Contractor** shall, however, be entitled to an extension of time for such causes only for the number of **Days** of delay which the **ACCO** or the Board may determine to be due solely to such causes, and then only if the **Contractor** shall have strictly complied with all of the requirements of Articles 9 and 10.

13.4 The **Contractor** shall not be entitled to receive a separate extension of time for each of several causes of delay operating concurrently, but, if at all, only for the actual period of delay in completion of the **Work** as determined by the **ACCO** or the Board, irrespective of the number of causes contributing to produce such delay. If one of several causes of delay operating concurrently results from any act, fault or omission of the **Contractor** or of its **Subcontractors** or **Materialmen**, and would of itself (irrespective

of the concurrent causes) have delayed the **Work**, no extension of time will be allowed for the period of delay resulting from such act, fault or omission.

13.5 The determination made by the **ACCO** or the Board on an application for an extension of time shall be binding and conclusive on the **Contractor**.

13.6 The **ACCO** or the Board acting entirely within their discretion may grant an application for an extension of time for causes of delay other than those herein referred.

13.7 Permitting the **Contractor** to continue with the **Work** after the time fixed for its completion has expired, or after the time to which such completion may have been extended has expired, or the making of any payment to the **Contractor** after such time, shall in no way operate as a waiver on the part of the **City** of any of its rights under this **Contract**.

13.8 Application for Extension of Time:

13.8.1 Before the **Contractor's** time extension request will be considered, the **Contractor** shall notify the **ACCO** of the condition which allegedly has caused or is causing the delay, and shall submit a written application to the **ACCO** identifying:

13.8.1(a) The **Contractor**; the registration number; and **Project** description;

13.8.1(b) Liquidated damage assessment rate, as specified in the **Contract**;

13.8.1(c) Original total bid price;

13.8.1(d) The original **Contract** start date and completion date;

13.8.1(e) Any previous time extensions granted (number and duration); and

13.8.1(f) The extension of time requested.

13.8.2 In addition, the application for extension of time shall set forth in detail:

13.8.2(a) The nature of each alleged cause of delay in completing the **Work**;

13.8.2(b) The date upon which each such cause of delay began and ended and the number of **Days** attributable to each such cause;

13.8.2(c) A statement that the **Contractor** waives all claims except for those delineated in the application, and the particulars of any claims which the **Contractor** does not agree to waive. For time extensions for **Substantial Completion** and final completion payments, the application shall include a detailed statement of the dollar amounts of each element of claim item reserved; and

13.8.2(d) A statement indicating the **Contractor's** understanding that the time extension is granted only for purposes of permitting continuation of **Contract** performance and payment for **Work** performed and that the **City** retains its right to conduct an investigation and assess liquidated damages as appropriate in the future.

13.9 Analysis and Approval of Time Extensions:

13.9.1 For time extensions for partial payments, a written determination shall be made by the **ACCO** who may, for good and sufficient cause, extend the time for the performance of the **Contract** as follows:

13.9.1(a) If the **Work** is to be completed within six (6) months, the time for performance may be extended for sixty (60) **Days**;

13.9.1(b) If the **Work** is to be completed within less than one (1) year but more than six (6) months, an extension of ninety (90) **Days** may be granted;

13.9.1(c) If the **Contract** period exceeds one (1) year, besides the extension granted in Article 13.9.1(b), an additional thirty (30) **Days** may be granted for each multiple of six (6) months involved beyond the one (1) year period; or

13.9.1(d) If exceptional circumstances exist, the **ACCO** may extend the time for performance beyond the extensions in Articles 13.9.1(a), 13.9.1(b), and 13.9.1(c). In that event, the **ACCO** shall file with the Mayor's Office of Contract Services a written explanation of the exceptional circumstances.

13.9.2 For extensions of time for **Substantial Completion** and final completion payments, the **Engineer**, in consultation with the **ACCO**, shall prepare a written analysis of the delay (including a preliminary determination of the causes of delay, the beginning and end dates for each such cause of delay, and whether the delays are excusable under the terms of this **Contract**). The report shall be subject to review by and approval of the Board, which shall have authority to question its analysis and determinations and request additional facts or documentation. The report as reviewed and made final by the Board shall be made a part of the **Agency** contract file. Neither the report itself nor anything contained therein shall operate as a waiver or release of any claim the **City** may have against the **Contractor** for either actual or liquidated damages.

13.9.3 Approval Mechanism for Time Extensions for **Substantial Completion** or Final Completion Payments: An extension shall be granted only with the approval of the Board which is comprised of the **ACCO** of the **Agency**, the **City** Corporation Counsel, and the **Comptroller**, or their authorized representatives.

13.9.4 Neither the granting of any application for an extension of time to the **Contractor** or any **Other Contractor** on this **Project** nor the papers, records or reports related to any application for or grant of an extension of time or determination related thereto shall be referred to or offered in evidence by the **Contractor** or its attorneys in any action or proceeding.

13.10 No Damage for Delay: The **Contractor** agrees to make no claim for damages for delay in the performance of this **Contract** occasioned by any act or omission to act of the **City** or any of its representatives, except as provided for in Article 11.

ARTICLE 14. COMPLETION AND FINAL ACCEPTANCE OF THE WORK

14.1 Date for **Substantial Completion**: The **Contractor** shall substantially complete the **Work** within the time fixed in Schedule A of the General Conditions, or within the time to which such **Substantial Completion** may be extended.

14.2 Determining the Date of **Substantial Completion**: The **Work** will be deemed to be substantially complete when the two conditions set forth below have been met.

14.2.1 Inspection: The **Engineer** or **Resident Engineer**, as applicable, has inspected the **Work** and has made a written determination that it is substantially complete.

14.2.2 Approval of **Final Approved Punch List** and Date for **Final Acceptance**: Following inspection of the **Work**, the **Engineer/Resident Engineer** shall furnish the **Contractor** with a final punch list, specifying all items of **Work** to be completed and proposing dates for the completion of each specified item of **Work**. The **Contractor** shall then submit in writing to the **Engineer/Resident Engineer** within ten (10) **Days** of the **Engineer/Resident Engineer** furnishing the final punch list either acceptance of the dates or proposed alternative dates for the completion of each specified item of **Work**. If the **Contractor** neither accepts the dates nor proposes alternative dates within ten (10) **Days**, the schedule proposed by the **Engineer/Resident Engineer** shall be deemed accepted. If the **Contractor** proposes alternative dates, then, within a reasonable time after receipt, the **Engineer/Resident Engineer**, in a written notification to the **Contractor**, shall approve the **Contractor's** completion dates or, if they are unable to agree, the **Engineer/Resident Engineer** shall establish dates for the completion of each item of **Work**. The latest completion date specified shall be the date for **Final Acceptance** of the **Work**.

14.3 Date of **Substantial Completion**. The date of approval of the **Final Approved Punch List**, shall be the date of **Substantial Completion**. The date of approval of the **Final Approved Punch List** shall be either (a) if the **Contractor** approves the final punch list and proposed dates for completion furnished by the **Engineer/Resident Engineer**, the date of the **Contractor**'s approval; or (b) if the **Contractor** neither accepts the dates nor proposes alternative dates, ten (10) **Days** after the **Engineer/Resident Engineer** furnishes the **Contractor** with a final punch list and proposed dates for completion; or (c) if the **Contractor** proposes alternative dates, the date that the **Engineer/Resident Engineer** sends written notification to the **Contractor** either approving the **Contractor**'s proposed alternative dates or establishing dates for the completion for each item of **Work**.

14.4 Determining the Date of **Final Acceptance**: The **Work** will be accepted as final and complete as of the date of the **Engineer's/Resident Engineer**'s inspection if, upon such inspection, the **Engineer/Resident Engineer** finds that all items on the **Final Approved Punch List** are complete and no further **Work** remains to be done. The **Commissioner** will then issue a written determination of **Final Acceptance**.

14.5 Request for Inspection: Inspection of the **Work** by the **Engineer/Resident Engineer** for the purpose of **Substantial Completion** or **Final Acceptance** shall be made within fourteen (14) **Days** after receipt of the **Contractor's** written request therefor.

14.6 Request for Re-inspection: If upon inspection for the purpose of **Substantial Completion** or **Final Acceptance**, the **Engineer/Resident Engineer** determines that there are items of **Work** still to be performed, the **Contractor** shall promptly perform them and then request a re-inspection. If upon re-inspection, the **Engineer/Resident Engineer** determines that the **Work** is substantially complete or finally accepted, the date of such re-inspection shall be the date of **Substantial Completion** or **Final Acceptance**. Re-inspection by the **Engineer/Resident Engineer** shall be made within ten (10) **Days** after receipt of the **Contractor's** written request therefor.

14.7 Initiation of Inspection by the **Engineer/Resident Engineer**: If the **Contractor** does not request inspection or re-inspection of the **Work** for the purpose of **Substantial Completion** or **Final Acceptance**, the **Engineer/Resident Engineer** may initiate such inspection or re-inspection.

ARTICLE 15. LIQUIDATED DAMAGES

15.1 In the event the **Contractor** fails to substantially complete the **Work** within the time fixed for such **Substantial Completion** in Schedule A of the General Conditions, plus authorized time extensions, or if the **Contractor**, in the sole determination of the **Commissioner**, has abandoned the **Work**, the **Contractor** shall pay to the **City** the sum fixed in Schedule A of the General Conditions, for each and every **Day** that the time consumed in substantially completing the **Work** exceeds the time allowed therefor; which said sum, in view of the difficulty of accurately ascertaining the loss which the **City** will suffer by reason of delay in the **Substantial Completion** of the **Work** hereunder, is hereby fixed and agreed as the liquidated damages that the **City** will suffer by reason of such delay, and not as a penalty. This Article 15 shall also apply to the **Contractor** whether or not the **Contractor** is defaulted pursuant to Chapter X of this **Contract**. Neither the failure to assess liquidated damages nor the granting of any time extension shall operate as a waiver or release of any claim the **City** may have against the **Contractor** for either actual or liquidated damages.

15.2 Liquidated damages received hereunder are not intended to be nor shall they be treated as either a partial or full waiver or discharge of the **City's** right to indemnification, or the **Contractor's** obligation to indemnify the **City**, or to any other remedy provided for in this **Contract** or by **Law**.

15.3 The **Commissioner** may deduct and retain out of the monies which may become due hereunder, the amount of any such liquidated damages; and in case the amount which may become due hereunder shall be less than the amount of liquidated damages suffered by the **City**, the **Contractor** shall be liable to pay the difference.

ARTICLE 16. OCCUPATION OR USE PRIOR TO COMPLETION

16.1 Unless otherwise provided for in the **Specifications**, the **Commissioner** may take over, use, occupy or operate any part of the **Work** at any time prior to **Final Acceptance**, upon written notification to the **Contractor**. The **Engineer** or **Resident Engineer**, as applicable, shall inspect the part of the **Work** to be taken over, used, occupied, or operated, and will furnish the **Contractor** with a written statement of the **Work**, if any, which remains to be performed on such part. The **Contractor** shall not object to, nor interfere with, the **Commissioner's** decision to exercise the rights granted by Article 16. In the event the **Commissioner** takes over, uses, occupies, or operates any part of the **Work:**

16.1.1 the **Engineer/Resident Engineer** shall issue a written determination of **Substantial Completion** with respect to such part of the **Work**;

16.1.2 the **Contractor** shall be relieved of its absolute obligation to protect such part of the unfinished **Work** in accordance with Article 7;

16.1.3 the **Contractor's** guarantee on such part of the **Work** shall begin on the date of such use by the **City**; and;

16.1.4 the **Contractor** shall be entitled to a return of so much of the amount retained in accordance with Article 21 as it relates to such part of the **Work**, except so much thereof as may be retained under Articles 24 and 44.

CHAPTER IV: SUBCONTRACTS AND ASSIGNMENTS

ARTICLE 17. SUBCONTRACTS

17.1 The **Contractor** shall not make subcontracts totaling an amount more than the percentage of the total **Contract** price fixed in Schedule A of the General Conditions, without prior written permission from the **Commissioner**. All subcontracts made by the **Contractor** shall be in writing. No **Work** may be performed by a **Subcontractor** prior to the **Contractor** entering into a written subcontract with the **Subcontractor** and complying with the provisions of this Article 17.

17.2 Before making any subcontracts, the **Contractor** shall submit a written statement to the **Commissioner** giving the name and address of the proposed **Subcontractor**; the portion of the **Work** and materials which it is to perform and furnish; the cost of the subcontract; the VENDEX questionnaire if required; the proposed subcontract if requested by the **Commissioner**; and any other information tending to prove that the proposed **Subcontractor** has the necessary facilities, skill, integrity, past experience, and financial resources to perform the **Work** in accordance with the terms and conditions of this **Contract**.

17.3 In addition to the requirements in Article 17.2, **Contractor** is required to list the **Subcontractor** in the web based Subcontractor Reporting System through the City's Payee Information Portal (PIP), available at www.nyc.gov/pip.[1] For each **Subcontractor** listed, **Contractor** is required to provide the following information: maximum contract value, description of **Subcontractor's** Work, start and end date of the subcontract and identification of the **Subcontractor**'s industry. Thereafter, **Contractor** will be required to report in the system the payments made to each **Subcontractor** within 30 days of making the payment. If any of the required information changes throughout the Term of the **Contract**, **Contractor** will be required to revise the information in the system.

Failure of the **Contractor** to list a **Subcontractor** and/or to report **Subcontractor** payments in a timely fashion may result in the **Commissioner** declaring the **Contractor** in default of the **Contract** and will subject **Contractor** to liquidated damages in the amount of $100 per day for each day that the **Contractor** fails to identify a **Subcontractor** along with the required information about the **Subcontractor** and/or fails to report payments to a **Subcontractor**, beyond the time frames set forth herein or in the notice from the **City**. Article 15 shall govern the issue of liquidated damages.

17.4 If an approved **Subcontractor** elects to subcontract any portion of its subcontract, the proposed sub-subcontract shall be submitted in the same manner as directed above.

17.5 The **Commissioner** will notify the **Contractor** in writing whether the proposed **Subcontractor** is approved. If the proposed **Subcontractor** is not approved, the **Contractor** may submit another proposed **Subcontractor** unless the **Contractor** decides to do the **Work**. No **Subcontractor** shall be permitted to enter or perform any work on the **Site** unless approved.

17.6 Before entering into any subcontract hereunder, the **Contractor** shall provide the proposed **Subcontractor** with a complete copy of this document and inform the proposed **Subcontractor** fully and completely of all provisions and requirements of this **Contract** relating either directly or indirectly to the **Work** to be performed and the materials to be furnished under such subcontract, and every such

[1] In order to use the new system, a PIP account will be required. Detailed instructions on creating a PIP account and using the new system are also available at www.nyc.gov/pip. Additional assistance with PIP may be obtained by emailing the Financial Information Services Agency Help Desk at pip@fisa.nyc.gov.

Subcontractor shall expressly stipulate that all labor performed and materials furnished by the **Subcontractor** shall strictly comply with the requirements of this **Contract**.

17.7 Documents given to a prospective **Subcontractor** for the purpose of soliciting the **Subcontractor's** bid shall include either a copy of the bid cover or a separate information sheet setting forth the **Project** name, the **Contract** number (if available), the **Agency** (as noted in Article 2.1.6), and the **Project's** location.

17.8 The **Commissioner's** approval of a **Subcontractor** shall not relieve the **Contractor** of any of its responsibilities, duties, and liabilities hereunder. The **Contractor** shall be solely responsible to the **City** for the acts or defaults of its **Subcontractor** and of such **Subcontractor's** officers, agents, and employees, each of whom shall, for this purpose, be deemed to be the agent or employee of the **Contractor** to the extent of its subcontract.

17.9 If the **Subcontractor** fails to maintain the necessary facilities, skill, integrity, past experience, and financial resources (other than due to the **Contractor's** failure to make payments where required) to perform the **Work** in accordance with the terms and conditions of this **Contract**, the **Contractor** shall promptly notify the **Commissioner** and replace such **Subcontractor** with a newly approved **Subcontractor** in accordance with this Article 17.

17.10 The **Contractor** shall be responsible for ensuring that all **Subcontractors** performing **Work** at the **Site** maintain all insurance required by **Law**.

17.11 The **Contractor** shall promptly, upon request, file with the **Engineer** a conformed copy of the subcontract and its cost. The subcontract shall provide the following:

17.11.1 Payment to **Subcontractors**: The agreement between the **Contractor** and its **Subcontractor** shall contain the same terms and conditions as to method of payment for **Work**, labor, and materials, and as to retained percentages, as are contained in this **Contract**.

17.11.2 Prevailing Rate of Wages: The agreement between the **Contractor** and its **Subcontractor** shall include the prevailing wage rates and supplemental benefits to be paid in accordance with Labor Law Section 220.

17.11.3 Section 6-123 of the Administrative Code: Pursuant to the requirements of Section 6-123 of the Administrative Code, every agreement between the **Contractor** and a **Subcontractor** in excess of fifty thousand ($50,000) dollars shall include a provision that the **Subcontractor** shall not engage in any unlawful discriminatory practice as defined in Title VIII of the Administrative Code (Section 8-101 *et seq.*).

17.11.4 All requirements required pursuant to federal and/or state grant agreement(s), if applicable to the **Work**.

17.12 The **Commissioner** may deduct from the amounts certified under this **Contract** to be due to the **Contractor**, the sum or sums due and owing from the **Contractor** to the **Subcontractors** according to the terms of the said subcontracts, and in case of dispute between the **Contractor** and its **Subcontractor**, or **Subcontractors**, as to the amount due and owing, the **Commissioner** may deduct and withhold from the amounts certified under this **Contract** to be due to the **Contractor** such sum or sums as may be claimed by such **Subcontractor**, or **Subcontractors**, in a sworn affidavit, to be due and owing until such time as such claim or claims shall have been finally resolved.

17.13 On contracts where performance bonds and payment bonds are executed, the **Contractor** shall include on each requisition for payment the following data: **Subcontractor's** name, value of the subcontract, total amount previously paid to **Subcontractor** for **Work** previously requisitioned, and the amount, including retainage, to be paid to the **Subcontractor** for **Work** included in the requisition.

17.14 On **Contracts** where performance bonds and payment bonds are not executed, the **Contractor** shall include with each requisition for payment submitted hereunder, a signed statement from each and every **Subcontractor** and/or **Materialman** for whom payment is requested in such requisition. Such signed statement shall be on the letterhead of the **Subcontractor** and/or **Materialman** for whom payment is requested and shall (i) verify that such **Subcontractor** and/or **Materialman** has been paid in full for all **Work** performed and/or material supplied to date, exclusive of any amount retained and any amount included on the current requisition, and (ii) state the total amount of retainage to date, exclusive of any amount retained on the current requisition.

ARTICLE 18. ASSIGNMENTS

18.1 The **Contractor** shall not assign, transfer, convey or otherwise dispose of this **Contract**, or the right to execute it, or the right, title or interest in or to it or any part thereof, or assign, by power of attorney or otherwise any of the monies due or to become due under this **Contract**, unless the previous written consent of the **Commissioner** shall first be obtained thereto, and the giving of any such consent to a particular assignment shall not dispense with the necessity of such consent to any further or other assignments.

18.2 Such assignment, transfer, conveyance or other disposition of this **Contract** shall not be valid until filed in the office of the **Commissioner** and the **Comptroller**, with the written consent of the **Commissioner** endorsed thereon or attached thereto.

18.3 Failure to obtain the previous written consent of the **Commissioner** to such an assignment, transfer, conveyance or other disposition, may result in the revocation and annulment of this **Contract**. The **City** shall thereupon be relieved and discharged from any further liability to the **Contractor**, its assignees, transferees or sublessees, who shall forfeit and lose all monies therefor earned under the **Contract**, except so much as may be required to pay the **Contractor's** employees.

18.4 The provisions of this clause shall not hinder, prevent, or affect an assignment by the **Contractor** for the benefit of its creditors made pursuant to the **Laws** of the State of New York.

18.5 This **Contract** may be assigned by the **City** to any corporation, agency or instrumentality having authority to accept such assignment.

CHAPTER V: CONTRACTOR'S SECURITY AND GUARANTEE

ARTICLE 19. SECURITY DEPOSIT

19.1 If performance and payment bonds are required, the **City** shall retain the bid security to ensure that the successful bidder executes the **Contract** and furnishes the required payment and performance security within ten (10) **Days** after notice of the award of the **Contract**. If the successful bidder fails to execute the **Contract** and furnish the required payment and performance security, the **City** shall retain such bid security as set forth in the Information for Bidders. If the successful bidder executes the

Contract and furnishes the required payment and performance security, the **City** shall return the bid security within a reasonable time after the furnishing of such bonds and execution of the **Contract** by the **City**.

19.2 If performance and payment bonds are not required, the bid security shall be retained by the **City** as security for the **Contractor**'s faithful performance of the **Contract**. If partial payments are provided, the bid security will be returned to the **Contractor** after the sum retained under Article 21 equals the amount of the bid security, subject to other provisions of this **Contract**. If partial payments are not provided, the bid security will be released when final payment is certified by the **City** for payment.

19.3 If the **Contractor** is declared in default under Article 48 prior to the return of the deposit, or if any claim is made such as referred to in Article 23, the amount of such deposit, or so much thereof as the **Comptroller** may deem necessary, may be retained and then applied by the **Comptroller**:

19.3.1 To compensate the **City** for any expense, loss or damage suffered or incurred by reason of or resulting from such default, including the cost of re-letting and liquidated damages; or

19.3.2 To indemnify the **City** against any and all claims.

ARTICLE 20. PAYMENT GUARANTEE

20.1 On **Contracts** where one hundred (100%) percent performance bonds and payment bonds are executed, this Article 20 does not apply.

20.2 In the event the terms of this **Contract** do not require the **Contractor** to provide a payment bond or where the **Contract** does not require a payment bond for one hundred (100%) percent of the **Contract** price, the **City** shall, in accordance with the terms of this Article 20, guarantee payment of all lawful claims for:

20.2.1 Wages and compensation for labor performed and/or services rendered; and

20.2.2 Materials, equipment, and supplies provided, whether incorporated into the **Work** or not, when demands have been filed with the **City** as provided hereinafter by any person, firm, or corporation which furnished labor, material, equipment, supplies, or any combination thereof, in connection with the **Work** performed hereunder (hereinafter referred to as the "beneficiary") at the direction of the **City** or the **Contractor**.

20.3 The provisions of Article 20.2 are subject to the following limitations and conditions:

20.3.1 If the **Contractor** provides a payment bond for a value that is less than one hundred (100%) percent of the value of the **Contract Work**, the payment bond provided by the **Contractor** shall be primary (and non-contributing) to the payment guarantee provided under this Article 20.

20.3.2 The guarantee is made for the benefit of all beneficiaries as defined in Article 20.2 provided that those beneficiaries strictly adhere to the terms and conditions of Article 20.3.4 and 20.3.5.

20.3.3 Nothing in this Article 20 shall prevent a beneficiary providing labor, services or material for the **Work** from suing the **Contractor** for any amounts due and owing the beneficiary by the **Contractor**.

20.3.4 Every person who has furnished labor or material, to the **Contractor** or to a **Subcontractor** of the **Contractor**, in the prosecution of the **Work** and who has not been paid in full therefor before the expiration of a period of ninety (90) **Days** after the date on which the last of the labor was performed or material was furnished by him/her for which the claim is made, shall have the right to sue on this payment guarantee in his/her own name for the amount, or the balance thereof, unpaid at the time of commencement of the action; provided, however, that a person having a direct contractual relationship with a **Subcontractor** of the **Contractor** but no contractual relationship express or implied with the **Contractor** shall not have a right of action upon the guarantee unless he/she shall have given written notice to the **Contractor** within one hundred twenty (120) **Days** from the date on which the last of the labor was performed or the last of the material was furnished, for which his/her claim is made, stating with substantial accuracy the amount claimed and the name of the party to whom the material was furnished or for whom the labor was performed. The notice shall be served by delivering the same personally to the **Contractor** or by mailing the same by registered mail, postage prepaid, in an envelope addressed to the **Contractor** at any place where it maintains an office or conducts its business; provided, however, that where such notice is actually received by the **Contractor** by other means, such notice shall be deemed sufficient.

20.3.5 Except as provided in Labor Law Section 220-g, no action on this payment guarantee shall be commenced after the expiration of the one-year limitations period set forth in Section 137(4)(b) of the State Finance Law.

20.3.6 The **Contractor** shall promptly forward to the **City** any notice or demand received pursuant to Article 20.3.4. The **Contractor** shall inform the **City** of any defenses to the notice or demand and shall forward to the **City** any documents the **City** requests concerning the notice or demand.

20.3.7 All demands made against the **City** by a beneficiary of this payment guarantee shall be presented to the **Engineer** along with all written documentation concerning the demand which the **Engineer** deems reasonably appropriate or necessary, which may include, but shall not be limited to: the subcontract; any invoices presented to the **Contractor** for payment; the notarized statement of the beneficiary that the demand is due and payable, that a request for payment has been made of the **Contractor** and that the demand has not been paid by the **Contractor** within the time allowed for such payment by the subcontract; and copies of any correspondence between the beneficiary and the **Contractor** concerning such demand. The **City** shall notify the **Contractor** that a demand has been made. The **Contractor** shall inform the **City** of any defenses to the demand and shall forward to the **City** any documents the **City** requests concerning the demand.

20.3.8 The **City** shall make payment only if, after considering all defenses presented by the **Contractor**, it determines that the payment is due and owing to the beneficiary making the demand.

20.3.9 No beneficiary shall be entitled to interest from the **City**, or to any other costs, including, but not limited to, attorneys' fees, except to the extent required by State Finance Law Section 137.

20.4 Upon the receipt by the **City** of a demand pursuant to this Article 20, the **City** may withhold from any payment otherwise due and owing to the **Contractor** under this **Contract** an amount sufficient to satisfy the demand.

20.4.1 In the event the **City** determines that the demand is valid, the **City** shall notify the **Contractor** of such determination and the amount thereof and direct the **Contractor** to immediately pay such amount to the beneficiary. In the event the **Contractor**, within seven (7) **Days** of receipt of such notification from the **City**, fails to pay the beneficiary, such failure shall constitute an automatic and irrevocable assignment of payment by the **Contractor** to the beneficiary for the amount of the demand determined by the **City** to be valid. The **Contractor**, without further notification or other process, hereby gives its unconditional consent to such assignment of payment to the beneficiary and authorizes the **City**, on its behalf, to take all necessary actions to implement such assignment of payment, including without limitation the execution of any instrument or documentation necessary to effectuate such assignment.

20.4.2In the event that the amount otherwise due and owing to the **Contractor** by the **City** is insufficient to satisfy such demand, the **City** may, at its option, require payment from the **Contractor** of an amount sufficient to cover such demand and exercise any other right to require or recover payment which the **City** may have under **Law** or **Contract**.

20.4.3 In the event the **City** determines that the demand is invalid, any amount withheld pending the **City**'s review of such demand shall be paid to the **Contractor**; provided, however, no lien has been filed. In the event a claim or an action has been filed, the terms and conditions set forth in Article 23 shall apply. In the event a lien has been filed, the parties will be governed by the provisions of the Lien Law of the State of New York.

20.5 The provisions of this Article 20 shall not prevent the **City** and the **Contractor** from resolving disputes in accordance with the **PPB** Rules, where applicable.

20.6 In the event the **City** determines that the beneficiary is entitled to payment pursuant to this Article 20, such determination and any defenses and counterclaims raised by the **Contractor** shall be taken into account in evaluating the **Contractor's** performance.

20.7 Nothing in this Article 20 shall relieve the **Contractor** of the obligation to pay the claims of all persons with valid and lawful claims against the **Contractor** relating to the **Work**.

20.8 The **Contractor** shall not require any performance, payment or other bonds of any **Subcontractor** if this **Contract** does not require such bonds of the **Contractor**.

20.9 The payment guarantee made pursuant to this Article 20 shall be construed in a manner consistent with Section 137 of the State Finance Law and shall afford to persons furnishing labor or materials to the **Contractor** or its **Subcontractors** in the prosecution of the **Work** under this **Contract** all of the rights and remedies afforded to such persons by such section, including but not limited to, the right to commence an action against the **City** on the payment guarantee provided by this Article 20 within the one-year limitations period set forth in Section 137(4)(b).

ARTICLE 21. RETAINED PERCENTAGE

21.1 If this **Contract** requires one hundred (100%) percent performance and payment security, then as further security for the faithful performance of this **Contract**, the **Commissioner** shall deduct, and

retain until the substantial completion of the **Work**, five (5%) percent of the value of **Work** certified for payment in each partial payment voucher.

21.2 If this **Contract** does not require one hundred (100%) percent performance and payment security and if the price for which this **Contract** was awarded does not exceed one million ($1,000,000) dollars, then as further security for the faithful performance of this **Contract**, the **Commissioner** shall deduct, and retain until the substantial completion of the **Work**, five (5%) percent of the value of **Work** certified for payment in each partial payment voucher.

21.3 If this **Contract** does not require one hundred (100%) percent performance and payment security and if the price for which this **Contract** was awarded exceeds one million ($1,000,000) dollars, then as further security for the faithful performance of this **Contract,** the **Commissioner** shall deduct, and retain until the substantial completion of the **Work**, up to ten (10%) percent of the value of **Work** certified for payment in each partial payment voucher. The percentage to be retained is set forth in Schedule A of the General Conditions.

ARTICLE 22. INSURANCE

22.1 Types of Insurance: The **Contractor** shall procure and maintain the following types of insurance if, and as indicated, in Schedule A of the General Conditions (with the minimum limits and special conditions specified in Schedule A). Such insurance shall be maintained from the date the **Contractor** is required to provide Proof of Insurance pursuant to Article 22.3.1 through the date of completion of all required **Work** (including punch list work as certified in writing by the **Resident Engineer**), except for insurance required pursuant to Article 22.1.4, which may terminate upon **Substantial Completion** of the **Contract**. All insurance shall meet the requirements set forth in this Article 22. Wherever this Article requires that insurance coverage be "at least as broad" as a specified form (including all ISO forms), there is no obligation that the form itself be used, provided that the **Contractor** can demonstrate that the alternative form or endorsement contained in its policy provides coverage at least as broad as the specified form.

22.1.1 Commercial General Liability Insurance: The **Contractor** shall provide Commercial General Liability Insurance covering claims for property damage and/or bodily injury, including death, which may arise from any of the operations under this **Contract**. Coverage under this insurance shall be at least as broad as that provided by the latest edition of Insurance Services Office ("ISO") Form CG 0001. Such insurance shall be "occurrence" based rather than "claims-made" and include, without limitation, the following types of coverage: premises operations; products and completed operations; contractual liability (including the tort liability of another assumed in a contract); broad form property damage; independent contractors; explosion, collapse and underground (XCU); construction means and methods; and incidental malpractice. Such insurance shall contain a "per project" aggregate limit, as specified in Schedule A, that applies separately to operations under this **Contract**.

22.1.1(a) Such Commercial General Liability Insurance shall name the **City** as an Additional Insured. Coverage for the City shall specifically include the **City's** officials and employees, be at least as broad as the latest edition of ISO Form CG 20 10 and provide completed operations coverage at least as broad as the latest edition of ISO Form CG 20 37.

22.1.1(b) Such Commercial General Liability Insurance shall name all other entities designated as additional insureds in Schedule A but only for claims arising from the

Contractor's operations under this **Contract**, with coverage at least as broad as the latest edition of ISO Form CG 20 26.

22.1.1(c) If the **Work** requires a permit from the Department of Buildings pursuant to 1 RCNY Section 101-08, the **Contractor** shall provide Commercial General Liability Insurance with limits of at least those required by 1 RCNY section 101-08 or greater limits required by the Agency in accordance with Schedule A. If the **Work** does not require such a permit, the minimum limits shall be those provided for in Schedule A.

22.1.1(d) If any of the **Work** includes repair of a waterborne vessel owned by or to be delivered to the **City**, such Commercial General Liability shall include, or be endorsed to include, Ship Repairer's Legal Liability Coverage to protect against, without limitation, liability arising from navigation of such vessels prior to delivery to and acceptance by the **City**.

22.1.2 Workers' Compensation Insurance, Employers' Liability Insurance, and Disability Benefits Insurance: The **Contractor** shall provide, and shall cause its **Subcontractors** to provide, Workers Compensation Insurance, Employers' Liability Insurance, and Disability Benefits Insurance in accordance with the **Laws** of the State of New York on behalf of all employees providing services under this **Contract** (except for those employees, if any, for which the **Laws** require insurance only pursuant to Article 22.1.3).

22.1.3 United States Longshoremen's and Harbor Workers Act and/or Jones Act Insurance: If specified in Schedule A of the General Conditions or if required by **Law**, the **Contractor** shall provide insurance in accordance with the United States Longshoremen's and Harbor Workers Act and/or the Jones Act, on behalf of all qualifying employees providing services under this **Contract**.

22.1.4 Builders Risk Insurance: If specified in Schedule A of the General Conditions, the **Contractor** shall provide Builders Risk Insurance on a completed value form for the total value of the **Work** through **Substantial Completion** of the **Work** in its entirety. Such insurance shall be provided on an All Risk basis and include coverage, without limitation, for windstorm (including named windstorm), storm surge, flood and earth movement. Unless waived by the **Commissioner**, it shall include coverage for ordinance and law, demolition and increased costs of construction, debris removal, pollutant clean up and removal, and expediting costs. Such insurance shall cover, without limitation, (a) all buildings and/or structures involved in the **Work**, as well as temporary structures at the **Site**, and (b) any property that is intended to become a permanent part of such building or structure, whether such property is on the **Site**, in transit or in temporary storage. Policies shall name the **Contractor** as Named Insured and list the **City** as both an Additional Insured and a Loss Payee as its interest may appear.

22.1.4(a) Policies of such insurance shall specify that, in the event a loss occurs at an occupied facility, occupancy of such facility is permitted without the consent of the issuing insurance company.

22.1.4(b) Such insurance may be provided through an Installation Floater, at the **Contractor's** option, if it otherwise conforms with the requirements of this Article 22.1.4.

22.1.5 Commercial Automobile Liability Insurance: The **Contractor** shall provide Commercial Automobile Liability Insurance for liability arising out of ownership,

maintenance or use of any owned (if any), non-owned and hired vehicles to be used in connection with this **Contract**. Coverage shall be at least as broad as the latest edition of ISO Form CA0001. If vehicles are used for transporting hazardous materials, the Automobile Liability Insurance shall be endorsed to provide pollution liability broadened coverage for covered vehicles (endorsement CA 99 48) as well as proof of MCS 90.

22.1.6 Contractors Pollution Liability Insurance: If specified in Schedule A of the General Conditions, the **Contractor** shall maintain, or cause the **Subcontractor** doing such **Work** to maintain, Contractors Pollution Liability Insurance covering bodily injury and property damage. Such insurance shall provide coverage for actual, alleged or threatened emission, discharge, dispersal, seepage, release or escape of pollutants (including asbestos), including any loss, cost or expense incurred as a result of any cleanup of pollutants (including asbestos) or in the investigation, settlement or defense of any claim, action, or proceedings arising from the operations under this **Contract**. Such insurance shall be in the **Contractor's** name and list the **City** as an Additional Insured and any other entity specified in Schedule A. Coverage shall include, without limitation, (a) loss of use of damaged property or of property that has not been physically injured, (b) transportation, and (c) non-owned disposal sites.

22.1.6(a) Coverage for the **City** as Additional Insured shall specifically include the **City's** officials and employees and be at least as broad as provided to the **Contractor** for this **Project**.

22.1.6(b) If such insurance is written on a claims-made policy, such policy shall have a retroactive date on or before the effective date of this **Contract**, and continuous coverage shall be maintained, or an extended discovery period exercised, for a period of not less than three (3) years from the time the **Work** under this **Contract** is completed.

22.1.7 Marine Insurance:

22.1.7(a) Marine Protection and Indemnity Insurance: If specified in Schedule A of the General Conditions or if the **Contractor** engages in marine operations in the execution of any part of the **Work**, the **Contractor** shall maintain, or cause the **Subcontractor** doing such Work to maintain, Marine Protection and Indemnity Insurance with coverage at least as broad as Form SP-23. The insurance shall provide coverage for the **Contractor** or **Subcontractor** (whichever is doing this **Work**) and for the **City** (together with its officials and employees) and any other entity specified in Schedule A as an Additional Insured for bodily injury and property damage arising from marine operations under this **Contract**. Coverage shall include, without limitation, injury or death of crew members (if not fully provided through other insurance), removal of wreck, damage to piers, wharves and other fixed or floating objects and loss of or damage to any other vessel or craft, or to property on such other vessel or craft.

22.1.7(b) Hull and Machinery Insurance: If specified in Schedule A of the General Conditions or if the **Contractor** engages in marine operations in the execution of any part of the **Work**, the **Contractor** shall maintain, or cause the **Subcontractor** doing such **Work** to maintain, Hull and Machinery Insurance with coverage for the **Contractor** or **Subcontractor** (whichever is doing this Work) and for the **City** (together with its officials and employees) as Additional Insured at least as broad as the latest edition of American Institute Tug Form for all tugs used under this

Contract and Collision Liability at least as broad as the latest edition of American Institute Hull Clauses.

22.1.7(c) Marine Pollution Liability Insurance: If specified in Schedule A of the General Conditions or if the **Contractor** engages in marine operations in the execution of any part of the **Work**, the **Contractor** shall maintain, or cause the **Subcontractor** doing such Work to maintain, Marine Pollution Liability Insurance covering itself (or the Subcontractor doing such Work) as Named Insured and the **City** (together with its officials and employees) and any other entity specified in Schedule A as an Additional Insured. Coverage shall be at least as broad as that provided by the latest edition of Water Quality Insurance Syndicate Form and include, without limitation, liability arising from the discharge or substantial threat of a discharge of oil, or from the release or threatened release of a hazardous substance including injury to, or economic losses resulting from, the destruction of or damage to real property, personal property or natural resources.

22.1.8 The **Contractor** shall provide such other types of insurance, at such minimum limits and with such conditions, as are specified in Schedule A of the General Conditions.

22.2 General Requirements for Insurance Coverage and Policies:

22.2.1 All required insurance policies shall be maintained with companies that may lawfully issue the required policy and have an A.M. Best rating of at least A-/VII or a Standard and Poor's rating of at least A, unless prior written approval is obtained from the **City** Corporation Counsel.

22.2.2 The **Contractor** shall be solely responsible for the payment of all premiums for all required policies and all deductibles and self-insured retentions to which such policies are subject, whether or not the **City** is an insured under the policy.

22.2.3 In his/her sole discretion, the **Commissioner** may, subject to the approval of the **Comptroller** and the **City** Corporation Counsel, accept Letters of Credit and/or custodial accounts in lieu of required insurance.

22.2.4 The **City's** limits of coverage for all types of insurance required pursuant to Schedule A of the General Conditions shall be the greater of (i) the minimum limits set forth in Schedule A or (ii) the limits provided to the **Contractor** as Named Insured under all primary, excess, and umbrella policies of that type of coverage.

22.2.5 The **Contractor** may satisfy its insurance obligations under this Article 22 through primary policies or a combination of primary and excess/umbrella policies, so long as all policies provide the scope of coverage required herein.

22.2.6 Policies of insurance provided pursuant to this Article 22 shall be primary and non-contributing to any insurance or self-insurance maintained by the **City**.

22.3 Proof of Insurance:

22.3.1 For all types of insurance required by Article 22.1 and Schedule A, except for insurance required by Articles 22.1.4 and 22.1.7, the **Contractor** shall file proof of insurance in accordance with this Article 22.3 within ten (10) **Days** of award. For insurance

provided pursuant to Articles 22.1.4 and 22.1.7, proof shall be filed by a date specified by the **Commissioner** or ten (10) **Days** prior to the commencement of the portion of the **Work** covered by such policy, whichever is earlier.

22.3.2 For Workers' Compensation Insurance provided pursuant to Article 22.1.2, the **Contractor** shall submit one of the following forms: C-105.2 Certificate of Workers' Compensation Insurance; U-26.3 - State Insurance Fund Certificate of Workers' Compensation Insurance; Request for WC/DB Exemption (Form CE-200); equivalent or successor forms used by the New York State Workers' Compensation Board; or other proof of insurance in a form acceptable to the **Commissioner**. For Disability Benefits Insurance provided pursuant to Article 22.1.2, the Contractor shall submit DB-120.1 - Certificate Of Insurance Coverage Under The NYS Disability Benefits Law, Request for WC/DB Exemption (Form CE-200); equivalent or successor forms used by the New York State Workers' Compensation Board; or other proof of insurance in a form acceptable to the **Commissioner**. ACORD forms are not acceptable.

22.3.3 For policies provided pursuant to all of Article 22.1 other than Article 22.1.2, the **Contractor** shall submit one or more Certificates of Insurance on forms acceptable to the **Commissioner**. All such Certificates of Insurance shall certify (a) the issuance and effectiveness of such policies of insurance, each with the specified minimum limits (b) for insurance secured pursuant to Article 22.1.1 that the **City** and any other entity specified in Schedule A is an Additional Insured thereunder; (c) in the event insurance is required pursuant to Article 22.1.6 and/or Article 22.1.7, that the City is an Additional Insured thereunder; (d) the company code issued to the insurance company by the National Association of Insurance Commissioners (the NAIC number); and (e) the number assigned to the **Contract** by the **City**. All such Certificates of Insurance shall be accompanied by either a duly executed "Certification by Insurance Broker or Agent" in the form contained in Part III of Schedule A or copies of all policies referenced in such Certificate of Insurance as certified by an authorized representative of the issuing insurance carrier. If any policy is not available at the time of submission, certified binders may be submitted until such time as the policy is available, at which time a certified copy of the policy shall be submitted.

22.3.4 Documentation confirming renewals of insurance shall be submitted to the **Commissioner** prior to the expiration date of coverage of policies required under this **Contract**. Such proofs of insurance shall comply with the requirements of Articles 22.3.2 and 22.3.3.

22.3.5 The **Contractor** shall be obligated to provide the **City** with a copy of any policy of insurance provided pursuant to this Article 22 upon the demand for such policy by the **Commissioner** or the **City** Corporation Counsel.

22.4 Operations of the **Contractor**:

22.4.1 The **Contractor** shall not commence the **Work** unless and until all required certificates have been submitted to and accepted by the **Commissioner**. Acceptance by the **Commissioner** of a certificate does not excuse the **Contractor** from securing insurance consistent with all provisions of this Article 22 or of any liability arising from its failure to do so.

22.4.2 The **Contractor** shall be responsible for providing continuous insurance coverage in the manner, form, and limits required by this **Contract** and shall be authorized to perform **Work** only during the effective period of all required coverage.

22.4.3 In the event that any of the required insurance policies lapse, are revoked, suspended or otherwise terminated, for whatever cause, the **Contractor** shall immediately stop all **Work**, and shall not recommence **Work** until authorized in writing to do so by the **Commissioner**. Upon quitting the **Site**, except as otherwise directed by the **Commissioner**, the **Contractor** shall leave all plant, materials, equipment, tools, and supplies on the **Site**. **Contract** time shall continue to run during such periods and no extensions of time will be granted. The **Commissioner** may also declare the **Contractor** in default for failure to maintain required insurance.

22.4.4 In the event the **Contractor** receives notice, from an insurance company or other person, that any insurance policy required under this Article 22 shall be cancelled or terminated (or has been cancelled or terminated) for any reason, the **Contractor** shall immediately forward a copy of such notice to both the **Commissioner** and the New York City Comptroller, attn: Office of Contract Administration, Municipal Building, One Centre Street, room 1005, New York, New York 10007. Notwithstanding the foregoing, the **Contractor** shall ensure that there is no interruption in any of the insurance coverage required under this Article 22.

22.4.5 Where notice of loss, damage, occurrence, accident, claim or suit is required under an insurance policy maintained in accordance with this Article 22, the **Contractor** shall notify in writing all insurance carriers that issued potentially responsive policies of any such event relating to any operations under this **Contract** (including notice to Commercial General Liability insurance carriers for events relating to the **Contractor**'s own employees) no later than 20 days after such event. For any policy where the **City** is an Additional Insured, such notice shall expressly specify that "this notice is being given on behalf of the City of New York as Insured as well as the Named Insured." Such notice shall also contain the following information: the number of the insurance policy, the name of the named insured, the date and location of the damage, occurrence, or accident, and the identity of the persons or things injured, damaged or lost. The **Contractor** shall simultaneously send a copy of such notice to the City of New York c/o Insurance Claims Specialist, Affirmative Litigation Division, New York City Law Department, 100 Church Street, New York, New York 10007.

22.4.6 In the event of any loss, accident, claim, action, or other event that does or can give rise to a claim under any insurance policy required under this Article 22, the **Contractor** shall at all times fully cooperate with the **City** with regard to such potential or actual claim.

22.5 **Subcontractor** Insurance: In the event the **Contractor** requires any **Subcontractor** to procure insurance with regard to any operations under this **Contract** and requires such **Subcontractor** to name the **Contractor** as an **Additional Insured** thereunder, the **Contractor** shall ensure that the **Subcontractor** name the **City**, including its officials and employees, as an Additional Insured with coverage at least as broad as the most recent edition of ISO Form CG 20 26.

22.6 Wherever reference is made in Article 7 or this Article 22 to documents to be sent to the **Commissioner** (e.g., notices, filings, or submissions), such documents shall be sent to the address set forth in Schedule A of the General Conditions. In the event no address is set forth in Schedule A, such documents are to be sent to the **Commissioner's** address as provided elsewhere in this **Contract**.

22.7 Apart from damages or losses covered by insurance provided pursuant to Articles 22.1.2, 22.1.3, or 22.1.5, the **Contractor** waives all rights against the **City**, including its officials and employees, for any damages or losses that are covered under any insurance required under this Article 22 (whether or

not such insurance is actually procured or claims are paid thereunder) or any other insurance applicable to the operations of the **Contractor** and/or its employees, agents, or **Subcontractors**.

22.8 In the event the **Contractor** utilizes a self-insurance program to satisfy any of the requirements of this Article 22, the **Contractor** shall ensure that any such self-insurance program provides the **City** with all rights that would be provided by traditional insurance under this Article 22, including but not limited to the defense and indemnification obligations that insurers are required to undertake in liability policies.

22.9 Materiality/Non-Waiver: The **Contractor's** failure to secure policies in complete conformity with this Article 22, or to give an insurance company timely notice of any sort required in this **Contract** or to do anything else required by this Article 22 shall constitute a material breach of this **Contract**. Such breach shall not be waived or otherwise excused by any action or inaction by the **City** at any time.

22.10 Pursuant to General Municipal Law Section 108, this **Contract** shall be void and of no effect unless **Contractor** maintains Workers' Compensation Insurance for the term of this **Contract** to the extent required and in compliance with the New York State Workers' Compensation Law.

22.11 Other Remedies: Insurance coverage provided pursuant to this Article 22 or otherwise shall not relieve the **Contractor** of any liability under this **Contract**, nor shall it preclude the **City** from exercising any rights or taking such other actions available to it under any other provisions of this **Contract** or **Law**.

ARTICLE 23. MONEY RETAINED AGAINST CLAIMS

23.1 If any claim shall be made by any person or entity (including **Other Contractors** with the **City** on this **Project**) against the **City** or against the **Contractor** and the **City** for any of the following:

(a) An alleged loss, damage, injury, theft or vandalism of any of the kinds referred to in Articles 7 and 12, plus the reasonable costs of defending the **City**, which in the opinion of the **Comptroller** may not be paid by an insurance company (for any reason whatsoever); or

(b) An infringement of copyrights, patents or use of patented articles, tools, etc., as referred to in Article 57; or

(c) Damage claimed to have been caused directly or indirectly by the failure of the **Contractor** to perform the **Work** in strict accordance with this **Contract,**

the amount of such claim, or so much thereof as the **Comptroller** may deem necessary, may be withheld by the **Comptroller**, as security against such claim, from any money due hereunder. The **Comptroller**, in his/her discretion, may permit the **Contractor** to substitute other satisfactory security in lieu of the monies so withheld.

23.2 If an action on such claim is timely commenced and the liability of the **City**, or the **Contractor**, or both, shall have been established therein by a final judgment of a court of competent jurisdiction, or if such claim shall have been admitted by the **Contractor** to be valid, the **Comptroller** shall pay such judgment or admitted claim out of the monies retained by the **Comptroller** under the provisions of this Article 23, and return the balance, if any, without interest, to the **Contractor**.

ARTICLE 24. MAINTENANCE AND GUARANTY

24.1 The **Contractor** shall promptly repair, replace, restore or rebuild, as the **Commissioner** may determine, any finished **Work** in which defects of materials or workmanship may appear or to which damage may occur because of such defects, during the one (1) year period subsequent to the date of **Substantial Completion** (or use and occupancy in accordance with Article 16), except where other periods of maintenance and guaranty are provided for in Schedule A.

24.2 As security for the faithful performance of its obligations hereunder, the **Contractor**, upon filing its requisition for payment on **Substantial Completion**, shall deposit with the **Commissioner** a sum equal to one (1%) percent of the price (or the amount fixed in Schedule A of the General Conditions) in cash or certified check upon a state or national bank and trust company or a check of such bank and trust company signed by a duly authorized officer thereof and drawn to the order of the **Comptroller**, or obligations of the **City**, which the **Comptroller** may approve as of equal value with the sum so required.

24.3 In lieu of the above, the **Contractor** may make such security payment to the **City** by authorizing the **Commissioner** in writing to deduct the amount from the **Substantial Completion** payment which shall be deemed the deposit required above.

24.4 If the **Contractor** has faithfully performed all of its obligations hereunder the **Commissioner** shall so certify to the **Comptroller** within five (5) **Days** after the expiration of one (1) year from the date of **Substantial Completion** and acceptance of the **Work** or within thirty (30) **Days** after the expiration of the guarantee period fixed in the **Specifications**. The security payment shall be repaid to the **Contractor** without interest within thirty (30) **Days** after certification by the **Commissioner** to the **Comptroller** that the **Contractor** has faithfully performed all of its obligations hereunder.

24.5 Notice by the **Commissioner** to the **Contractor** to repair, replace, rebuild or restore such defective or damaged **Work** shall be timely, pursuant to this article, if given not later than ten (10) **Days** subsequent to the expiration of the one (1) year period or other periods provided for herein.

24.6 If the **Contractor** shall fail to repair, replace, rebuild or restore such defective or damaged **Work** promptly after receiving such notice, the **Commissioner** shall have the right to have the **Work** done by others in the same manner as provided for in the completion of a defaulted **Contract**, under Article 51.

24.7 If the security payment so deposited is insufficient to cover the cost of such **Work**, the **Contractor** shall be liable to pay such deficiency on demand by the **Commissioner**.

24.8 The **Engineer's** certificate setting forth the fair and reasonable cost of repairing, replacing, rebuilding or restoring any damaged or defective **Work** when performed by one other than the **Contractor**, shall be binding and conclusive upon the **Contractor** as to the amount thereof.

24.9 The **Contractor** shall obtain all manufacturers' warranties and guaranties of all equipment and materials required by this **Contract** in the name of the **City** and shall deliver same to the **Commissioner**. All of the **City's** rights and title and interest in and to said manufacturers' warranties and guaranties may be assigned by the **City** to any subsequent purchasers of such equipment and materials or lessees of the premises into which the equipment and materials have been installed.

CHAPTER VI: CHANGES, EXTRA WORK, AND DOCUMENTATION OF CLAIM

ARTICLE 25. CHANGES

25.1 Changes may be made to this **Contract** only as duly authorized in writing by the **Commissioner** in accordance with the **Law** and this **Contract**. All such changes, modifications, and amendments will become a part of the **Contract**. **Work** so ordered shall be performed by the **Contractor**.

25.2 **Contract** changes will be made only for **Work** necessary to complete the **Work** included in the original scope of the **Contract** and/or for non-material changes to the scope of the **Contract**. Changes are not permitted for any material alteration in the scope of **Work** in the **Contract**.

25.3 The **Contractor** shall be entitled to a price adjustment for **Extra Work** performed pursuant to a written change order. Adjustments to price shall be computed in one or more of the following ways:

25.3.1 By applicable unit prices specified in the **Contract**; and/or

25.3.2 By agreement of a fixed price; and/or

25.3.3 By time and material records; and/or

25.3.4 In any other manner approved by the **CCPO**.

25.4 All payments for change orders are subject to pre-audit by the **Engineering Audit Officer** and may be post-audited by the **Comptroller** and/or the **Agency**.

ARTICLE 26. METHODS OF PAYMENT FOR OVERRUNS AND EXTRA WORK

26.1 Overrun of Unit Price Item: An overrun is any quantity of a unit price item which the **Contractor** is directed to provide which is in excess of one hundred twenty-five (125%) percent of the estimated quantity for that item set forth in the bid schedule.

26.1.1For any unit price item, the **Contractor** will be paid at the unit price bid for any quantity up to one hundred twenty-five (125%) percent of the estimated quantity for that item set forth in the bid schedule. If during the progress of the **Work**, the actual quantity of any unit price item required to complete the **Work** approaches the estimated quantity for that item, and for any reason it appears that the actual quantity of any unit price item necessary to complete the **Work** will exceed the estimated quantity for that item by twenty-five (25%) percent, the **Contractor** shall immediately notify the **Engineer** of such anticipated overrun. The **Contractor** shall not be compensated for any quantity of a unit price item provided which is in excess of one hundred twenty-five (125%) percent of the estimated quantity for that item set forth in the bid schedule without written authorization from the **Engineer**.

26.1.2 If the actual quantity of any unit price item necessary to complete the **Work** will exceed one hundred twenty five (125%) percent of the estimated quantity for that item set forth in the bid schedule, the **City** reserves the right and the **Contractor** agrees to negotiate a new unit price for such item. In no event shall such negotiated new unit price exceed the unit bid price. If the **City** and **Contractor** cannot agree on a new unit price, then the **City** shall order the **Contractor** and the **Contractor** agrees to provide additional quantities of

the item on the basis of time and material records for the actual and reasonable cost as determined under Article 26.2, but in no event at a unit price exceeding the unit price bid.

26.2 **Extra Work:** For **Extra Work** where payment is by agreement on a fixed price in accordance with Article 25.3.2, the price to be paid for such **Extra Work** shall be based on the fair and reasonable estimated cost of the items set forth below. For **Extra Work** where payment is based on time and material records in accordance with Article 25.3.3, the price to be paid for such **Extra Work** shall be the actual and reasonable cost of the items set forth below, calculated in accordance with the formula specified therein, if any.

26.2.1 Necessary materials (including transportation to the **Site**); plus

26.2.2 Necessary direct labor, including payroll taxes (subject to statutory wage caps) and supplemental benefits; plus

26.2.3 Sales and personal property taxes, if any, required to be paid on materials not incorporated into such **Extra Work**; plus

26.2.4 Reasonable rental value of **Contractor**-owned (or **Subcontractor**-owned, as applicable), necessary plant and equipment other than **Small Tools**, plus fuel/energy costs. Except for fuel costs for pick-up trucks which shall be reimbursed based on a consumption of five (5) gallons per shift, fuel costs shall be reimbursed based on actual costs or, in the absence of auditable documentation, the following fuel consumption formula per operating hour: (.035) x (HP rating) x (Fuel cost/gallon). Reasonable rental value is defined as the lower of either seventy-five percent of the monthly prorated rental rates established in "The AED Green Book, Rental Rates and Specifications for Construction Equipment" published by Equipment Watch (the "Green Book"), or seventy-five percent of the monthly prorated rental rates established in the "Rental Rate Blue Book for Construction Equipment" published by Equipment Watch (the "Blue Book") (the applicable Blue Book rate being for rental only without the addition of any operational costs listed in the Blue Book). The reasonable rental value is deemed to be inclusive of all operating costs except for fuel/energy consumption and equipment operator's wages/costs. For multiple shift utilization, reimbursement shall be calculated as follows: first shift shall be seventy-five (75%) percent of such rental rates; second shift shall be sixty (60%) percent of the first shift rate; and third shift shall be forty (40%) percent of the first shift rate. Equipment on standby shall be reimbursed at one-third (1/3) the prorated monthly rental rate. **Contractor**-owned (or **Subcontractor**-owned, as applicable) equipment includes equipment from rental companies affiliated with or controlled by the **Contractor** (or **Subcontractor**, as applicable), as determined by the **Commissioner**. In establishing cost reimbursement for non-operating **Contractor**-owned (or **Subcontractor**-owned, as applicable) equipment (scaffolding, sheeting systems, road plates, etc.), the **City** may restrict reimbursement to a purchase-salvage/life cycle basis if less than the computed rental costs; plus

26.2.5 Necessary installation and dismantling of such plant and equipment, including transportation to and from the **Site**, if any, provided that, in the case of non-**Contractor**-owned (or non-**Subcontractor**-owned, as applicable) equipment rented from a third party, the cost of installation and dismantling are not allowable if such costs are included in the rental rate; plus

26.2.6 Necessary fees charged by governmental entities; plus

26.2.7 Necessary construction-related service fees charged by non-governmental entities, such as landfill tipping fees; plus

26.2.8 Reasonable rental costs of non-**Contractor**-owned (or non-**Subcontractor**-owned, as applicable) necessary plant and equipment other than **Small Tools**, plus fuel/energy costs. Except for fuel costs for pick-up trucks which shall be reimbursed based on a consumption of five (5) gallons per shift, fuel costs shall be reimbursed based on actual costs or, in the absence of auditable documentation, the following fuel consumption formula per hour of operation: (.035) x (HP rating) x (Fuel cost/gallon). In lieu of renting, the **City** reserves the right to direct the purchase of non-operating equipment (scaffolding, sheeting systems, road plates, etc.), with payment on a purchase-salvage/life cycle basis, if less than the projected rental costs; plus

26.2.9 Workers' Compensation Insurance, and any insurance coverage expressly required by the **City** for the performance of the **Extra Work** which is different than the types of insurance required by Article 22 and Schedule A of the General Conditions. The cost of Workers' Compensation Insurance is subject to applicable payroll limitation caps and shall be based upon the carrier's Manual Rate for such insurance derived from the applicable class Loss Cost ("LC") and carrier's Lost Cost Multiplier ("LCM") approved by the New York State Department of Financial Services, and with the exception of experience rating; rate modifiers as promulgated by the New York Compensation Insurance Rating Board ("NYCIRB"); plus

26.2.10 Additional costs incurred as a result of the **Extra Work** for performance and payment bonds; plus

26.2.11 Twelve percent (12%) percent of the total of items in Articles 26.2.1 through 26.2.5 as compensation for overhead, except that no percentage for overhead will be allowed on **Payroll Taxes** or on the premium portion of overtime pay or on sales and personal property taxes. Overhead shall include without limitation, all costs and expenses in connection with administration, management superintendence, small tools, and insurance required by Schedule A of the General Conditions other than Workers' Compensation Insurance; plus

26.2.12 Ten (10%) percent of the total of items in Articles 26.2.1 through 26.2.5, plus the items in Article 26.2.11, as compensation for profit, except that no percentage for profit will be allowed on **Payroll Taxes** or on the premium portion of overtime pay or on sales and personal property taxes; plus

26.2.13 Five (5%) percent of the total of items in Articles 26.2.6 through 26.2.10 as compensation for overhead and profit.

26.3 Where the **Extra Work** is performed in whole or in part by other than the **Contractor's** own forces pursuant to Article 26.2, the **Contractor** shall be paid, subject to pre-audit by the **Engineering Audit Officer**, the cost of such **Work** computed in accordance with Article 26.2 above, plus an additional allowance of five (5%) percent to cover the **Contractor's** overhead and profit.

26.4 Where a change is ordered, involving both **Extra Work** and omitted or reduced **Contract Work,** the **Contract** price shall be adjusted, subject to pre-audit by the **EAO**, in an amount based on the difference between the cost of such **Extra Work** and of the omitted or reduced **Work.**

26.5 Where the **Contractor** and the **Commissioner** can agree upon a fixed price for **Extra Work** in accordance with Article 25.3.2 or another method of payment for **Extra Work** in accordance with

Article 25.3.4, or for **Extra Work** ordered in connection with omitted **Work**, such method, subject to pre-audit by the **EAO**, may, at the option of the **Commissioner**, be substituted for the cost plus a percentage method provided in Article 26.2; provided, however, that if the **Extra Work** is performed by a **Subcontractor**, the **Contractor** shall not be entitled to receive more than an additional allowance of five (5%) percent for overhead and profit over the cost of such **Subcontractor's Work** as computed in accordance with Article 26.2.

ARTICLE 27. RESOLUTION OF DISPUTES

27.1 All disputes between the **City** and the **Contractor** of the kind delineated in this Article 27.1 that arise under, or by virtue of, this **Contract** shall be finally resolved in accordance with the provisions of this Article 27 and the **PPB** Rules. This procedure for resolving all disputes of the kind delineated herein shall be the exclusive means of resolving any such disputes.

27.1.1 This Article 27 shall not apply to disputes concerning matters dealt with in other sections of the **PPB** Rules, or to disputes involving patents, copyrights, trademarks, or trade secrets (as interpreted by the courts of New York State) relating to proprietary rights in computer software.

27.1.2 This Article 27 shall apply only to disputes about the scope of **Work** delineated by the **Contract**, the interpretation of **Contract** documents, the amount to be paid for **Extra Work** or disputed work performed in connection with the **Contract**, the conformity of the **Contractor's Work** to the **Contract**, and the acceptability and quality of the **Contractor's Work**; such disputes arise when the **Engineer**, **Resident Engineer**, **Engineering Audit Officer**, or other designee of the **Commissioner** makes a determination with which the **Contractor** disagrees.

27.2 All determinations required by this Article 27 shall be made in writing clearly stated, with a reasoned explanation for the determination based on the information and evidence presented to the party making the determination. Failure to make such determination within the time required by this Article 27 shall be deemed a non-determination without prejudice that will allow application to the next level.

27.3 During such time as any dispute is being presented, heard, and considered pursuant to this Article 27, the **Contract** terms shall remain in force and the **Contractor** shall continue to perform **Work** as directed by the **ACCO** or the **Engineer**. Failure of the **Contractor** to continue **Work** as directed shall constitute a waiver by the **Contractor** of its claim.

27.4 Presentation of Disputes to **Commissioner**.

Notice of Dispute and Agency Response. The **Contractor** shall present its dispute in writing ("Notice of Dispute") to the **Commissioner** within thirty (30) Days of receiving written notice of the determination or action that is the subject of the dispute. This notice requirement shall not be read to replace any other notice requirements contained in the **Contract**. The Notice of Dispute shall include all the facts, evidence, documents, or other basis upon which the **Contractor** relies in support of its position, as well as a detailed computation demonstrating how any amount of money claimed by the **Contractor** in the dispute was arrived at. Within thirty (30) Days after receipt of the detailed written submission comprising the complete Notice of Dispute, the **Engineer**, **Resident Engineer**, **Engineering Audit Officer**, or other designee of the **Commissioner** shall submit to the **Commissioner** all materials he or she deems pertinent to the dispute. Following initial submissions to the **Commissioner**, either party may demand of the other the production of any document or other material the demanding party believes may be relevant to the dispute. The requested party shall produce all relevant materials that are not otherwise

protected by a legal privilege recognized by the courts of New York State. Any question of relevancy shall be determined by the **Commissioner** whose decision shall be final. Willful failure of the **Contractor** to produce any requested material whose relevancy the **Contractor** has not disputed, or whose relevancy has been affirmatively determined, shall constitute a waiver by the **Contractor** of its claim.

27.4.1 **Commissioner** Inquiry. The **Commissioner** shall examine the material and may, in his or her discretion, convene an informal conference with the **Contractor**, the **ACCO**, and the **Engineer**, **Resident Engineer**, **Engineering Audit Officer**, or other designee of the **Commissioner** to resolve the issue by mutual consent prior to reaching a determination. The **Commissioner** may seek such technical or other expertise as he or she shall deem appropriate, including the use of neutral mediators, and require any such additional material from either or both parties as he or she deems fit. The **Commissioner's** ability to render, and the effect of, a decision hereunder shall not be impaired by any negotiations in connection with the dispute presented, whether or not the **Commissioner** participated therein. The **Commissioner** may or, at the request of any party to the dispute, shall compel the participation of any **Other Contractor** with a contract related to the **Work** of this **Contract**, and that **Contractor** shall be bound by the decision of the **Commissioner**. Any **Other Contractor** thus brought into the dispute resolution proceeding shall have the same rights and obligations under this Article 27 as the **Contractor** initiating the dispute.

27.4.2 **Commissioner** Determination. Within thirty (30) **Days** after the receipt of all materials and information, or such longer time as may be agreed to by the parties, the **Commissioner** shall make his or her determination and shall deliver or send a copy of such determination to the **Contractor**, the **ACCO,** and **Engineer**, **Resident Engineer**, **Engineering Audit Officer**, or other designee of the **Commissioner**, as applicable, together with a statement concerning how the decision may be appealed.

27.4.3 Finality of **Commissioner's** Decision. The **Commissioner's** decision shall be final and binding on all parties, unless presented to the Contract Dispute Resolution Board pursuant to this Article 27. The **City** may not take a petition to the Contract Dispute Resolution Board. However, should the **Contractor** take such a petition, the **City** may seek, and the Contract Dispute Resolution Board may render, a determination less favorable to the **Contractor** and more favorable to the **City** than the decision of the **Commissioner**.

27.5 Presentation of Dispute to the **Comptroller**. Before any dispute may be brought by the **Contractor** to the Contract Dispute Resolution Board, the **Contractor** must first present its claim to the **Comptroller** for his or her review, investigation, and possible adjustment.

27.5.1 Time, Form, and Content of Notice. Within thirty (30) **Days** of its receipt of a decision by the **Commissioner,** the **Contractor** shall submit to the **Comptroller** and to the **Commissioner** a Notice of Claim regarding its dispute with the **Agency**. The Notice of Claim shall consist of (i) a brief written statement of the substance of the dispute, the amount of money, if any, claimed and the reason(s) the **Contractor** contends the dispute was wrongly decided by the **Commissioner**; (ii) a copy of the written decision of the **Commissioner**; and (iii) a copy of all materials submitted by the **Contractor** to the **Agency**, including the Notice of Dispute. The **Contractor** may not present to the **Comptroller** any material not presented to the **Commissioner**, except at the request of the **Comptroller**.

27.5.2 Response. Within thirty (30) **Days** of receipt of the Notice of Claim, the **Agency** shall make available to the **Comptroller** a copy of all material submitted by the **Agency** to the **Commissioner** in connection with the dispute. The **Agency** may not present to the **Comptroller** any material not presented to the **Commissioner** except at the request of the **Comptroller**.

27.5.3 **Comptroller** Investigation. The **Comptroller** may investigate the claim in dispute and, in the course of such investigation, may exercise all powers provided in Sections 7-201 and 7-203 of the Administrative Code. In addition, the **Comptroller** may demand of either party, and such party shall provide, whatever additional material the **Comptroller** deems pertinent to the claim, including original business records of the **Contractor**. Willful failure of the **Contractor** to produce within fifteen (15) **Days** any material requested by the **Comptroller** shall constitute a waiver by the **Contractor** of its claim. The **Comptroller** may also schedule an informal conference to be attended by the **Contractor**, **Agency** representatives, and any other personnel desired by the **Comptroller**.

27.5.4 Opportunity of **Comptroller** to Compromise or Adjust Claim. The **Comptroller** shall have forty-five (45) **Days** from his or her receipt of all materials referred to in Article 27.5.3 to investigate the disputed claim. The period for investigation and compromise may be further extended by agreement between the **Contractor** and the **Comptroller**, to a maximum of ninety (90) **Days** from the **Comptroller's** receipt of all materials. The **Contractor** may not present its petition to the Contract Dispute Resolution Board until the period for investigation and compromise delineated in this Article 27.5.4 has expired. In compromising or adjusting any claim hereunder, the **Comptroller** may not revise or disregard the terms of the **Contract** between the parties.

27.6 Contract Dispute Resolution Board. There shall be a Contract Dispute Resolution Board composed of:

27.6.1 The chief administrative law judge of the Office of Administrative Trials and Hearings (OATH) or his/her designated OATH administrative law judge, who shall act as chairperson, and may adopt operational procedures and issue such orders consistent with this Article 27 as may be necessary in the execution of the Contract Dispute Resolution Board's functions, including, but not limited to, granting extensions of time to present or respond to submissions;

27.6.2 The **CCPO** or his/her designee; any designee shall have the requisite background to consider and resolve the merits of the dispute and shall not have participated personally and substantially in the particular matter that is the subject of the dispute or report to anyone who so participated; and

27.6.3 A person with appropriate expertise who is not an employee of the **City**. This person shall be selected by the presiding administrative law judge from a prequalified panel of individuals, established and administered by OATH with appropriate background to act as decision-makers in a dispute. Such individual may not have a contract or dispute with the **City** or be an officer or employee of any company or organization that does, or regularly represents persons, companies, or organizations having disputes with the **City**.

27.7 Petition to the Contract Dispute Resolution Board. In the event the claim has not been settled or adjusted by the **Comptroller** within the period provided in this Article 27, the **Contractor**,

within thirty (30) **Days** thereafter, may petition the Contract Dispute Resolution Board to review the **Commissioner's** determination.

27.7.1 Form and Content of Petition by **Contractor**. The **Contractor** shall present its dispute to the Contract Dispute Resolution Board in the form of a petition, which shall include (i) a brief written statement of the substance of the dispute, the amount of money, if any, claimed, and the reason(s) the **Contractor** contends the dispute was wrongly decided by the **Commissioner**; (ii) a copy of the written Decision of the **Commissioner,** (iii) copies of all materials submitted by the **Contractor** to the Agency; (iv) a copy of the written decision of the **Comptroller**, if any, and (v) copies of all correspondence with, or written material submitted by the **Contractor**, to the **Comptroller**. The **Contractor** shall concurrently submit four (4) complete sets of the Petition: one set to the **City** Corporation Counsel (Attn: Commercial and Real Estate Litigation Division) and three (3) sets to the Contract Dispute Resolution Board at OATH's offices with proof of service on the **City** Corporation Counsel. In addition, the **Contractor** shall submit a copy of the written statement of the substance of the dispute, cited in (i) above, to both the **Commissioner** and the **Comptroller**.

27.7.2 **Agency** Response. Within thirty (30) **Days** of its receipt of the Petition by the **City** Corporation Counsel, the **Agency** shall respond to the brief written statement of the **Contractor** and make available to the Contract Dispute Resolution Board all material it submitted to the **Commissioner** and **Comptroller**. Three (3) complete copies of the **Agency** response shall be provided to the Contract Dispute Resolution Board and one to the **Contractor**. Extensions of time for submittal of the **Agency** response shall be given as necessary upon a showing of good cause or, upon consent of the parties, for an initial period of up to thirty (30) Days.

27.7.3 Further Proceedings. The Contract Dispute Resolution Board shall permit the **Contractor** to present its case by submission of memoranda, briefs, and oral argument. The Contract Dispute Resolution Board shall also permit the **Agency** to present its case in response to the **Contractor** by submission of memoranda, briefs, and oral argument. If requested by the **City** Corporation Counsel, the **Comptroller** shall provide reasonable assistance in the preparation of the **Agency's** case. Neither the **Contractor** nor the **Agency** may support its case with any documentation or other material that was not considered by the **Comptroller**, unless requested by the Contract Dispute Resolution Board. The Contract Dispute Resolution Board, in its discretion, may seek such technical or other expert advice as it shall deem appropriate and may seek, on its own or upon application of a party, any such additional material from any party as it deems fit. The Contract Dispute Resolution Board, in its discretion, may combine more than one dispute between the parties for concurrent resolution.

27.7.4 Contract Dispute Resolution Board Determination. Within forty-five (45) **Days** of the conclusion of all written submissions and oral arguments, the Contract Dispute Resolution Board shall render a written decision resolving the dispute. In an unusually complex case, the Contract Dispute Resolution Board may render its decision in a longer period, not to exceed ninety (90) **Days**, and shall so advise the parties at the commencement of this period. The Contract Dispute Resolution Board's decision must be consistent with the terms of the **Contract**. Decisions of the Contract Dispute Resolution Board shall only resolve matters before the Contract Dispute Resolution Board and shall not have precedential effect with respect to matters not before the Contract Dispute Resolution Board.

27.7.5 Notification of Contract Dispute Resolution Board Decision. The Contract Dispute Resolution Board shall send a copy of its decision to the **Contractor**, the **ACCO**, the Engineer, the **Comptroller**, the **City** Corporation Counsel, the CCPO, and the **PPB**. A decision in favor of the **Contractor** shall be subject to the prompt payment provisions of the **PPB** Rules. The Required Payment Date shall be thirty (30) Days after the date the parties are formally notified of the Contract Dispute Resolution Board's decision.

27.7.6 Finality of Contract Dispute Resolution Board Decision. The Contract Dispute Resolution Board's decision shall be final and binding on all parties. Any party may seek review of the Contract Dispute Resolution Board's decision solely in the form of a challenge, filed within four (4) months of the date of the Contract Dispute Resolution Board's decision, in a court of competent jurisdiction of the State of New York, County of New York pursuant to Article 78 of the Civil Practice Law and Rules. Such review by the court shall be limited to the question of whether or not the Contract Dispute Resolution Board's decision was made in violation of lawful procedure, was affected by an error of **Law**, or was arbitrary and capricious or an abuse of discretion. No evidence or information shall be introduced or relied upon in such proceeding that was not presented to the Contract Dispute Resolution Board in accordance with this Article 27.

27.8 Any termination, cancellation, or alleged breach of the **Contract** prior to or during the pendency of any proceedings pursuant to this Article 27 shall not affect or impair the ability of the **Commissioner** or Contract Dispute Resolution Board to make a binding and final decision pursuant to this Article 27.

ARTICLE 28. RECORD KEEPING FOR EXTRA OR DISPUTED WORK OR WORK ON A TIME & MATERIALS BASIS

28.1 While the **Contractor** or any of its **Subcontractors** is performing **Work** on a time and material basis or **Extra Work** on a time and material basis ordered by the **Commissioner** under Article 25, or where the **Contractor** believes that it or any of its **Subcontractors** is performing **Extra Work** but a final determination by **Agency** has not been made, or the **Contractor** or any of its **Subcontractors** is performing disputed **Work** (whether on or off the **Site**), or complying with a determination or order under protest in accordance with Articles 11, 27, and 30, in each such case the **Contractor** shall furnish the **Resident Engineer** daily with three (3) copies of written statements signed by the **Contractor's** representative at the **Site** showing:

28.1.1 The name, trade, and number of each worker employed on such **Work** or engaged in complying with such determination or order, the number of hours employed, and the character of the **Work** each is doing; and

28.1.2 The nature and quantity of any materials, plant and equipment furnished or used in connection with the performance of such **Work** or compliance with such determination or order, and from whom purchased or rented.

28.2 A copy of such statement will be countersigned by the **Resident Engineer**, noting thereon any items not agreed to or questioned, and will be returned to the **Contractor** within two (2) **Days** after submission.

28.3 The **Contractor** and its **Subcontractors**, when required by the **Commissioner**, or the **Comptroller**, shall also produce for inspection, at the office of the **Contractor** or **Subcontractor**, any and all of its books, bid documents, financial statements, vouchers, records, daily job diaries and reports,

and cancelled checks, and any other documents relating to showing the nature and quantity of the labor, materials, plant and equipment actually used in the performance of such **Work**, or in complying with such determination or order, and the amounts expended therefor, and shall permit the **Commissioner** and the **Comptroller** to make such extracts therefrom, or copies thereof, as they or either of them may desire.

28.4 In connection with the examination provided for herein, the **Commissioner**, upon demand therefor, will produce for inspection by the **Contractor** such records as the **Agency** may have with respect to such **Extra Work** or disputed **Work** performed under protest pursuant to order of the **Commissioner**, except those records and reports which may have been prepared for the purpose of determining the accuracy and validity of the **Contractor's** claim.

28.5 Failure to comply strictly with these requirements shall constitute a waiver of any claim for extra compensation or damages on account of the performance of such **Work** or compliance with such determination or order.

ARTICLE 29. OMITTED WORK

29.1 If any **Contract Work** in a lump sum **Contract**, or if any part of a lump sum item in a unit price, lump sum, or percentage-bid **Contract** is omitted by the **Commissioner** pursuant to Article 33, the **Contract** price, subject to audit by the EAO, shall be reduced by a pro rata portion of the lump sum bid amount based upon the percent of **Work** omitted subject to Article 29.4. For the purpose of determining the pro rata portion of the lump sum bid amount, the bid breakdown submitted in accordance with Article 41 shall be considered, but shall not be the determining factor.

29.2 If the whole of a lump sum item or units of any other item is so omitted by the **Commissioner** in a unit price, lump sum, or percentage-bid **Contract**, then no payment will be made therefor except as provided in Article 29.4.

29.3 For units that have been ordered but are only partially completed, the unit price shall be reduced by a pro rata portion of the unit price bid based upon the percentage of **Work** omitted subject to Article 29.4.

29.4 In the event the **Contractor**, with respect to any omitted **Work**, has purchased any non-cancelable material and/or equipment that is not capable of use except in the performance of this **Contract** and has been specifically fabricated for the sole purpose of this **Contract**, but not yet incorporated into the **Work**, the **Contractor** shall be paid for such material and/or equipment in accordance with Article 64.2.1(b); provided, however, such payment is contingent upon the **Contractor's** delivery of such material and/or equipment in acceptable condition to a location designated by the **City**.

29.5 The **Contractor** agrees to make no claim for damages or for loss of overhead and profit with regard to any omitted **Work**.

ARTICLE 30. NOTICE AND DOCUMENTATION OF COSTS AND DAMAGES; PRODUCTION OF FINANCIAL RECORDS

30.1 If the **Contractor** shall claim to be sustaining damages by reason of any act or omission of the **City** or its agents, it shall submit to the **Commissioner** within forty-five (45) **Days** from the time such damages are first incurred, and every thirty (30) **Days** thereafter to the extent additional damages are being incurred for the same condition, verified statements of the details and the amounts of such

damages, together with documentary evidence of such damages. The **Contractor** may submit any of the above statements within such additional time as may be granted by the **Commissioner** in writing upon written request therefor. Failure of the **Commissioner** to respond in writing to a written request for additional time within thirty (30) **Days** shall be deemed a denial of the request. On failure of the **Contractor** to strictly comply with the foregoing provisions, such claims shall be deemed waived and no right to recover on such claims shall exist. Damages that the **Contractor** may claim in any action or dispute resolution procedure arising under or by reason of this **Contract** shall not be different from or in excess of the statements and documentation made pursuant to this Article 30. This Article 30.1 does not apply to claims submitted to the **Commissioner** pursuant to Article 11 or to claims disputing a determination under Article 27.

30.2 In addition to the foregoing statements, the **Contractor** shall, upon notice from the **Commissioner**, produce for examination at the **Contractor's** office, by the **Engineer**, **Architect** or **Project Manager**, all of its books of account, bills, invoices, payrolls, subcontracts, time books, daily reports, bank deposit books, bank statements, check books, and cancelled checks, showing all of its acts and transactions in connection with or relating to or arising by reason of this **Contract**, and submit itself and persons in its employment, for examination under oath by any person designated by the **Commissioner** or **Comptroller** to investigate claims made or disputes against the **City** under this **Contract**. At such examination, a duly authorized representative of the **Contractor** may be present.

30.3 In addition to the statements required under Article 28 and this Article 30, the **Contractor** and/or its **Subcontractor** shall, within thirty (30) **Days** upon notice from the **Commissioner** or **Comptroller**, produce for examination at the **Contractor's** and/or **Subcontractor's** office, by a representative of either the **Commissioner** or **Comptroller**, all of its books of account, bid documents, financial statements, accountant workpapers, bills, invoices, payrolls, subcontracts, time books, daily reports, bank deposit books, bank statements, check books, and cancelled checks, showing all of its acts and transactions in connection with or relating to or arising by reason of this **Contract**. Further, the **Contractor** and/or its **Subcontractor** shall submit any person in its employment, for examination under oath by any person designated by the **Commissioner** or **Comptroller** to investigate claims made or disputes against the **City** under this **Contract**. At such examination, a duly authorized representative of the **Contractor** may be present.

30.4 Unless the information and examination required under Article 30.3 is provided by the **Contractor** and/or its **Subcontractor** upon thirty (30) **Days'** notice from the **Commissioner** or **Comptroller**, or upon the **Commissioner's** or **Comptroller's** written authorization to extend the time to comply, the **City** shall be released from all claims arising under, relating to or by reason of this **Contract**, except for sums certified by the **Commissioner** to be due under the provisions of this **Contract**. It is further stipulated and agreed that no person has the power to waive any of the foregoing provisions and that in any action or dispute resolution procedure against the **City** to recover any sum in excess of the sums certified by the **Commissioner** to be due under or by reason of this **Contract**, the **Contractor** must allege in its complaint and prove, at trial or during such dispute resolution procedure, compliance with the provisions of this Article 30.

30.5 In addition, after the commencement of any action or dispute resolution procedure by the **Contractor** arising under or by reason of this **Contract**, the **City** shall have the right to require the **Contractor** to produce for examination under oath, up until the trial of the action or hearing before the Contract Dispute Resolution Board, the books and documents described in Article 30.3 and submit itself and all persons in its employ for examination under oath. If this Article 30 is not complied with as required, then the **Contractor** hereby consents to the dismissal of the action or dispute resolution procedure.

CHAPTER VII: POWERS OF THE RESIDENT ENGINEER,THE ENGINEER OR ARCHITECT AND THE COMMISSIONER

ARTICLE 31. THE RESIDENT ENGINEER

31.1 The **Resident Engineer** shall have the power to inspect, supervise, and control the performance of the **Work**, subject to review by the **Commissioner**. The **Resident Engineer** shall not, however, have the power to issue an **Extra Work** order, except as specifically designated in writing by the **Commissioner**.

ARTICLE 32. THE ENGINEER OR ARCHITECT OR PROJECT MANAGER

32.1 The **Engineer** or **Architect** or **Project Manager**, in addition to those matters elsewhere herein delegated to the **Engineer** and expressly made subject to his/her determination, direction or approval, shall have the power, subject to review by the **Commissioner**:

32.1.1 To determine the amount, quality, and location of the **Work** to be paid for hereunder; and

32.1.2 To determine all questions in relation to the **Work**, to interpret the **Contract Drawings**, **Specifications**, and **Addenda**, and to resolve all patent inconsistencies or ambiguities therein; and

32.1.3 To determine how the **Work** of this **Contract** shall be coordinated with **Work** of **Other Contractors** engaged simultaneously on this **Project**, including the power to suspend any part of the **Work**, but not the whole thereof; and

32.1.4 To make minor changes in the **Work** as he/she deems necessary, provided such changes do not result in a net change in the cost to the **City** or to the **Contractor** of the **Work** to be done under the **Contract**; and

32.1.5 To amplify the **Contract Drawings**, add explanatory information and furnish additional **Specifications** and drawings, consistent with this **Contract**.

32.2 The foregoing enumeration shall not imply any limitation upon the power of the **Engineer** or **Architect** or **Project Manager**, for it is the intent of this **Contract** that all of the **Work** shall generally be subject to his/her determination, direction, and approval, except where the determination, direction or approval of someone other than the **Engineer** or **Architect** or **Project Manager** is expressly called for herein.

32.3 The **Engineer** or **Architect** or **Project Manager** shall not, however, have the power to issue an **Extra Work** order, except as specifically designated in writing by the **Commissioner**.

ARTICLE 33. THE COMMISSIONER

33.1 The **Commissioner**, in addition to those matters elsewhere herein expressly made subject to his/her determination, direction or approval, shall have the power:

33.1.1 To review and make determinations on any and all questions in relation to this **Contract** and its performance; and

33.1.2 To modify or change this **Contract** so as to require the performance of **Extra Work** (subject, however, to the limitations specified in Article 25) or the omission of **Contract Work**; and

33.1.3 To suspend the whole or any part of the **Work** whenever in his/her judgment such suspension is required:

33.1.3(a) In the interest of the **City** generally; or

33.1.3(b) To coordinate the **Work** of the various contractors engaged on this **Project** pursuant to the provisions of Article 12; or

33.1.3(c) To expedite the completion of the entire **Project** even though the completion of this particular **Contract** may thereby be delayed.

ARTICLE 34. NO ESTOPPEL

34.1 Neither the **City** nor any **Agency**, official, agent or employee thereof, shall be bound, precluded or estopped by any determination, decision, approval, order, letter, payment or certificate made or given under or in connection with this **Contract** by the **City**, the **Commissioner**, the **Engineer**, the **Resident Engineer**, or any other official, agent or employee of the **City**, either before or after the final completion and acceptance of the **Work** and payment therefor:

34.1.1 From showing the true and correct classification, amount, quality or character of the **Work** actually done; or that any such determination, decision, order, letter, payment or certificate was untrue, incorrect or improperly made in any particular, or that the **Work**, or any part thereof, does not in fact conform to the requirements of this **Contract**; and

34.1.2 From demanding and recovering from the **Contractor** any overpayment made to it, or such damages as the **City** may sustain by reason of the **Contractor's** failure to perform each and every part of its **Contract**.

CHAPTER VIII: LABOR PROVISIONS

ARTICLE 35. EMPLOYEES

35.1 The **Contractor** and its **Subcontractors** shall not employ on the **Work**:

35.1.1 Anyone who is not competent, faithful and skilled in the **Work** for which he/she shall be employed; and whenever the **Commissioner** shall inform the **Contractor**, in writing, that any employee is, in his/her opinion, incompetent, unfaithful or disobedient, that employee shall be discharged from the **Work** forthwith, and shall not again be employed upon it; or

35.1.2 Any labor, materials or means whose employment, or utilization during the course of this **Contract**, may tend to or in any way cause or result in strikes, work stoppages, delays, suspension of **Work** or similar troubles by workers employed by the **Contractor** or its **Subcontractors**, or by any of the trades working in or about the buildings and premises where **Work** is being performed under this **Contract**, or by **Other Contractors** or their **Subcontractors** pursuant to other contracts, or on any other building or premises owned or operated by the **City**, its **Agencies**, departments, boards or authorities. Any violation by the **Contractor** of this requirement may, upon certification of the **Commissioner**, be considered as proper and sufficient cause for declaring the **Contractor** to be in default, and for the **City** to take action against it as set forth in Chapter X of this **Contract**, or such other article of this **Contract** as the Commissioner may deem proper; or

35.1.3 In accordance with Section 220.3-e of the Labor Law of the State of New York (hereinafter "Labor Law"), the **Contractor** and its **Subcontractors** shall not employ on the **Work** any apprentice, unless he/she is a registered individual, under a bona fide program registered with the New York State Department of Labor. The allowable ratio of apprentices to journey-level workers in any craft classification shall not be greater than the ratio permitted to the **Contractor** as to its work force on any job under the registered program. Any employee listed on a payroll at an apprentice wage rate, who is not registered as above, shall be paid the wage rate determined by the **Comptroller** of the **City** for the classification of **Work** actually performed. The **Contractor** or **Subcontractor** will be required to furnish written evidence of the registration of its program and apprentices as well as all the appropriate ratios and wage rates, for the area of the construction prior to using any apprentices on the **Contract Work**.

35.2 If the total cost of the **Work** under this **Contract** is at least two hundred fifty thousand ($250,000) dollars, all laborers, workers, and mechanics employed in the performance of the **Contract** on the public work site, either by the **Contractor**, **Subcontractor** or other person doing or contracting to do the whole or a part of the **Work** contemplated by the **Contract**, shall be certified prior to performing any **Work** as having successfully completed a course in construction safety and health approved by the United States Department of Labor's Occupational Safety and Health Administration that is at least ten (10) hours in duration.

35.3 In accordance with Local Law Nos. 30-2012 and 33-2012, codified at sections 6-132 and 12-113 of the Administrative Code, respectively,

35.3.1 The **Contractor** shall not take an adverse personnel action with respect to an officer or employee in retaliation for such officer or employee making a report of information concerning conduct which such officer or employee knows or reasonably believes to involve corruption, criminal activity, conflict of interest, gross mismanagement or abuse of authority by any officer or employee relating to this **Contract** to (a) the Commissioner of the Department of Investigation, (b) a member of the New York City Council, the Public Advocate, or the **Comptroller**, or (c) the **CCPO**, **ACCO**, **Agency** head, or **Commissioner**.

35.3.2 If any of the **Contractor**'s officers or employees believes that he or she has been the subject of an adverse personnel action in violation of Article 35.3.1, he or she shall be entitled to bring a cause of action against the **Contractor** to recover all relief necessary to make him or her whole. Such relief may include but is not limited to: (a) an injunction to restrain continued retaliation, (b) reinstatement to the position such employee would have had but for the retaliation or to an equivalent position, (c) reinstatement of full fringe benefits and seniority rights, (d) payment of two times back

pay, plus interest, and (e) compensation for any special damages sustained as a result of the retaliation, including litigation costs and reasonable attorney's fees.

35.3.3 The **Contractor** shall post a notice provided by the **City** in a prominent and accessible place on any site where work pursuant to the **Contract** is performed that contains information about:

35.3.3(a) how its employees can report to the New York City Department of Investigation allegations of fraud, false claims, criminality or corruption arising out of or in connection with the **Contract**; and

35.3.3(b) the rights and remedies afforded to its employees under Administrative Code sections 7-805 (the New York City False Claims Act) and 12-113 (the Whistleblower Protection Expansion Act) for lawful acts taken in connection with the reporting of allegations of fraud, false claims, criminality or corruption in connection with the **Contract**.

35.3.4 For the purposes of this Article 35.3, "adverse personnel action" includes dismissal, demotion, suspension, disciplinary action, negative performance evaluation, any action resulting in loss of staff, office space, equipment or other benefit, failure to appoint, failure to promote, or any transfer or assignment or failure to transfer or assign against the wishes of the affected officer or employee.

35.3.5 This Article 35.3 is applicable to all of the **Contractor**'s **Subcontractors** having subcontracts with a value in excess of $100,000; accordingly, the **Contractor** shall include this rider in all subcontracts with a value a value in excess of $100,000.

35.4 Article 35.3 is not applicable to this **Contract** if it is valued at $100,000 or less. Articles 35.3.1, 35.3.2, 35.3.4, and 35.3.5 are not applicable to this **Contract** if it was solicited pursuant to a finding of an emergency.

35.5 Paid Sick Leave Law.

35.5.1 Introduction and General Provisions.

35.5.1(a) The Earned Sick Time Act, also known as the Paid Sick Leave Law ("PSLL"), requires covered employees who annually perform more than 80 hours of work in New York City to be provided with paid sick time.[2] Contractors of the **City** or of other governmental entities may be required to provide sick time pursuant to the PSLL.

35.5.1(b) The PSLL became effective on April 1, 2014, and is codified at Title 20, Chapter 8, of the New York City Administrative Code. It is administered by the City's Department of Consumer Affairs ("DCA"); DCA's rules promulgated under the PSLL are codified at Chapter 7 of Title 6 of the Rules of the City of New York ("Rules").

[2] Pursuant to the PSLL, if fewer than five employees work for the same employer, as determined pursuant to New York City Administrative Code § 20-912(g), such employer has the option of providing such employees uncompensated sick time.

35.5.1(c) The **Contractor** agrees to comply in all respects with the PSLL and the Rules, and as amended, if applicable, in the performance of this **Contract**. The **Contractor** further acknowledges that such compliance is a material term of this **Contract** and that failure to comply with the PSLL in performance of this **Contract** may result in its termination.

35.5.1(d) The **Contractor** must notify the **Agency Chief Contracting Officer** of the **Agency** with whom it is contracting in writing within ten (10) days of receipt of a complaint (whether oral or written) regarding the PSLL involving the performance of this **Contract**. Additionally, the **Contractor** must cooperate with DCA's education efforts and must comply with DCA's subpoenas and other document demands as set forth in the PSLL and Rules.

35.5.1(e) The PSLL is summarized below for the convenience of the **Contractor**. The **Contractor** is advised to review the PSLL and Rules in their entirety. On the website www.nyc.gov/PaidSickLeave there are links to the PSLL and the associated Rules as well as additional resources for employers, such as Frequently Asked Questions, timekeeping tools and model forms, and an event calendar of upcoming presentations and webinars at which the **Contractor** can get more information about how to comply with the PSLL. The **Contractor** acknowledges that it is responsible for compliance with the PSLL notwithstanding any inconsistent language contained herein.

35.5.2 Pursuant to the PSLL and the Rules: Applicability, Accrual, and Use.

35.5.2(a) An employee who works within the City of New York for more than eighty hours in any consecutive 12-month period designated by the employer as its "calendar year" pursuant to the PSLL ("Year") must be provided sick time. Employers must provide a minimum of one hour of sick time for every 30 hours worked by an employee and compensation for such sick time must be provided at the greater of the employee's regular hourly rate or the minimum wage. Employers are not required to provide more than 40 hours of sick time to an employee in any Year.

35.5.2(b) An employee has the right to determine how much sick time he or she will use, provided that employers may set a reasonable minimum increment for the use of sick time not to exceed four hours per **Day**. In addition, an employee may carry over up to 40 hours of unused sick time to the following Year, provided that no employer is required to allow the use of more than forty hours of sick time in a Year or carry over unused paid sick time if the employee is paid for such unused sick time and the employer provides the employee with at least the legally required amount of paid sick time for such employee for the immediately subsequent Year on the first **Day** of such Year.

35.5.2(c) An employee entitled to sick time pursuant to the PSLL may use sick time for any of the following:

i. such employee's mental illness, physical illness, injury, or health condition or the care of such illness, injury, or condition or such employee's need for medical diagnosis or preventive medical care;
ii. such employee's care of a family member (an employee's child, spouse, domestic partner, parent, sibling, grandchild or grandparent, or the child or parent of an employee's spouse or domestic partner) who has a mental

illness, physical illness, injury or health condition or who has a need for medical diagnosis or preventive medical care;

iii. closure of such employee's place of business by order of a public official due to a public health emergency; or

iv. such employee's need to care for a child whose school or childcare provider has been closed due to a public health emergency.

35.5.2(d) An employer must not require an employee, as a condition of taking sick time, to search for a replacement. However, an employer may require an employee to provide: reasonable notice of the need to use sick time; reasonable documentation that the use of sick time was needed for a reason above if for an absence of more than three consecutive work days; and/or written confirmation that an employee used sick time pursuant to the PSLL. However, an employer may not require documentation specifying the nature of a medical condition or otherwise require disclosure of the details of a medical condition as a condition of providing sick time and health information obtained solely due to an employee's use of sick time pursuant to the PSLL must be treated by the employer as confidential.

35.5.2(e) If an employer chooses to impose any permissible discretionary requirement as a condition of using sick time, it must provide to all employees a written policy containing those requirements, using a delivery method that reasonably ensures that employees receive the policy. If such employer has not provided its written policy, it may not deny sick time to an employee because of non-compliance with such a policy.

35.5.2(f) Sick time to which an employee is entitled must be paid no later than the payday for the next regular payroll period beginning after the sick time was used.

35.5.3 Exemptions and Exceptions. Notwithstanding the above, the PSLL does not apply to any of the following:

35.5.3(a) an independent contractor who does not meet the definition of employee under section 190(2) of the New York State Labor Law;

35.5.3(b) an employee covered by a valid collective bargaining agreement in effect on April 1, 2014, until the termination of such agreement;

35.5.3(c) an employee in the construction or grocery industry covered by a valid collective bargaining agreement if the provisions of the PSLL are expressly waived in such collective bargaining agreement;

35.5.3(d) an employee covered by another valid collective bargaining agreement if such provisions are expressly waived in such agreement and such agreement provides a benefit comparable to that provided by the PSLL for such employee;

35.5.3(e) an audiologist, occupational therapist, physical therapist, or speech language pathologist who is licensed by the New York State Department of Education and who calls in for work assignments at will, determines his or her own schedule, has the ability to reject or accept any assignment referred to him or her, and is paid an average hourly wage that is at least four times the federal minimum wage;

35.5.3(f) an employee in a work study program under Section 2753 of Chapter 42 of the United States Code;

35.5.3(g) an employee whose work is compensated by a qualified scholarship program as that term is defined in the Internal Revenue Code, Section 117 of Chapter 20 of the United States Code; or

35.5.3(h) a participant in a Work Experience Program (WEP) under section 336-c of the New York State Social Services Law.

35.5.4 Retaliation Prohibited. An employer may not threaten or engage in retaliation against an employee for exercising or attempting in good faith to exercise any right provided by the PSLL. In addition, an employer may not interfere with any investigation, proceeding, or hearing pursuant to the PSLL.

35.5.5 Notice of Rights.

35.5.5(a) An employer must provide its employees with written notice of their rights pursuant to the PSLL. Such notice must be in English and the primary language spoken by an employee, provided that DCA has made available a translation into such language. Downloadable notices are available on DCA's website at http://www.nyc.gov/html/dca/html/law/PaidSickLeave.shtml.

35.5.5(b) Any person or entity that willfully violates these notice requirements is subject to a civil penalty in an amount not to exceed fifty dollars for each employee who was not given appropriate notice.

35.5.6 Records. An employer must retain records documenting its compliance with the PSLL for a period of at least three years, and must allow DCA to access such records in furtherance of an investigation related to an alleged violation of the PSLL.

35.5.7 Enforcement and Penalties.

35.5.7(a) Upon receiving a complaint alleging a violation of the PSLL, DCA has the right to investigate such complaint and attempt to resolve it through mediation. Within 30 **Days** of written notification of a complaint by DCA, or sooner in certain circumstances, the employer must provide DCA with a written response and such other information as DCA may request. If DCA believes that a violation of the PSLL has occurred, it has the right to issue a notice of violation to the employer.

35.5.7(b) DCA has the power to grant an employee or former employee all appropriate relief as set forth in New York City Administrative Code § 20-924(d). Such relief may include, among other remedies, treble damages for the wages that should have been paid, damages for unlawful retaliation, and damages and reinstatement for unlawful discharge. In addition, DCA may impose on an employer found to have violated the PSLL civil penalties not to exceed $500 for a first violation, $750 for a second violation within two years of the first violation, and $1,000 for each succeeding violation within two years of the previous violation.

35.5.8 More Generous Polices and Other Legal Requirements. Nothing in the PSLL is intended to discourage, prohibit, diminish, or impair the adoption or retention of a more generous sick time policy, or the obligation of an employer to comply with any contract,

collective bargaining agreement, employment benefit plan or other agreement providing more generous sick time. The PSLL provides minimum requirements pertaining to sick time and does not preempt, limit or otherwise affect the applicability of any other law, regulation, rule, requirement, policy or standard that provides for greater accrual or use by employees of sick leave or time, whether paid or unpaid, or that extends other protections to employees. The PSLL may not be construed as creating or imposing any requirement in conflict with any federal or state law, rule or regulation.

35.6 HireNYC: Hiring and Reporting Requirements. This Article 35.6 applies to construction contracts of $1,000,000 or more. The **Contractor** shall comply with the requirements of Articles 35.6.1-35.6.5 for all non-trades jobs (e.g., for an administrative position arising out of **Work** ant located in New York City). The **Contractor** shall reasonably cooperate with SBS and the **City** on specific outreach events, including "Hire-on-the-Spot" events, for the hiring of trades workers in connection with the **Work**. If provided elsewhere in this **Contract**, this **Contract** is subject to a project labor agreement.

35.6.1 Enrollment. The **Contractor** shall enroll with the HireNYC system, found at www.nyc.gov/sbs, within thirty (30) days after the registration of this **Contract** pursuant to Section 328 of the New York City Charter. The **Contractor** shall provide information about the business, designate a primary contact and say whether it intends to hire for any entry to mid-level job opportunities arising from this **Contract** and located in New York City, and, if so, the approximate start date of the first hire.

35.6.2 Job Posting Requirements.

35.6.2(a) Once enrolled in HireNYC, the **Contractor** agrees to update the HireNYC portal with all entry to mid-level job opportunities arising from this **Contract** and located in New York City, if any, which shall be defined as jobs requiring no more than an associate degree, as provided by the New York State Department of Labor (see Column F of https://labor.ny.gov/stats/2012-2022- NYS-Employment-Prospects.xls). The information to be updated includes the types of entry and mid-level positions made available from the work arising from the **Contract** and located in New York City, the number of positions, the anticipated schedule of initiating the hiring process for these positions, and the contact information for the **Contractor's** representative charged with overseeing hiring. The **Contractor** must update the HireNYC portal with any hiring needs arising from the contract and located in New York City, and the requirements of the jobs to be filled, no less than three weeks prior to the intended first day of employment for each new position, except with the permission of SBS, not to be unreasonably withheld, and must also update the HireNYC portal as set forth below.

35.6.2(b) After enrollment through HireNYC and submission of relevant information, SBS will work with the **Contractor** to develop a recruitment plan which will outline the candidate screening process, and will provide clear instructions as to when, where, and how interviews will take place. HireNYC will screen applicants based on employer requirements and refer applicants whom it believes are qualified to the **Contractor** for interviews. The **Contractor** must interview referred applicants whom it believes are qualified.

35.6.2(c) After completing an interview of a candidate referred by HireNYC, the **Contractor** must provide feedback via the portal within twenty (20) business days to indicate which candidates were interviewed and hired, if any. In addition, the **Contractor** shall provide the start date of new hires, and additional information

reasonably related to such hires, within twenty (20) business days after the start date. In the event the **Contractor** does not have any job openings covered by this Rider in any given year, the **Contractor** shall be required to provide an annual update to HireNYC to that effect. For this purpose, the reporting year shall run from the date of the registration of the **Contract** pursuant to Charter section 328 and each anniversary date.

35.6.2(d) These requirements do not limit the **Contractor's** ability to assess the qualifications of prospective workers, and to make final hiring and retention decisions. No provision of this Article 35.6 shall be interpreted so as to require the **Contractor** to employ any particular worker.

35.6.2(e) In addition, the provisions of this Article 35.6 shall not apply to positions that the **Contractor** intends to fill with employees employed pursuant to the job retention provision of Section 22-505 of the Administrative Code of the City of New York. The **Contractor** shall not be required to report such openings with HireNYC. However, the **Contractor** shall enroll with the HireNYC system pursuant to Article 35.6.1, above, and, if such positions subsequently become open, then the remaining provisions of this Article 35.6 will apply.

35.6.3 Breach and Liquidated Damages. If the **Contractor** fails to comply with the terms of the **ContrSact** and this Article 35.6 (l) by not enrolling its business with HireNYC; (2) by not informing HireNYC, as required, of open positions; or (3) by failing to interview a qualified candidate, the **Agency** may assess liquidated damages in the amount of two-thousand five hundred dollars ($2,500) per breach. For all other events of noncompliance with the terms of this Article 35.6, the **Agency** may assess liquidated damages in the amount of five hundred dollars ($500) per breach. Furthermore, in the event the **Contractor** breaches the requirements of this Article 35.6 during the term of the **Contract**, the **City** may hold the **Contractor** in default of this **Contract**.

35.6.4 Audit Compliance. In addition to the auditing requirements set forth in other parts of the **Contract**, the **Contractor** shall permit SBS and the **City** to inspect any and all records concerning or relating to job openings or the hiring of individuals for work arising from the **Contract** and located in New York City. The **Contractor** shall permit an inspection within seven (7) business days of the request.

35.6.5 Other Reporting Requirements. The **Contractor** shall report to the **City**, on a monthly basis, all information reasonably requested by the **City** that is necessary for the **City** to comply with any reporting requirements imposed by **Law**, including any requirement that the **City** maintain a publicly accessible database. In addition, the **Contractor** agrees to comply with all reporting requirements imposed by **Law**, or as otherwise requested by the **City**.

35.6.6 Federal Hiring Requirements. If this **Contract** is federally funded (as indicated elsewhere in this Contract), the **Contractor** shall comply with all federal hiring requirements as may be set forth in this **Contract**, including, as applicable: (a) Section 3 of the HUD Act of 1968, which requires, to the greatest extent feasible, economic opportunities for 30 percent of new hires be given to low- and very low-income persons, particularly persons who are recipients of HUD assistance for housing and Executive Order 11246, which prohibits discrimination in employment due to race, color, religion, sex or national origin, and requires the implementation of goals for minority and female participation for work involving any construction trade.

ARTICLE 36. NO DISCRIMINATION

36.1 The **Contractor** specifically agrees, as required by Labor Law Section 220-e, as amended, that:

36.1.1 In the hiring of employees for the performance of **Work** under this **Contract** or any subcontract hereunder, neither the **Contractor**, **Subcontractor**, nor any person acting on behalf of such **Contractor** or **Subcontractor**, shall by reason of race, creed, color or national origin discriminate against any citizen of the State of New York who is qualified and available to perform the **Work** to which the employment relates;

36.1.2 Neither the **Contractor**, **Subcontractor**, nor any person on its behalf shall, in any manner, discriminate against or intimidate any employee hired for the performance of **Work** under this **Contract** on account of race, creed, color or national origin;

36.1.3 There may be deducted from the amount payable to the **Contractor** by the **City** under this **Contract** a penalty of fifty ($50.00) dollars for each person for each **Day** during which such person was discriminated against or intimidated in violation of the provisions of this **Contract**; and

36.1.4 This **Contract** may be cancelled or terminated by the **City** and all moneys due or to become due hereunder may be forfeited, for a second or any subsequent violation of the terms or conditions of this Article 36.

36.1.5 This Article 36 covers all construction, alteration and repair of any public building or public work occurring in the State of New York and the manufacture, sale, and distribution of materials, equipment, and supplies to the extent that such operations are performed within the State of New York pursuant to this **Contract**.

36.2 The **Contractor** specifically agrees, as required by Section 6-108 of the Administrative Code, as amended, that:

36.2.1 It shall be unlawful for any person engaged in the construction, alteration or repair of buildings or engaged in the construction or repair of streets or highways pursuant to a **Contract** with the **City** or engaged in the manufacture, sale or distribution of materials, equipment or supplies pursuant to a **Contract** with the **City** to refuse to employ or to refuse to continue in any employment any person on account of the race, color or creed of such person.

36.2.2 It shall be unlawful for any person or any servant, agent or employee of any person, described in Article 36.1.2, to ask, indicate or transmit, orally or in writing, directly or indirectly, the race, color or creed or religious affiliation of any person employed or seeking employment from such person, firm or corporation.

36.2.3 Breach of the foregoing provisions shall be deemed a violation of a material provision of this **Contract**.

36.2.4 Any person, or the employee, manager or owner of or officer of such firm or corporation who shall violate any of the provisions of this Article 36.2 shall, upon

conviction thereof, be punished by a fine of not more than one hundred ($100.00) dollars or by imprisonment for not more than thirty (30) **Days**, or both.

36.3 This **Contract** is subject to the requirements of Executive Order No. 50 (1980) ("E.O. 50"), as revised, and the rules and regulations promulgated thereunder. No contract will be awarded unless and until these requirements have been complied with in their entirety. By signing this **Contract**, the **Contractor** agrees that it:

36.3.1 Will not engage in any unlawful discrimination against any employee or applicant for employment because of race, creed, color, national origin, sex, age, disability, marital status or sexual orientation with respect to all employment decisions including, but not limited to, recruitment, hiring, upgrading, demotion, downgrading, transfer, training, rates of pay or other forms of compensation, layoff, termination, and all other terms and conditions of employment; and

36.3.2 Will not engage in any unlawful discrimination in the selection of **Subcontractors** on the basis of the owner's race, color, creed, national origin, sex, age, disability, marital status or sexual orientation; and

36.3.3 Will state in all solicitations or advertisements for employees placed by or on behalf of the **Contractor** that all qualified applicants will receive consideration for employment without unlawful discrimination based on race, creed, color, national origin, sex, age, citizens status, disability, marital status, sexual orientation, or that it is an equal employment opportunity employer; and

36.3.4 Will send to each labor organization or representative of workers with which it has a collective bargaining agreement or other contract or memorandum of understanding, written notification of its equal employment opportunity commitments under E.O. 50 and the rules and regulations promulgated thereunder; and

36.3.5 Will furnish, before the award of the **Contract**, all information and reports, including an employment report, that are required by E.O. 50, the rules and regulations promulgated thereunder, and orders of the **City** Department of Business Services, Division of Labor Services (**DLS**) and will permit access to its books, records, and accounts by the **DLS** for the purposes of investigation to ascertain compliance with such rules, regulations, and orders.

36.4 The **Contractor** understands that in the event of its noncompliance with the nondiscrimination clauses of this **Contract** or with any of such rules, regulations, or orders, such noncompliance shall constitute a material breach of this **Contract** and noncompliance with E.O. 50 and the rules and regulations promulgated thereunder. After a hearing held pursuant to the rules of the **DLS**, the Director of the **DLS** may direct the **Commissioner** to impose any or all of the following sanctions:

36.4.1 Disapproval of the **Contractor**; and/or

36.4.2 Suspension or termination of the **Contract**; and/or

36.4.3 Declaring the **Contractor** in default; and/or

36.4.4 In lieu of any of the foregoing sanctions, the Director of the **DLS** may impose an employment program.

In addition to any actions taken under this **Contract**, failure to comply with E.O. 50 and the rules and regulations promulgated thereunder, in one or more instances, may result in a **City Agency** declaring the **Contractor** to be non-responsible in future procurements. The **Contractor** further agrees that it will refrain from entering into any **Contract** or **Contract** modification subject to E.O. 50 and the rules and regulations promulgated thereunder with a **Subcontractor** who is not in compliance with the requirements of E.O. 50 and the rules and regulations promulgated thereunder.

36.5 The **Contractor** specifically agrees, as required by Section 6-123 of the Administrative Code, that:

36.5.1 The **Contractor** will not engage in any unlawful discriminatory practice in violation of Title 8 of the Administrative Code; and

36.5.2 Any failure to comply with this Article 36.5 may subject the **Contractor** to the remedies set forth in Section 6-123 of the Administrative Code, including, where appropriate, sanctions such as withholding of payment, imposition of an employment program, finding the **Contractor** to be in default, cancellation of the **Contract**, or any other sanction or remedy provided by **Law** or **Contract**.

ARTICLE 37. LABOR LAW REQUIREMENTS

37.1 The **Contractor** shall strictly comply with all applicable provisions of the Labor Law, as amended. Such compliance is a material term of this **Contract**.

37.2 The **Contractor** specifically agrees, as required by Labor Law Sections 220 and 220-d, as amended, that:

37.2.1 Hours of **Work**: No laborer, worker, or mechanic in the employ of the **Contractor**, **Subcontractor** or other person doing or contracting to do the whole or a part of the **Work** contemplated by this **Contract** shall be permitted or required to work more than eight (8) hours in any one (1) **Day**, or more than five (5) **Days** in any one (1) week, except as provided in the Labor Law and in cases of extraordinary emergency including fire, flood, or danger to life or property, or in the case of national emergency when so proclaimed by the President of the United States of America.

37.2.2 In situations in which there are not sufficient laborers, workers, and mechanics who may be employed to carry on expeditiously the **Work** contemplated by this **Contract** as a result of such restrictions upon the number of hours and **Days** of labor, and the immediate commencement or prosecution or completion without undue delay of the **Work** is necessary for the preservation of the **Site** and/or for the protection of the life and limb of the persons using the same, such laborers, workers, and mechanics shall be permitted or required to work more than eight (8) hours in any one (1) **Day**; or five (5) **Days** in any one (1) week; provided, however, that upon application of any **Contractor**, the **Commissioner** shall have first certified to the Commissioner of Labor of the State of New York (hereinafter "Commissioner of Labor") that such public **Work** is of an important nature and that a delay in carrying it to completion would result in serious disadvantage to the public; and provided, further, that such Commissioner of Labor shall have determined that such an emergency does in fact exist as provided in Labor Law Section 220.2.

37.2.3 Failure of the **Commissioner** to make such a certification to the Commissioner of Labor shall not entitle the **Contractor** to damages for delay or for any cause whatsoever.

37.2.4 Prevailing Rate of Wages: The wages to be paid for a legal day's **Work** to laborers, workers, or mechanics employed upon the **Work** contemplated by this **Contract** or upon any materials to be used thereon shall not be less than the "prevailing rate of wage" as defined in Labor Law Section 220, and as fixed by the **Comptroller** in the attached Schedule of Wage Rates and in updated schedules thereof. The prevailing wage rates and supplemental benefits to be paid are those in effect at the time the **Work** is being performed.

37.2.5 Requests for interpretation or correction in the Information for Bidders includes all requests for clarification of the classification of trades to be employed in the performance of the **Work** under this **Contract**. In the event that a trade not listed in the **Contract** is in fact employed during the performance of this **Contract**, the **Contractor** shall be required to obtain from the **Agency** the prevailing wage rates and supplementary benefits for the trades used and to complete the performance of this **Contract** at the price at which the **Contract** was awarded.

37.2.6 Minimum Wages: Except for employees whose wage is required to be fixed pursuant to Labor Law Section 220, all persons employed by the **Contractor** and any **Subcontractor** in the manufacture or furnishing of the supplies, materials, or equipment, or the furnishing of work, labor, or services, used in the performance of this **Contract**, shall be paid, without subsequent deduction or rebate unless expressly authorized by **Law**, not less than the sum mandated by **Law**.

37.3 Working Conditions: No part of the **Work**, labor or services shall be performed or rendered by the **Contractor** in any plants, factories, buildings or surroundings or under working conditions which are unsanitary or hazardous or dangerous to the health and safety of employees engaged in the performance of this **Contract**. Compliance with the safety, sanitary, and factory inspection **Laws** of the state in which the **Work** is to be performed shall be prima facie evidence of compliance with this Article 37.3.

37.4 Prevailing Wage Enforcement: The **Contractor** agrees to pay for all costs incurred by the **City** in enforcing prevailing wage requirements, including the cost of any investigation conducted by or on behalf of the **Agency** or the **Comptroller,** where the **City** discovers a failure to comply with any of the requirements of this Article 37 by the **Contractor** or its **Subcontractor(s)**. The **Contractor** also agrees that, should it fail or refuse to pay for any such investigation, the **Agency** is hereby authorized to deduct from a **Contractor's** account an amount equal to the cost of such investigation.

37.4.1 The Labor Law Section 220 and Section 220-d, as amended, provide that this **Contract** shall be forfeited and no sum paid for any **Work** done hereunder on a second conviction for willfully paying less than:

37.4.1(a) The stipulated prevailing wage scale as provided in Labor Law section 220, as amended, or

37.4.1(b) The stipulated minimum hourly wage scale as provided in Labor Law section 220-d, as amended.

37.4.2 For any breach or violation of either working conditions (Article 37.3) or minimum wages (Article 37.2.6) provisions, the party responsible therefor shall be liable to the **City** for liquidated damages, which may be withheld from any amounts due on any contracts with the **City** of such party responsible, or may be recovered in actions brought by the **City**

Corporation Counsel in the name of the **City**, in addition to damages for any other breach of this **Contract**, for a sum equal to the amount of any underpayment of wages due to any employee engaged in the performance of this **Contract**. In addition, the **Commissioner** shall have the right to cancel contracts and enter into other contracts for the completion of the original contract, with or without public letting, and the original **Contractor** shall be liable for any additional cost. All sums withheld or recovered as deductions, rebates, refunds, or underpayment of wages hereunder, shall be held in a special deposit account and shall be paid without interest, on order of the **Comptroller**, directly to the employees who have been paid less than minimum rates of pay as set forth herein and on whose account such sums were withheld or recovered, provided that no claims by employees for such payments shall be entertained unless made within two (2) years from the date of actual notice to the **Contractor** of the withholding or recovery of such sums by the **City**.

37.4.3 A determination by the **Comptroller** that a **Contractor** and/or its **Subcontractor** willfully violated Labor Law Section 220 will be forwarded to the **City's** five District Attorneys for review.

37.4.4 The **Contractor's** or **Subcontractor's** noncompliance with this Article 37.4 and Labor Law Section 220 may result in an unsatisfactory performance evaluation and the **Comptroller** may also find and determine that the **Contractor** or **Subcontractor** willfully violated the New York Labor **Law**.

37.4.4(a) An unsatisfactory performance evaluation for noncompliance with this Article 37.4 may result in a determination that the **Contractor** is a non-responsible bidder on subsequent procurements with the **City** and thus a rejection of a future award of a contract with the **City**, as well as any other sanctions provided for by **Law**.

37.4.4(b) Labor Law Section 220-b, as amended, provides that when two (2) final determinations have been rendered against a **Contractor** or **Subcontractor** within any consecutive six (6) year period determining that such **Contractor** or **Subcontractor** has willfully failed to pay the prevailing rate of wages or to provide supplements in accordance with the Labor Law and this Article 37.4, whether such failures were concurrent or consecutive and whether or not such final determinations concerning separate public works projects are rendered simultaneously, such **Contractor** or **Subcontractor** shall be ineligible to submit a bid on or be awarded any public works contract with the **City** for a period of five (5) years from the second final determination. If the final determination involves the falsification of payroll records or the kickback of wages or supplements, the **Contractor** or **Subcontractor** shall be ineligible to submit a bid on or be awarded any public works contract with the **City** for a period of five (5) years from the first final determination.

37.4.4(c) Labor Law Section 220, as amended, provides that the **Contractor** or **Subcontractor** found to have violated this Article 37.4 may be directed to make payment of wages or supplements including interest found to be due, and the **Contractor** or **Subcontractor** may be directed to make payment of a further sum as a civil penalty in an amount not exceeding twenty-five (25%) percent of the total amount found to be due.

37.5 The **Contractor** and its **Subcontractors** shall within ten (10) **Days** after mailing of a Notice of Award or written order, post in prominent and conspicuous places in each and every plant, factory, building, and structure where employees of the **Contractor** and its **Subcontractors** engaged in the

performance of this **Contract** are employed, notices furnished by the **City**, in relation to prevailing wages and supplements, minimum wages, and other stipulations contained in Sections 220 and 220-h of the Labor Law, and the **Contractor** and its **Subcontractors** shall continue to keep such notices posted in such prominent and conspicuous places until **Final Acceptance** of the supplies, materials, equipment, or **Work**, labor, or services required to be furnished or rendered under this **Contract**.

37.6 The **Contractor** shall strictly comply with all of the provisions of Articles 37.6.1 through 37.6.5, and provide for all workers, laborers or mechanics in its employ, the following:

37.6.1 Notices Posted At **Site**: Post, in a location designated by the **City**, schedules of prevailing wages and supplements for this **Project**, a copy of all re-determinations of such schedules for the **Project**, the Workers' Compensation **Law** Section 51 notice, all other notices required by **Law** to be posted at the **Site**, the **City** notice that this **Project** is a public works project on which each worker is entitled to receive the prevailing wages and supplements for the occupation at which he or she is working, and all other notices which the **City** directs the **Contractor** to post. The **Contractor** shall provide a surface for such notices which is satisfactory to the **City**. The **Contractor** shall maintain and keep current such notices in a legible manner and shall replace any notice or schedule which is damaged, defaced, illegible or removed for any reason. The **Contractor** shall post such notices before commencing any **Work** on the **Site** and shall maintain such notices until all **Work** on the **Site** is complete; and

37.6.2 Daily **Site** Sign-in Sheets: Maintain daily **Site** sign-in sheets, and require that **Subcontractors** maintain daily **Site** sign-in sheets for its employees, which include blank spaces for an employee's name to be both printed and signed, job title, date started and Social Security number, the time the employee began work and the time the employee left work, until **Final Acceptance** of the supplies, materials, equipment, or **Work**, labor, or services to be furnished or rendered under this **Contract** unless exception is granted by the **Comptroller** upon application by the **Agency**. In the alternative, subject to the approval of the **CCPO**, the **Contractor** and **Subcontractor** may maintain an electronic or biometric sign-in system, which provides the information required by this Article 37.6.2; and

37.6.3 Individual Employee Information Notices: Distribute a notice to each worker, laborer or mechanic employed under this **Contract**, in a form provided by the **Agency**, that this **Project** is a public works project on which each worker, laborer or mechanic is entitled to receive the prevailing rate of wages and supplements for the occupation at which he or she is working. If the total cost of the **Work** under this **Contract** is at least two hundred fifty thousand ($250,000) dollars, such notice shall also include a statement that each worker, laborer or mechanic must be certified prior to performing any **Work** as having successfully completed a course in construction safety and health approved by the United States Department of Labor's Occupational Safety and Health Administration that is at least ten (10) hours in duration. Such notice shall be distributed to each worker before he or she starts performing any **Work** of this **Contract** and with the first paycheck after July first of each year. "Worker, laborer or mechanic" includes employees of the **Contractor** and all **Subcontractors** and all employees of suppliers entering the **Site**. At the time of distribution, the **Contractor** shall have each worker, laborer or mechanic sign a statement, in a form provided by the **Agency**, certifying that the worker has received the notice required by this Article 37.6.3, which signed statement shall be maintained with the payroll records required by this **Contract**; and

37.6.3(a) The **Contractor** and each **Subcontractor** shall notify each worker, laborer or mechanic employed under this **Contract** in writing of the prevailing rate of

wages for their particular job classification. Such notification shall be given to every worker, laborer, and mechanic on their first pay stub and with every pay stub thereafter; and

37.6.4 **Site** Laminated Identification Badges: The **Contractor** shall provide laminated identification badges which include a photograph of the worker's, laborer's or mechanic's face and indicate the worker's, laborer's or mechanic's name, trade, employer's name, and employment starting date (month/day/year). Further, the **Contractor** shall require as a condition of employment on the **Site**, that each and every worker, laborer or mechanic wear the laminated identification badge at all times and that it may be seen by any representative of the **City**. The **Commissioner** may grant a written waiver from the requirement that the laminated identification badge include a photograph if the **Contractor** demonstrates that the identity of an individual wearing a laminated identification badge can be easily verified by another method; and

37.6.5 Language Other Than English Used On **Site**: Provide the **ACCO** notice when three (3) or more employees (worker and/or laborer and/or mechanic) on the **Site**, at any time, speak a language other than English. The **ACCO** will then provide the **Contractor** the notices described in Article 37.6.1 in that language or languages as may be required. The **Contractor** is responsible for all distributions under this Article 37; and

37.6.6 Provision of Records: The **Contractor** and **Subcontractor(s)** shall produce within five (5) **Days** on the **Site** of the **Work** and upon a written order of the **Engineer**, the **Commissioner**, the **ACCO**, the **Agency EAO**, or the **Comptroller,** such records as are required to be kept by this Article 37.6; and

37.6.7 The **Contractor** and **Subcontractor(s)** shall pay employees by check or direct deposit. If this **Contract** is for an amount greater than one million ($1,000,000) dollars, checks issued by the **Contractor** to covered employees shall be generated by a payroll service or automated payroll system (an in-house system may be used if approved by the **Agency**). For any subcontract for an amount greater than seven hundred fifty thousand ($750,000) dollars, checks issued by a **Subcontractor** to covered employees shall be generated by a payroll service or automated payroll system (an in-house system may be used if approved by the **Agency**); and

37.6.8 The failure of the **Contractor** or **Subcontractor(s)** to comply with the provisions of Articles 37.6.1 through 37.6.7 may result in the **Commissioner** declaring the **Contractor** in default and/or the withholding of payments otherwise due under the **Contract.**

37.7 The **Contractor** and its **Subcontractors** shall keep such employment and payroll records as are required by Section 220 of the Labor Law. The failure of the **Contractor** or **Subcontractor(s)** to comply with the provisions of this Article 37.7 may result in the **Commissioner** declaring the **Contractor** in default and/or the withholding of payments otherwise due under the **Contract.**

37.8 At the time the **Contractor** makes application for each partial payment and for final payment, the **Contractor** shall submit to the **Commissioner** a written payroll certification, in the form provided by this **Contract**, of compliance with the prevailing wage, minimum wage, and other provisions and stipulations required by Labor Law Section 220 and of compliance with the training requirements of Labor Law Section 220-h set forth in Article 35.2. This certification of compliance shall be a condition precedent to payment and no payment shall be made to the **Contractor** unless and until each such certification shall have been submitted to and received by the **Commissioner**.

37.9 This **Contract** is executed by the **Contractor** with the express warranty and representation that the **Contractor** is not disqualified under the provisions of Section 220 of the Labor Law from the award of the **Contract**.

37.10 Any breach or violation of any of the foregoing shall be deemed a breach or violation of a material provision of this **Contract**, and grounds for cancellation thereof by the **City**.

ARTICLE 38. PAYROLL REPORTS

38.1 The **Contractor** and its **Subcontractor(s)** shall maintain on the **Site** during the performance of the **Work** the original payrolls or transcripts thereof which the **Contractor** and its **Subcontractor(s)** are required to maintain and shall submit such original payrolls or transcripts, subscribed and affirmed by it as true, within thirty (30) **Days** after issuance of its first payroll, and every thirty (30) **Days** thereafter, pursuant to Labor Law Section 220(3-a)(a)(iii). The **Contractor** and **Subcontractor(s)** shall submit such original payrolls or transcripts along with each and every payment requisition. If payment requisitions are not submitted at least once a month, the **Contractor** and its **Subcontractor(s)** shall submit original payrolls and transcripts both along with its payment requisitions and independently of its payment requisitions.

38.2 The **Contractor** shall maintain payrolls or transcripts thereof for six (6) years from the date of completion of the **Work** on this **Contract**. If such payrolls and transcripts are maintained outside of New York City after the completion of the **Work** and their production is required pursuant to this Article 38, the **Contractor** shall produce such records in New York City upon request by the City.

38.3 The **Contractor** and **Subcontractor(s)** shall comply with any written order, direction, or request made by the **Engineer**, the **Commissioner**, the **ACCO**, the **Agency EAO**, the **Agency Labor Law Investigator(s)**, or the **Comptroller**, to provide to the requesting party any of the following information and/or records within five (5) **Days** of such written order, direction, or request:

38.3.1 Such original payrolls or transcripts thereof subscribed and affirmed by it as true and the statements signed by each worker pursuant to this Chapter VIII; and/or

38.3.2 Attendance sheets for each **Day** on which any employee of the **Contractor** and/or any of the **Subcontractor(s)** performed **Work** on the **Site**, which attendance sheet shall be in a form acceptable to the **Agency** and shall provide information acceptable to the **Agency** to identify each such employee; and/or

38.3.3 Any other information to satisfy the **Engineer**, the **Commissioner**, the **ACCO**, the **Agency EAO**, the **Agency Labor Law Investigator(s)** or the **Comptroller**, that this Chapter VIII and the Labor Law, as to the hours of employment and prevailing rates of wages and/or supplemental benefits, are being observed.

38.4 The failure of the **Contractor** or **Subcontractor(s)** to comply with the provisions of Articles 38.1 and/or 38.2 may result in the **Commissioner** declaring the **Contractor** in default and/or the withholding of payments otherwise due under the **Contract**.

ARTICLE 39. DUST HAZARDS

39.1 Should a harmful dust hazard be created in performing the **Work** of this **Contract**, for the elimination of which appliances or methods have been approved by the Board of Standards and Appeals

of the City of New York, such appliances and methods shall be installed, maintained, and effectively operated during the continuance of such harmful dust hazard. Failure to comply with this provision after notice shall make this **Contract** voidable at the sole discretion of the **City**.

CHAPTER IX: PARTIAL AND FINAL PAYMENTS

ARTICLE 40. CONTRACT PRICE

40.1 The **City** shall pay, and the **Contractor** agrees to accept, in full consideration for the **Contractor's** performance of the **Work** subject to the terms and conditions hereof, the lump sum price or unit prices for which this **Contract** was awarded, plus the amount required to be paid for any **Extra Work** ordered by the **Commissioner** under Article 25, less credit for any **Work** omitted pursuant to Article 29.

ARTICLE 41. BID BREAKDOWN ON LUMP SUM

41.1 Within fifteen (15) **Days** after the commencement date specified in the **Notice to Proceed** or **Order to Work**, unless otherwise directed by the **Resident Engineer**, the **Contractor** shall submit to the **Resident Engineer** a breakdown of its bid price, or of lump sums bid for items of the **Contract**, showing the various operations to be performed under the **Contract**, as directed in the progress schedule required under Article 9, and the value of each of such operations, the total of such items to equal the lump sum price bid. Said breakdown must be approved in writing by the **Resident Engineer**.

41.2 No partial payment will be approved until the **Contractor** submits a bid breakdown that is acceptable to the **Resident Engineer**.

41.3 The **Contractor** shall also submit such other information relating to the bid breakdown as directed by the **Resident Engineer**. Thereafter, the breakdown may be used only for checking the **Contractor's** applications for partial payments hereunder, but shall not be binding upon the **City**, the **Commissioner**, or the **Engineer** for any purpose whatsoever.

ARTICLE 42. PARTIAL PAYMENTS

42.1 From time to time as the **Work** progresses satisfactorily, but not more often than once each calendar month (except where the **Commissioner** approves in writing the submission of invoices on a more frequent basis and for invoices relating to **Work** performed pursuant to a change order), the **Contractor** may submit to the **Engineer** a requisition for a partial payment in the prescribed form, which shall contain an estimate of the quantity and the fair value of the **Work** done during the payment period.

42.2 Partial payments may be made for materials, fixtures, and equipment in advance of their actual incorporation in the **Work**, as the **Commissioner** may approve, and upon the terms and conditions set forth in the General Conditions.

42.3 The **Contractor** shall also submit to the **Commissioner** in connection with every application for partial payment a verified statement in the form prescribed by the **Comptroller** setting forth the information required under Labor Law Section 220-a.

42.4 Within thirty (30) **Days** after receipt of a satisfactory payment application, and within sixty (60) **Days** after receipt of a satisfactory payment application in relation to **Work** performed pursuant to a change order, the **Engineer** will prepare and certify, and the **Commissioner** will approve, a voucher for a partial payment in the amount of such approved estimate, less any and all deductions authorized to be made by the **Commissioner** under the terms of this **Contract** or by **Law**.

ARTICLE 43. PROMPT PAYMENT

43.1 The Prompt Payment provisions of the **PPB** Rules in effect at the time of the bid will be applicable to payments made under this **Contract**. The provisions require the payment to the **Contractor** of interest on payments made after the required payment date, except as set forth in the **PPB** Rules.

43.2 The **Contractor** shall submit a proper invoice to receive payment, except where the **Contract** provides that the **Contractor** will be paid at predetermined intervals without having to submit an invoice for each scheduled payment.

43.3 Determination of interest due will be made in accordance with the **PPB** Rules.

43.4 If the **Contractor** is paid interest, the proportionate share(s) of that interest shall be forwarded by the **Contractor** to its **Subcontractor(s)**.

43.5 The **Contractor** shall pay each **Subcontractor** or **Materialman** not later than seven (7) **Days** after receipt of payment out of amounts paid to the **Contractor** by the **City** for **Work** performed by the **Subcontractor** or **Materialman** under this **Contract**.

> 43.5.1 If **Contractor** fails to make any payment to any **Subcontractor** or **Materialman** within seven (7) **Days** after receipt of payment by the **City** pursuant to this Article 43.5, then the **Contractor** shall pay interest on amounts due to such **Subcontractor** or **Materialman** at the rate of interest in effect on the date such payment is made by the **Contractor** computed in accordance with Section 756-b (1)(b) of the New York General Business Law. Accrual of interest shall commence on the **Day** immediately following the expiration of the seventh **Day** following receipt of payment by the **Contractor** from the **City** and shall end on the date on which payment is made.

43.6 The **Contractor** shall include in each of its subcontracts a provision requiring each **Subcontractor** to make payment to each of its **Subcontractors** or **Materialmen** for **Work** performed under this **Contract** in the same manner and within the same time period set forth above.

ARTICLE 44. SUBSTANTIAL COMPLETION PAYMENT

44.1 The **Contractor** shall submit with the **Substantial Completion** requisition:

> 44.1.1 A final verified statement of any pending Article 27 disputes in accordance with the **PPB** Rules and this **Contract** and any and all alleged claims against the **City**, in any way connected with or arising out of this **Contract** (including those as to which details may have been furnished pursuant to Articles 11, 27, 28, and 30) setting forth with respect to each such claim the total amount thereof, the various items of labor and materials included therein, and the alleged value of each item; and if the alleged claim be one for delay, the alleged cause of each such delay, the period or periods of time, giving the dates when the

Contractor claims the performance of the **Work** or a particular part thereof was delayed, and an itemized statement and breakdown of the amount claimed for each such delay.

44.1.1(a) With respect to each such claim, the **Commissioner**, the **Comptroller** and, in the event of litigation, the **City** Corporation Counsel shall have the same right to inspect, and to make extracts or copies of, the **Contractor's** books, vouchers, records, etc., as is referred to in Articles 11, 27, 28, and 30. Nothing contained in this Article 44.1.1(a) is intended to or shall relieve the **Contractor** from the obligation of complying strictly with Articles 11, 27, 28, and 30. The **Contractor** is warned that unless such claims are completely set forth as herein required, the **Contractor** upon acceptance of the **Substantial Completion** payment pursuant to this Article 44, will have waived any such claims.

44.1.2 A **Final Approved Punch List**.

44.1.3 Where required, a request for an extension of time to achieve **Substantial Completion** or final extension of time.

44.2 The **Commissioner** shall issue a voucher calling for payment of any part or all of the balance due for **Work** performed under the **Contract**, including monies retained under Article 21, less any and all deductions authorized to be made by the **Commissioner**, under this **Contract** or by **Law**, and less twice the amount the **Commissioner** considers necessary to ensure the completion of the balance of the **Work** by the **Contractor**. Such a payment shall be considered a partial and not a final payment. No **Substantial Completion** payment shall be made under this Article 44 where the **Contractor** failed to complete the **Work** within the time fixed for such completion in the Schedule A of the General Conditions, or within the time to which completion may have been extended, until an extension or extensions of time for the completion of **Work** have been acted upon pursuant to Article 13.

44.3 No further partial payments shall be made to the **Contractor** after **Substantial Completion**, except the **Substantial Completion** payment and payment pursuant to any **Contractor's** requisition that were properly filed with the **Commissioner** prior to the date of **Substantial Completion**; however, the **Commissioner** may grant a waiver for further partial payments after the date of **Substantial Completion** to permit payments for change order **Work** and/or release of retainage and deposits pursuant to Articles 21 and 24. Such waiver shall be in writing.

44.4 The **Contractor** acknowledges that nothing contained in this Article 44 is intended to or shall in any way diminish the force and effect of Article 13.

ARTICLE 45. FINAL PAYMENT

45.1 After completion and **Final Acceptance** of the **Work**, the **Contractor** shall submit all required certificates and documents, together with a requisition for the balance claimed to be due under the **Contract**, less the amount authorized to be retained for maintenance under Article 24. Such submission shall be within 90 days of the date of the **Commissioner's** written determination of **Final Acceptance**, or within such additional time as may be granted by the **Commissioner** in writing. If the **Contractor** fails to submit all required certificates and documents within the time allowed, no payment of the balance claimed shall be made to the **Contractor** and the **Contractor** shall be deemed to have forfeited its right to payment of any balance claimed. A verified statement similar to that required in connection with applications for partial payments shall also be submitted to the **Commissioner**.

45.2 Amended Verified Statement of Claims: The **Contractor** shall also submit with the final requisition any amendments to the final verified statement of any pending dispute resolution procedures in accordance with the **PPB** Rules and this **Contract** and any and all alleged claims against the **City**, in any way connected with or arising out of this **Contract** (including those as to which details may have been furnished pursuant to Articles 11, 27, 28, and 30) that have occurred subsequent to **Substantial Completion**, setting forth with respect to each such claim the total amount thereof, the various items of labor and materials included therein, and the alleged value of each such item; and if the alleged claim be one for delay, the alleged cause of each such delay, the period or periods of time, giving the dates when the **Contractor** claims the performance of the **Work** or a particular part thereof was delayed, and an itemized statement and breakdown of the amount claimed for each such delay. With reference to each such claim, the **Commissioner**, the **Comptroller** and, in the event of litigation, the **City** Corporation Counsel shall have the same right to inspect, and to make extracts or copies of, the **Contractor's** books, vouchers, records, etc., as is referred to in Articles 11, 27, 28, and 30. Nothing contained in this Article 45.2, is intended to or shall relieve the **Contractor** from the obligation of complying strictly with Articles 11, 27, 28, and 30. The **Contractor** is warned that unless such claims are completely set forth as herein required, the **Contractor**, upon acceptance of the Final Payment pursuant to Article 46, will have waived any such claims.

45.3 Preparation of Final Voucher: Upon determining the balance due hereunder other than on account of claims, the **Engineer** will prepare and certify, for the Commissioner's approval, a voucher for final payment in that amount less any and all deductions authorized to be made by the **Commissioner** under this **Contract** or by **Law**. In the case of a lump sum **Contract**, the **Commissioner** shall certify the voucher for final payment within thirty (30) **Days** from the date of completion and acceptance of the **Work**, provided all requests for extensions of time have been acted upon.

45.3.1 All prior certificates and vouchers upon which partial payments were made, being merely estimates made to enable the **Contractor** to prosecute the **Work** more advantageously, shall be subject to correction in the final voucher, and the certification of the **Engineer** thereon and the approval of the **Commissioner** thereof, shall be conditions precedent to the right of the **Contractor** to receive any money hereunder. Such final voucher shall be binding and conclusive upon the **Contractor**.

45.3.2 Payment pursuant to such final voucher, less any deductions authorized to be made by the **Commissioner** under this **Contract** or by **Law**, shall constitute the final payment, and shall be made by the **Comptroller** within thirty (30) **Days** after the filing of such voucher in his/her office.

45.4 The **Contractor** acknowledges that nothing contained in this Article 45 is intended to or shall in any way diminish the force and effect of Article 13.

ARTICLE 46. ACCEPTANCE OF FINAL PAYMENT

46.1 The acceptance by the **Contractor**, or by anyone claiming by or through it, of the final payment, whether such payment be made pursuant to any judgment of any court, or otherwise, shall constitute and operate as a release of the **City** from any and all claims of and liability to the **Contractor** for anything heretofore done or furnished for the **Contractor** relating to or arising out of this **Contract** and the **Work** done hereunder, and for any prior act, neglect or default on the part of the **City** or any of its officials, agents or employees, excepting only a claim against the **City** for the amounts deducted or retained in accordance with the terms and provisions of this **Contract** or by **Law**, and excepting any claims, not otherwise waived, or any pending dispute resolution procedures which are contained in the

verified statement filed with the **Contractor's** substantial and final requisitions pursuant to Articles 44 and 45.

46.2 The **Contractor** is warned that the execution by it of a release, in connection with the acceptance of the final payment, containing language purporting to reserve claims other than those herein specifically excepted from the operation of this Article 46, or those for amounts deducted by the **Commissioner** from the final requisition or from the final payment as certified by the **Engineer** and approved by the **Commissioner**, shall not be effective to reserve such claims, anything stated to the **Contractor** orally or in writing by any official, agent or employee of the **City** to the contrary notwithstanding.

46.3 Should the **Contractor** refuse to accept the final payment as tendered by the **Comptroller**, it shall constitute a waiver of any right to interest thereon.

46.4 The **Contractor**, however, shall not be barred by this Article 46 from commencing an action for breach of **Contract** to the extent permitted by **Law** and by the terms of the **Contract** for any claims that are contained in the verified statement filed with the **Contractor's** substantial and final requisitions pursuant to Articles 44 and 45 or that arose after submission of the final payment requisition, provided that a detailed and verified statement of claim is served upon the contracting **Agency** and **Comptroller** not later than forty (40) **Days** after the making of such final payment by electronic funds transfer (EFT) or the mailing of such final payment. The statement shall specify the items upon which the claim will be based and any such claim shall be limited to such items.

ARTICLE 47. APPROVAL BY PUBLIC DESIGN COMMISSION

47.1 All works of art, including paintings, mural decorations, stained glass, statues, bas-reliefs, and other sculptures, monuments, fountains, arches, and other structures of a permanent character intended for ornament or commemoration, and every design of the same to be used in the performance of this **Contract**, and the design of all bridges, approaches, buildings, gates, fences, lamps, or structures to be erected, pursuant to the terms of this **Contract**, shall be submitted to the Art Commission, d/b/a the Public Design Commission of the City of New York, and shall be approved by the Public Design Commission prior to the erection or placing in position of the same. The final payment shall not become due or payable under this **Contract** unless and until the Public Design Commission shall certify that the design for the **Work** herein contracted for has been approved by the said Public Design Commission, and that the same has been executed in substantial accordance with the design so approved, pursuant to the provisions of Chapter 37, Section 854 of the **City** Charter, as amended.

CHAPTER X: CONTRACTOR'S DEFAULT

ARTICLE 48. COMMISSIONER'S RIGHT TO DECLARE CONTRACTOR IN DEFAULT

48.1 In addition to those instances specifically referred to in other Articles herein, the **Commissioner** shall have the right to declare the **Contractor** in default of this **Contract** if:

48.1.1 The **Contractor** fails to commence **Work** when notified to do so by the **Commissioner**; or if

48.1.2 The **Contractor** shall abandon the **Work**; or if

48.1.3 The **Contractor** shall refuse to proceed with the **Work** when and as directed by the **Commissioner**; or if

48.1.4 The **Contractor** shall, without just cause, reduce its working force to a number which, if maintained, would be insufficient, in the opinion of the **Commissioner**, to complete the **Work** in accordance with the progress schedule; or if

48.1.5 The **Contractor** shall fail or refuse to increase sufficiently such working force when ordered to do so by the **Commissioner**; or if

48.1.6 The **Contractor** shall sublet, assign, transfer, convert or otherwise dispose of this **Contract** other than as herein specified; or sell or assign a majority interest in the **Contractor**; or if

48.1.7 The **Contractor** fails to secure and maintain all required insurance; or if

48.1.8 A receiver or receivers are appointed to take charge of the **Contractor's** property or affairs; or if

48.1.9 The **Commissioner** shall be of the opinion that the **Contractor** is or has been unnecessarily or unreasonably or willfully delaying the performance and completion of the **Work**, or the award of necessary subcontracts, or the placing of necessary material and equipment orders; or if

48.1.10 The **Commissioner** shall be of the opinion that the **Contractor** is or has been willfully or in bad faith violating any of the provisions of this **Contract**; or if

48.1.11 The **Commissioner** shall be of the opinion that the **Work** cannot be completed within the time herein provided therefor or within the time to which such completion may have been extended; provided, however, that the impossibility of timely completion is, in the **Commissioner's** opinion, attributable to conditions within the **Contractor's** control; or if

48.1.12 The **Work** is not completed within the time herein provided therefor or within the time to which the **Contractor** may be entitled to have such completion extended; or if

48.1.13 Any statement or representation of the **Contractor** in the **Contract** or in any document submitted by the **Contractor** with respect to the **Work**, the **Project**, or the **Contract** (or for purposes of securing the **Contract**) was untrue or incorrect when made; or if

48.1.14 The **Contractor** or any of its officers, directors, partners, five (5%) percent shareholders, principals, or other persons substantially involved in its activities, commits any of the acts or omissions specified as the grounds for debarment in the **PPB** Rules.

48.2 Before the **Commissioner** shall exercise his/her right to declare the **Contractor** in default, the **Commissioner** shall give the **Contractor** an opportunity to be heard, upon not less than two (2) **Days'** notice.

ARTICLE 49. EXERCISE OF THE RIGHT TO DECLARE DEFAULT

49.1 The right to declare the **Contractor** in default for any of the grounds specified or referred to in Article 48 shall be exercised by sending the **Contractor** a notice, signed by the **Commissioner**, setting forth the ground or grounds upon which such default is declared (hereinafter referred to as a "Notice of Default").

49.2 The **Commissioner's** determination that the **Contractor** is in default shall be conclusive, final, and binding on the parties and such a finding shall preclude the **Contractor** from commencing a plenary action for any damages relating to the **Contract**. If the **Contractor** protests the determination of the **Commissioner**, the **Contractor** may commence an action in a court of competent jurisdiction of the State of New York under Article 78 of the New York Civil Practice Law and Rules.

ARTICLE 50. QUITTING THE SITE

50.1 Upon receipt of such notice the **Contractor** shall immediately discontinue all further operations under this **Contract** and shall immediately quit the **Site**, leaving untouched all plant, materials, equipment, tools, and supplies then on the **Site**.

ARTICLE 51. COMPLETION OF THE WORK

51.1 The **Commissioner**, after declaring the **Contractor** in default, may then have the **Work** completed by such means and in such manner, by contract with or without public letting, or otherwise, as he/she may deem advisable, utilizing for such purpose such of the **Contractor's** plant, materials, equipment, tools, and supplies remaining on the **Site**, and also such **Subcontractors**, as he/she may deem advisable.

51.2 After such completion, the **Commissioner** shall make a certificate stating the expense incurred in such completion, which shall include the cost of re-letting and also the total amount of liquidated damages (at the rate provided for in the **Contract**) from the date when the **Work** should have been completed by the **Contractor** in accordance with the terms hereof to the date of actual completion of the **Work**. Such certificate shall be binding and conclusive upon the **Contractor**, its sureties, and any person claiming under the **Contractor**, as to the amount thereof.

51.3 The expense of such completion, including any and all related and incidental costs, as so certified by the **Commissioner**, and any liquidated damages assessed against the **Contractor**, shall be charged against and deducted out of monies which are earned by the **Contractor** prior to the date of default. Should the expense of such completion, as certified by the **Commissioner**, exceed the total sum which would have been payable under the **Contract** if it had been completed by the **Contractor**, any excess shall be paid by the **Contractor**.

ARTICLE 52. PARTIAL DEFAULT

52.1 In case the **Commissioner** shall declare the **Contractor** in default as to a part of the **Work** only, the **Contractor** shall discontinue such part, shall continue performing the remainder of the **Work** in strict conformity with the terms of this **Contract**, and shall in no way hinder or interfere with any **Other Contractor(s)** or persons whom the **Commissioner** may engage to complete the **Work** as to which the **Contractor** was declared in default.

52.2 The provisions of this Chapter relating to declaring the **Contractor** in default as to the entire **Work** shall be equally applicable to a declaration of partial default, except that the **Commissioner** shall be entitled to utilize for completion of the part of the **Work** as to which the **Contractor** was declared in default only such plant, materials, equipment, tools, and supplies as had been previously used by the **Contractor** on such part.

ARTICLE 53. PERFORMANCE OF UNCOMPLETED WORK

53.1 In completing the whole or any part of the **Work** under the provisions of this Chapter X, the **Commissioner** shall have the power to depart from or change or vary the terms and provisions of this **Contract**, provided, however, that such departure, change or variation is made for the purpose of reducing the time or expense of such completion. Such departure, change or variation, even to the extent of accepting a lesser or different performance, shall not affect the conclusiveness of the **Commissioner's** certificate of the cost of completion referred to in Article 51, nor shall it constitute a defense to an action to recover the amount by which such certificate exceeds the amount which would have been payable to the **Contractor** hereunder but for its default.

ARTICLE 54. OTHER REMEDIES

54.1 In addition to the right to declare the **Contractor** in default pursuant to this Chapter X, the **Commissioner** shall have the absolute right, in his/her sole discretion and without a hearing, to complete or cause to be completed in the same manner as described in Articles 51 and 53, any or all unsatisfactory or uncompleted punch list **Work** that remains after the completion date specified in the **Final Approved Punch List**. A written notice of the exercise of this right shall be sent to the **Contractor** who shall immediately quit the **Site** in accordance with the provisions of Article 50.

54.2 The expense of completion permitted under Article 54.1, including any and all related and incidental costs, as so certified by the **Commissioner**, shall be charged against and deducted out of monies which have been earned by the **Contractor** prior to the date of the exercise of the right set forth in Article 54.1; the balance of such monies, if any, subject to the other provisions of this **Contract**, to be paid to the **Contractor** without interest after such completion. Should the expense of such completion, as certified by the **Commissioner**, exceed the total sum which would have been payable under the **Contract** if it had been completed by the **Contractor**, any excess shall be paid by the **Contractor**.

54.3 The previous provisions of this Chapter X shall be in addition to any and all other remedies available under **Law** or in equity.

54.4 The exercise by the **City** of any remedy set forth herein shall not be deemed a waiver by the **City** of any other legal or equitable remedy contained in this **Contract** or provided under **Law**.

CHAPTER XI: MISCELLANEOUS PROVISIONS

ARTICLE 55. CONTRACTOR'S WARRANTIES

55.1 In consideration of, and to induce, the award of this **Contract** to the **Contractor**, the **Contractor** represents and warrants:

55.1.1 That it is financially solvent, sufficiently experienced and competent to perform the **Work**; and

55.1.2 That the facts stated in its bid and the information given by it pursuant to the Information for Bidders is true and correct in all respects; and

55.1.3 That it has read and complied with all requirements set forth in the **Contract**.

ARTICLE 56. CLAIMS AND ACTIONS THEREON

56.1 Any claim, that is not subject to dispute resolution under the **PPB** Rules or this **Contract**, against the **City** for damages for breach of **Contract** shall not be made or asserted in any action, unless the **Contractor** shall have strictly complied with all requirements relating to the giving of notice and of information with respect to such claims, as herein before provided.

56.2 Nor shall any action be instituted or maintained on any such claims unless such action is commenced within six (6) months after **Substantial Completion**; except that:

56.2.1 Any claims arising out of events occurring after **Substantial Completion** and before **Final Acceptance** of the **Work** shall be asserted within six (6) months of **Final Acceptance** of the **Work**;

56.2.2 If the **Commissioner** exercises his/her right to complete or cause to complete any or all unsatisfactory or uncompleted punch list **Work** that remains after the completion date specified in the **Final Approved Punch List** pursuant to Article 54, any such action shall be commenced within six (6) months from the date the **Commissioner** notifies the **Contractor** in writing that he/she has exercised such right. Any claims for monies deducted, retained or withheld under the provisions of this **Contract** shall be asserted within six (6) months after the date when such monies otherwise become due and payable hereunder; and

56.2.3 If the **Commissioner** exercises his/her right to terminate the **Contract** pursuant to Article 64, any such action shall be commenced within six (6) months of the date the **Commissioner** exercises said right.

ARTICLE 57. INFRINGEMENT

57.1 The **Contractor** shall be solely responsible for and shall defend, indemnify, and hold the **City** harmless from any and all claims (even if the allegations of the lawsuit are without merit) and judgments for damages and from costs and expenses to which the **City** may be subject to or which it may suffer or incur allegedly arising out of or in connection with any infringement by the **Contractor** of any copyright, trade secrets, trademark or patent rights or any other property or personal right of any third party by the **Contractor** and/or its **Subcontractors** in the performance or completion of the **Work**. Insofar as the facts or **Law** relating to any claim would preclude the **City** from being completely indemnified by the **Contractor**, the **City** shall be partially indemnified by the **Contractor** to the fullest extent permitted by **Law**.

ARTICLE 58. NO CLAIM AGAINST OFFICIALS, AGENTS OR EMPLOYEES

58.1 No claim whatsoever shall be made by the **Contractor** against any official, agent or employee of the **City** for, or on account of, anything done or omitted to be done in connection with this **Contract**.

ARTICLE 59. SERVICE OF NOTICES

59.1 The **Contractor** hereby designates the business address, fax number, and email address specified in its bid, as the place where all notices, directions or other communications to the **Contractor** may be delivered, or to which they may be mailed. Any notice, direction, or communication from either party to the other shall be in writing and shall be deemed to have been given when (i) delivered personally; (ii) sent by certified mail, return receipt requested; (iii) delivered by overnight or same day courier service in a properly addressed envelope with confirmation; or (iv) sent by fax or email and, unless receipt of the fax or e-mail is acknowledged by the recipient by fax or e-mail, deposited in a post office box regularly maintained by the United States Postal Service in a properly addressed, postage pre-paid envelope.

59.2 **Contractor's** notice address, email address, or fax number may be changed at any time by an instrument in writing, executed and acknowledged by the **Contractor**, and delivered to the **Commissioner**.

59.3 Nothing herein contained shall, however, be deemed to preclude or render inoperative the service of any notice, direction or other communication upon the **Contractor** personally, or, if the **Contractor** is a corporation, upon any officer thereof.

ARTICLE 60. UNLAWFUL PROVISIONS DEEMED STRICKEN FROM CONTRACT

60.1 If this **Contract** contains any unlawful provision not an essential part of the **Contract** and which shall not appear to have been a controlling or material inducement to the making thereof, the same shall be deemed of no effect and shall, upon notice by either party, be deemed stricken from the **Contract** without affecting the binding force of the remainder.

ARTICLE 61. ALL LEGAL PROVISIONS DEEMED INCLUDED

61.1 It is the intent and understanding of the parties to this **Contract** that each and every provision of **Law** required to be inserted in this **Contract** shall be and is inserted herein. Furthermore, it is hereby stipulated that every such provision is to be deemed to be inserted herein, and if, through mistake or otherwise, any such provision is not inserted, or is not inserted in correct form, then this **Contract** shall forthwith upon the application of either party be amended by such insertion so as to comply strictly with the **Law** and without prejudice to the rights of either party hereunder.

ARTICLE 62. TAX EXEMPTION

62.1 The **City** is exempt from payment of Federal, State, and local taxes, including sales and compensating use taxes of the State of New York and its cities and counties on all tangible personal property sold to the **City** pursuant to the provisions of this **Contract**. These taxes are not to be included in bids. However, this exemption does not apply to tools, machinery, equipment or other property leased by or to the **Contractor**, **Subcontractor** or **Materialman** or to tangible personal property which, even

though it is consumed, is not incorporated into the completed **Work** (consumable supplies) and tangible personal property that the **Contractor** is required to remove from the **Site** during or upon completion of the **Work**. The **Contractor** and its **Subcontractors** and **Materialmen** shall be responsible for and pay any and all applicable taxes, including sales and compensating use taxes, on such leased tools, machinery, equipment or other property and upon all such consumable supplies and tangible personal property that the **Contractor** is required to remove from the **Site** during or upon completion of the **Work**.

62.2 The **Contractor** agrees to sell and the **City** agrees to purchase all tangible personal property, other than consumable supplies and other tangible personal property that the **Contractor** is required to remove from the **Site** during or upon completion of the **Work**, that is required, necessary or proper for or incidental to the construction of the **Project** covered by this **Contract**. The sum paid under this **Contract** for such tangible personal property shall be in full payment and consideration for the sale of such tangible personal property.

62.2.1 The **Contractor** agrees to construct the **Project** and to perform all **Work**, labor and services rendered, necessary, proper or incidental thereto for the sum shown in the bid for the performance of such **Work**, labor, and services, and the sum so paid pursuant to this **Contract** for such **Work**, labor, and services, shall be in full consideration for the performance by the **Contractor** of all its duties and obligations under this **Contract** in connection with said **Work,** labor, and services.

62.3 20 NYCRR Section 541.3(d) provides that a **Contractor**'s purchases of tangible personal property that is either incorporated into real property owned by a governmental entity or purchased for and sold to a governmental entity are exempt from sales and use tax. The **City** shall not pay sales tax for any such tangible personal property that it purchases from the **Contractor** pursuant to the **Contract.** With respect to such tangible personal property, the **Contractor**, at the request of the **City**, shall furnish to the **City** such bills of sale and other instruments as may be required by the **City**, properly executed, acknowledged and delivered assuring to the **City** title to such tangible personal property, free of liens and/or encumbrances, and the **Contractor** shall mark or otherwise identify all such tangible personal property as the property of the **City**.

62.4 Title to all tangible personal property to be sold by the **Contractor** to the **City** pursuant to the provisions of the **Contract** shall immediately vest in and become the sole property of the **City** upon delivery of such tangible personal property to the **Site**. Notwithstanding such transfer of title, the **Contractor** shall have the full and continuing responsibility to install such tangible personal property in accordance with the provisions of this **Contract**, protect it, maintain it in a proper condition and forthwith repair, replace and make good any damage thereto, theft or disappearance thereof, and furnish additional tangible personal property in place of any that may be lost, stolen or rendered unusable, without cost to the **City**, until such time as the **Work** covered by the **Contract** is fully accepted by the **City**. Such transfer of title shall in no way affect any of the **Contractor's** obligations hereunder. In the event that, after title has passed to the **City**, any of the tangible personal property is rejected as being defective or otherwise unsatisfactory, title to all such tangible personal property shall be deemed to have been transferred back to the **Contractor**.

62.5 The purchase by **Subcontractors** or **Materialmen** of tangible personal property to be sold hereunder shall be a purchase or procurement for resale to the **Contractor** (either directly or through other **Subcontractors**) and therefore not subject to the aforesaid sales and compensating use taxes, provided that the subcontracts and purchase agreements provide for the resale of such tangible personal property and that such subcontracts and purchase agreements are in a form similar to this **Contract** with respect to the separation of the sale of consumable supplies and tangible personal property that the

Contractor is required to remove from the **Site** during or upon completion of the **Work** from the **Work** and labor, services, and any other matters to be provided, and provided further that the subcontracts and purchase agreements provide separate prices for tangible personal property and all other services and matters. Such separation shall actually be followed in practice, including the separation of payments for tangible personal property from the payments for other **Work** and labor and other things to be provided.

62.6 The **Contractor** and its **Subcontractors** and **Materialmen** shall furnish a **Contractor** Exempt Purchase Certificate to all persons, firms or corporations from which they purchase tangible personal property for the performance of the **Work** covered by this **Contract**.

62.7 In the event any of the provisions of this Article 62 shall be deemed to be in conflict with any other provisions of this **Contract** or create any ambiguity, then the provisions of this Article 62 shall control.

ARTICLE 63. INVESTIGATION(S) CLAUSE

63.1 The parties to this **Contract** agree to cooperate fully and faithfully with any investigation, audit or inquiry conducted by a United States, a State of New York (State) or a **City** governmental agency or authority that is empowered directly or by designation to compel the attendance of witnesses and to examine witnesses under oath, or conducted by the Inspector General of a governmental agency that is a party in interest to the transaction, submitted bid, submitted proposal, contract, lease, permit or license that is the subject of the investigation, audit or inquiry.

63.2 If any person who has been advised that his/her statement, and any information from such statement, will not be used against him/her in any subsequent criminal proceeding refuses to testify before a grand jury or other governmental agency or authority empowered directly or by designation to compel the attendance of witnesses and to examine witnesses under oath concerning the award of or performance under any transaction, agreement, lease, permit, contract, or license entered into with the **City**, the State, or any political subdivision or public authority thereof, or the Port Authority of New York and New Jersey, or any local development corporation within the **City**, or any public benefit corporation organized under the **Laws** of the State of New York, or;

63.3 If any person refuses to testify for a reason other than the assertion of his/her privilege against self incrimination in an investigation, audit or inquiry conducted by a **City** or State governmental agency or authority empowered directly or by designation to compel the attendance of witnesses and to take testimony under oath, or by the Inspector General of the governmental agency that is a party in interest in, and is seeking testimony concerning the award of, or performance under any transaction, agreement, lease, permit, contract, or license entered into with the **City**, the State, or any political subdivision thereof or any local development corporation within the **City**, then;

63.4 The **Commissioner** whose **Agency** is a party in interest to the transaction, submitted bid, submitted proposal, contract, lease, permit, or license shall convene a hearing, upon not less than five (5) **Days**' written notice to the parties involved to determine if any penalties should attach for the failure of a person to testify.

63.5 If any non-governmental party to the hearing requests an adjournment, the **Commissioner** who convened the hearing may, upon granting the adjournment, suspend any contract, lease, permit, or license, pending the final determination pursuant to Article 63.7 without the **City** incurring any penalty or damages for delay or otherwise.

63.6 The penalties which may attach after a final determination by the **Commissioner** may include but shall not exceed:

63.6.1 The disqualification for a period not to exceed five (5) years from the date of an adverse determination for any person, or any entity of which such person was a member at the time the testimony was sought, from submitting bids for, or transacting business with, or entering into or obtaining any contract, lease, permit or license with or from the **City**; and/or

63.6.2 The cancellation or termination of any and all such existing **City** contracts, leases, permits or licenses that the refusal to testify concerns and that have not been assigned as permitted under this **Contract**, nor the proceeds of which pledged, to an unaffiliated and unrelated institutional lender for fair value prior to the issuance of the notice scheduling the hearing, without the **City** incurring any penalty or damages on account of such cancellation or termination; monies lawfully due for goods delivered, work done, rentals, or fees accrued prior to the cancellation or termination shall be paid by the **City**.

63.7 The **Commissioner** shall consider and address in reaching his/her determination and in assessing an appropriate penalty the factors in Articles 63.7.1 and 63.7.2. The **Commissioner** may also consider, if relevant and appropriate, the criteria established in Articles 63.7.3 and 63.7.4, in addition to any other information which may be relevant and appropriate:

63.7.1 The party's good faith endeavors or lack thereof to cooperate fully and faithfully with any governmental investigation or audit, including but not limited to the discipline, discharge, or disassociation of any person failing to testify, the production of accurate and complete books and records, and the forthcoming testimony of all other members, agents, assignees or fiduciaries whose testimony is sought.

63.7.2 The relationship of the person who refused to testify to any entity that is a party to the hearing, including but not limited to, whether the person whose testimony is sought has an ownership interest in the entity and/or the degree of authority and responsibility the person has within the entity.

63.7.3 The nexus of the testimony sought to the subject entity and its contracts, leases, permits or licenses with the **City**.

63.7.4 The effect a penalty may have on an unaffiliated and unrelated party or entity that has a significant interest in an entity subject to penalties under Article 63.6, provided that the party or entity has given actual notice to the **Commissioner** upon the acquisition of the interest, or at the hearing called for in Article 63.4, gives notice and proves that such interest was previously acquired. Under either circumstance the party or entity shall present evidence at the hearing demonstrating the potential adverse impact a penalty will have on such person or entity.

63.8 Definitions:

63.8.1 The term "license" or "permit" as used in this Article 63 shall be defined as a license, permit, franchise or concession not granted as a matter of right.

63.8.2 The term "person" as used in this Article 63 shall be defined as any natural person doing business alone or associated with another person or entity as a partner, director, officer, principal or employee.

63.8.3 The term "entity" as used in this Article 63 shall be defined as any firm, partnership, corporation, association, joint venture, or person that receives monies, benefits, licenses, leases, or permits from or through the **City** or otherwise transacts business with the **City**.

63.8.4 The term "member" as used in this Article 63 shall be defined as any person associated with another person or entity as a partner, director, officer, principal or employee.

63.9 In addition to and notwithstanding any other provision of this **Contract**, the **Commissioner** may in his/her sole discretion terminate this **Contract** upon not less than three (3) **Days'** written notice in the event the **Contractor** fails to promptly report in writing to the **Commissioner** of the Department of Investigations ("DOI") of the **City** any solicitation of money, goods, requests for future employment or other benefit or thing of value, by or on behalf of any employee of the **City** or other person, firm, corporation or entity for any purpose which may be related to the procurement or obtaining of this **Contract** by the **Contractor**, or affecting the performance of this **Contract**.

ARTICLE 64. TERMINATION BY THE CITY

64.1 In addition to termination pursuant to any other article of this **Contract**, the **Commissioner** may, at any time, terminate this **Contract** by written notice to the **Contractor**. In the event of termination, the **Contractor** shall, upon receipt of such notice, unless otherwise directed by the **Commissioner**:

64.1.1 Stop **Work** on the date specified in the notice;

64.1.2 Take such action as may be necessary for the protection and preservation of the **City's** materials and property;

64.1.3 Cancel all cancelable orders for material and equipment;

64.1.4 Assign to the **City** and deliver to the **Site** or another location designated by the **Commissioner**, any non-cancelable orders for material and equipment that is not capable of use except in the performance of this **Contract** and has been specifically fabricated for the sole purpose of this **Contract** and not incorporated in the **Work**;

64.1.5 Take no action which will increase the amounts payable by the **City** under this **Contract**.

64.2 In the event of termination by the **City** pursuant to this Article 64, payment to the **Contractor** shall be in accordance with Articles 64.2.1, 64.2.2 or 64.2.3, to the extent that each respective article applies.

64.2.1 Lump Sum Contracts or Items: On all lump sum **Contracts**, or on lump sum items in a **Contract**, the **City** will pay the **Contractor** the sum of the amounts described in Articles 64.2.1(a) and 64.2.1(b), less all payments previously made pursuant to this **Contract**. On lump sum **Contracts** only, the **City** will also pay the **Contractor** an additional sum as provided in Article 64.2.1(c).

64.2.1(a) For **Work** completed prior to the notice of termination, the **Contractor** shall be paid a pro rata portion of the lump sum bid amount, plus approved change orders, based upon the percent completion of the **Work**, as determined by the

Commissioner. For the purpose of determining the pro rata portion of the lump sum bid amount to which the **Contractor** is entitled, the bid breakdown submitted in accordance with Article 41 shall be considered, but shall not be dispositive. The **Commissioner's** determination hereunder shall be final, binding, and conclusive.

64.2.1(b) For non-cancelable material and equipment that is not capable of use except in the performance of this **Contract** and has been specifically fabricated for the sole purpose of this **Contract**, but not yet incorporated in the **Work**, the **Contractor** shall be paid the lesser of the following, less salvage value:

64.2.1(b)(i) The Direct Cost, as defined in Article 64.2.4; or

64.2.1(b)(ii) The fair and reasonable value, if less than Direct Cost, of such material and equipment, plus necessary and reasonable delivery costs.

64.2.1(b)(iii) In addition, the **Contractor** shall be paid five (5%) percent of the amount described in Article 64.2.1(b)(i) or Article 64.2.1(b)(ii), whichever applies.

64.2.1(c) Except as otherwise provided in Article 64.2.1(d), on all lump sum **Contracts**, the **Contractor** shall be paid the percentage indicated below applied to the difference between the total lump sum bid amount and the total of all payments made prior to the notice of termination plus all payments allowed pursuant to Articles 64.2.1(a) and 64.2.1(b):

64.2.1(c)(i) Five (5%) percent of the first five million ($5,000,000) dollars; and

64.2.1(c)(ii) Three (3%) percent of any amount between five million ($5,000,000) dollars and fifteen million ($15,000,000) dollars; plus

64.2.1(c)(iii) One (1%) percent of any amount over fifteen million ($15,000,000) dollars.

64.2.1(d) In the event the **City** terminates a lump sum **Contract** pursuant to this Article 64 within ninety (90) **Days** after registration of the **Contract** with the **Comptroller**, the **Contractor** shall be paid one (1%) percent of the difference between the lump sum bid amount and the total of all payments made pursuant to this Article 64.2.

64.2.2 Unit Price Contracts or Items: On all unit price **Contracts**, or on unit price items in a **Contract**, the **City** will pay the **Contractor** the sum of the amounts described in Articles 64.2.2(a) and 64.2.2(b), less all payments previously made pursuant to this **Contract**:

64.2.2(a) For all completed units, the unit price stated in the **Contract**, and

64.2.2(b) For units that have been ordered but are only partially completed, the **Contractor** will be paid:

64.2.2(b)(i) A pro rata portion of the unit price stated in the **Contract** based upon the percent completion of the unit and

64.2.2(b)(ii) For non-cancelable material and equipment, payment will be made pursuant to Article 64.2.1(b).

64.2.3 Time and Materials Contracts or Items Based on Time and Material Records: On all **Contracts** or items in a **Contract** where payment for the **Work** is based on time and material records, the **Contractor** shall be paid in accordance with Article 26, less all payments previously made pursuant to this **Contract**.

64.2.4 Direct Costs: Direct Costs as used in this Article 64.2 shall mean:

64.2.4(a) The actual purchase price of material and equipment, plus necessary and reasonable delivery costs,

64.2.4(b) The actual cost of labor involved in construction and installation at the **Site**, and

64.2.4(c) The actual cost of necessary bonds and insurance purchased pursuant to requirements of this **Contract** less any amounts that have been or should be refunded by the **Contractor's** sureties or insurance carriers.

64.2.4(d) Direct Costs shall not include overhead.

64.3 In no event shall any payments under this Article 64 exceed the **Contract** price for such items.

64.4 All payments pursuant to Article 64 shall be in the nature of liquidated damages and shall be accepted by the **Contractor** in full satisfaction of all claims against the **City**.

64.5 The **City** may deduct or set off against any sums due and payable pursuant to this Article 64, any deductions authorized by this **Contract** or by **Law** (including but not limited to liquidated damages) and any claims it may have against the **Contractor**. The **City's** exercise of the right to terminate the **Contract** pursuant to this Article 64 shall not impair or otherwise effect the **City's** right to assert any claims it may have against the **Contractor** in a plenary action.

64.6 Where the **Work** covered by the **Contract** has been substantially completed, as determined in writing by the **Commissioner**, termination of the **Work** shall be handled as an omission of **Work** pursuant to Articles 29 and 33, in which case a change order will be issued to reflect an appropriate reduction in the **Contract** sum, or if the amount is determined after final payment, such amount shall be paid by the **Contractor**.

ARTICLE 65. CHOICE OF LAW, CONSENT TO JURISDICTION AND VENUE

65.1 This **Contract** shall be deemed to be executed in the **City** regardless of the domicile of the **Contractor**, and shall be governed by and construed in accordance with the **Laws** of the State of New York and the **Laws** of the United States, where applicable.

65.2 The parties agree that any and all claims asserted against the **City** arising under this **Contract** or related thereto shall be heard and determined in the courts of the State of New York ("New York State Courts") located in the **City** and County of New York. To effect this **Contract** and intent, the **Contractor** agrees:

65.2.1 If the **City** initiates any action against the **Contractor** in Federal court or in a New York State Court, service of process may be made on the **Contractor** either in person, wherever such **Contractor** may be found, or by registered mail addressed to the **Contractor** at its address as set forth in this **Contract**, or to such other address as the **Contractor** may provide to the **City** in writing; and

65.2.2 With respect to any action between the **City** and the **Contractor** in a New York State Court, the **Contractor** hereby expressly waives and relinquishes any rights it might otherwise have:

65.2.2(a) To move to dismiss on grounds of forum non conveniens;

65.2.2(b) To remove to Federal Court; and

65.2.2(c) To move for a change of venue to a New York State Court outside New York County.

65.2.3 With respect to any action brought by the **City** against the **Contractor** in a Federal Court located in the **City**, the **Contractor** expressly waives and relinquishes any right it might otherwise have to move to transfer the action to a Federal Court outside the **City**.

65.2.4 If the **Contractor** commences any action against the **City** in a court located other than in the **City** and County of New York, upon request of the **City**, the **Contractor** shall either consent to a transfer of the action to a New York State Court of competent jurisdiction located in the **City** and County of New York or, if the Court where the action is initially brought will not or cannot transfer the action, the **Contractor** shall consent to dismiss such action without prejudice and may thereafter reinstate the action in a New York State Court of competent jurisdiction in New York County.

65.3 If any provision(s) of this Article 65 is held unenforceable for any reason, each and all other provision(s) shall nevertheless remain in full force and effect.

ARTICLE 66. PARTICIPATION IN AN INTERNATIONAL BOYCOTT

66.1 The **Contractor** agrees that neither the **Contractor** nor any substantially owned affiliated company is participating or shall participate in an international boycott in violation of the provisions of the Federal Export Administration Act of 1979, as amended, or the regulations of the United States Department of Commerce (Commerce Department) promulgated thereunder.

66.2 Upon the final determination by the Commerce Department or any other agency of the United States as to, or conviction of the **Contractor** or a substantially-owned affiliated company thereof for participation in an international boycott in violation of the provisions of the Export Administration Act of 1979, as amended, or the regulations promulgated thereunder, the **Comptroller** may, at his/her option, render forfeit and void this **Contract**.

66.3 The **Contractor** shall comply in all respects, with the provisions of Section 6-114 of the Administrative Code and the rules and regulations issued by the **Comptroller** thereunder.

ARTICLE 67. LOCALLY BASED ENTERPRISE PROGRAM

67.1 This **Contract** is subject to the requirements of Section 6-108.1 of the Administrative Code and regulations promulgated thereunder. No construction contract shall be awarded unless and until these requirements have been complied with in their entirety; however, compliance with this Article 67 is not required if the Agency sets Subcontractor Participation Goals for Minority- and Women-Owned Business Enterprises (M/WBEs).

67.2 Unless specifically waived by the **Commissioner** with the approval of the Division of Economic and Financial Opportunity of the **City** Department of Business Services, if any portion of the **Contract** is subcontracted, not less than ten (10%) percent of the total dollar amount of the **Contract** shall be awarded to locally based enterprises (LBEs); except that where less than ten (10%) percent of the total dollar amount of the **Contract** is subcontracted, such lesser percentage shall be so awarded.

67.3 The **Contractor** shall not require performance and payment bonds from LBE **Subcontractors**.

67.4 If the **Contractor** has indicated prior to award that no **Work** will be subcontracted, no **Work** shall be subcontracted without the prior approval of the **Commissioner**, which shall be granted only if the **Contractor** makes a good faith effort beginning at least six (6) weeks before the **Work** is to be performed to obtain LBE **Subcontractors** to perform the **Work**.

67.5 If the **Contractor** has not identified sufficient LBE **Subcontractors** prior to award, it shall sign a letter of compliance stating that it complies with Section 6-108.1 of the Administrative Code, recognizes that achieving the LBE requirement is a condition of its **Contract**, and shall submit documentation demonstrating its good faith efforts to obtain LBEs. After award, the **Contractor** shall begin to solicit LBE's to perform subcontracted **Work** at least six (6) weeks before the date such **Work** is to be performed and shall demonstrate that a good faith effort has been made to obtain LBEs on each subcontract until it meets the required percentage.

67.6 Failure of the **Contractor** to comply with the requirements of Section 6-108.1 of the Administrative Code and the regulations promulgated thereunder shall constitute a material breach of this **Contract**. Remedy for such breach may include the imposition of any or all of the following sanctions:

67.6.1 Reducing the **Contractor's** compensation by an amount equal to the dollar value of the percentage of the LBE subcontracting requirement not complied with;

67.6.2 Declaring the **Contractor** in default;

67.6.3 If the **Contractor** is an LBE, de-certifying and declaring the **Contractor** ineligible to participate in the LBE program for a period of up to three (3) years.

ARTICLE 68. ANTITRUST

68.1 The **Contractor** hereby assigns, sells, and transfers to the **City** all right, title, and interest in and to any claims and causes of action arising under the antitrust **Laws** of New York State or of the United States relating to the particular goods or services purchased or procured by the **City** under this **Contract**.

ARTICLE 69. MacBRIDE PRINCIPLES PROVISIONS

69.1 Notice To All Prospective **Contractors**:

69.1.1 Local Law No. 34 of 1991 became effective on September 10, 1991 and added Section 6-115.1 of the Administrative Code. The local **Law** provides for certain restrictions on **City Contracts** to express the opposition of the people of the **City** to employment discrimination practices in Northern Ireland to promote freedom of work-place opportunity.

69.1.2 Pursuant to Section 6-115.1, prospective **Contractors** for **Contracts** to provide goods or services involving an expenditure of an amount greater than ten thousand ($10,000.) dollars, or for construction involving an amount greater than fifteen thousand ($15,000.) dollars, are asked to sign a rider in which they covenant and represent, as a material condition of their **Contract**, that any business operations in Northern Ireland conducted by the **Contractor** and any individual or legal entity in which the **Contractor** holds a ten (10%) percent or greater ownership interest in the **Contractor** will be conducted in accordance with the MacBride Principles of nondiscrimination in employment.

69.1.3 Prospective **Contractors** are not required to agree to these conditions. However, in the case of **Contracts** let by competitive sealed bidding, whenever the lowest responsible bidder has not agreed to stipulate to the conditions set forth in this notice and another bidder who has agreed to stipulate to such conditions has submitted a bid within five (5%) percent of the lowest responsible bid for a **Contract** to supply goods, services or contraction of comparable quality, the **Agency** shall refer such bids to the Mayor, the Speaker or other officials, as appropriate, who may determine, in accordance with applicable **Law**, that it is in the best interest of the **City** that the **Contract** be awarded to other than the lowest responsible pursuant to Section 313(b)(2) of the **City** Charter.

69.1.4 In the case of **Contracts** let by other than competitive sealed bidding, if a prospective **Contractor** does not agree to these conditions, no **Agency**, elected official or the **City** Council shall award the **Contract** to that bidder unless the **Agency** seeking to use the goods, services or construction certifies in writing that the **Contract** is necessary for the **Agency** to perform its functions and there is no other responsible **Contractor** who will supply goods, services or construction of comparable quality at a comparable price.

69.2 In accordance with Section 6-115.1 of the Administrative Code, the **Contractor** stipulates that such **Contractor** and any individual or legal entity in which the **Contractor** holds a ten (10%) percent or greater ownership interest in the **Contractor** either:

69.2.1 Have no business operations in Northern Ireland, or

69.2.2 Shall take lawful steps in good faith to conduct any business operations they have in Northern Ireland in accordance with the MacBride Principles, and shall permit independent monitoring of their compliance with such principles.

69.3 For purposes of this Article, the following terms shall have the following meanings:

69.3.1 "MacBride Principles" shall mean those principles relating to nondiscrimination in employment and freedom of work-place opportunity which require employers doing business in Northern Ireland to:

69.3.1(a) increase the representation of individuals from under-represented religious groups in the workforce, including managerial, supervisory, administrative, clerical and technical jobs;

69.3.1(b) take steps to promote adequate security for the protection of employees from under-represented religious groups both at the work-place and while traveling to and from **Work**;

69.3.1(c) ban provocative religious or political emblems from the workplace;

69.3.1(d) publicly advertise all job openings and make special recruitment efforts to attract applicants from under-represented religious groups;

69.3.1(e) establish layoff, recall, and termination procedures which do not in practice favor a particular religious group;

69.3.1(f) abolish all job reservations, apprenticeship restrictions and different employment criteria which discriminate on the basis of religion;

69.3.1(g) develop training programs that will prepare substantial numbers of current employees from under-represented religious groups for skilled jobs, including the expansion of existing programs and the creation of new programs to train, upgrade, and improve the skills of workers from under-represented religious groups;

69.3.1(h) establish procedures to asses, identify, and actively recruit employees from under-represented religious groups with potential for further advancement; and

69.3.1(i) appoint a senior management staff member to oversee affirmative action efforts and develop a timetable to ensure their full implementation.

69.4 The **Contractor** agrees that the covenants and representations in Article 69.2 are material conditions to this **Contract**. In the event the **Agency** receives information that the **Contractor** who made the stipulation required by this Article 69 is in violation thereof, the **Agency** shall review such information and give the **Contractor** an opportunity to respond. If the **Agency** finds that a violation has occurred, the **Agency** shall have the right to declare the **Contractor** in default in default and/or terminate this **Contract** for cause and procure supplies, services or **Work** from another source in the manner the **Agency** deems proper. In the event of such termination, the **Contractor** shall pay to the **Agency**, or the **Agency** in its sole discretion may withhold from any amounts otherwise payable to the **Contractor**, the difference between the **Contract** price for the uncompleted portion of this **Contract** and the cost to the **Agency** of completing performance of this **Contract** either itself or by engaging another **Contractor** or **Contractors**. In the case of a requirement **Contract**, the **Contractor** shall be liable for such difference in price for the entire amount of supplies required by the **Agency** for the uncompleted term of **Contractor's Contract**. In the case of a construction **Contract**, the **Agency** shall also have the right to hold the **Contractor** in partial or total default in accordance with the default provisions of this **Contract**, and/or may seek debarment or suspension of the **Contractor**. The rights and remedies of the **Agency** hereunder shall be in addition to, and not in lieu of, any rights and remedies the **Agency** has pursuant to this **Contract** or by operation of **Law**.

ARTICLE 70. ELECTRONIC FILING/NYC DEVELOPMENT HUB

70.1 The **Contractor** shall electronically file all alteration type-2 and alteration type-3 applications via the New York City Development Hub Web site, except applications for the following types of minor alterations: enlargements, curb cuts, legalizations, fire alarms, builders pavement plans, and jobs filed on Landmark Preservation Commission calendared properties. All such filings must be professionally certified. Information about electronic filing via the New York City Development Hub is available on the **City** Department of Buildings Web site at www.nyc.gov/buildings.

ARTICLE 71. PROHIBITION OF TROPICAL HARDWOODS

71.1 Tropical hardwoods, as defined in Section 165 of the New York State Finance Law (Finance Law), shall not be utilized in the performance of this **Contract** except as expressly permitted by Section 165 of the Finance Law.

ARTICLE 72. CONFLICTS OF INTEREST

72.1 Section 2604 of the **City** Charter and other related provisions of the **City** Charter, the Administrative Code, and the Penal Law are applicable under the terms of this **Contract** in relation to conflicts of interest and shall be extended to **Subcontractors** authorized to perform **Work**, labor and services pursuant to this **Contract** and further, it shall be the duty and responsibility of the **Contractor** to so inform its respective **Subcontractors**. Notice is hereby given that, under certain circumstances, penalties may be invoked against the donor as well as the recipient of any form of valuable gift.

ARTICLE 73. MERGER CLAUSE

73.1 The written **Contract** herein, contains all the terms and conditions agreed upon by the parties hereto, and no other agreement, oral or otherwise, regarding the subject matter of this **Contract** shall be deemed to exist or to bind any of the parties hereto, or to vary any of the terms contained herein.

ARTICLE 74. STATEMENT OF WORK

74.1 The **Contractor** shall furnish all labor and materials and perform all **Work** in strict accordance with the **Specifications** and **Addenda** thereto, numbered as shown in Schedule A.

ARTICLE 75. COMPENSATION TO BE PAID TO CONTRACTOR

75.1 The **City** will pay and the **Contractor** will accept in full consideration for the performance of the **Contract**, subject to additions and deductions as provided herein, the total sum shown in Schedule A, this said sum being the amount at which the **Contract** was awarded to the **Contractor** at a public letting thereof, based upon the **Contractor's** bid for the **Contract**.

ARTICLE 76. ELECTRONIC FUNDS TRANSFER

76.1 In accordance with Section 6-107.1 of the Administrative Code, the **Contractor** agrees to accept payments under this **Contract** from the **City** by electronic funds transfer (EFT). An EFT is any

transfer of funds, other than a transaction originated by check, draft or similar paper instrument, which is initiated through an electronic terminal, telephonic instrument or computer or magnetic tape so as to order, instruct or authorize a financial institution to debit or credit an account. Prior to the first payment made under this **Contract**, the **Contractor** shall designate one financial institution or other authorized payment agent and shall complete the attached "EFT Vendor Payment Enrollment Form" in order to provide the Commissioner of the **City** Department of Finance with information necessary for the **Contractor** to receive electronic funds transfer payments through a designated financial institution or authorized payment agent. The crediting of the amount of a payment to the appropriate account on the books of a financial institution or other authorized payment agent designated by the **Contractor** shall constitute full satisfaction by the **City** for the amount of the payment under this **Contract**. The account information supplied by the **Contractor** to facilitate the electronic funds transfer shall remain confidential to the fullest extent provided by **Law**.

76.2 The **Commissioner** may waive the application of the requirements of this Article 76 to payments on contracts entered into pursuant to Section 315 of the **City** Charter. In addition, the Commissioner of the Department of Finance and the Comptroller may jointly issue standards pursuant to which the **Agency** may waive the requirements of this Article 76 for payments in the following circumstances: (i) for individuals or classes of individuals for whom compliance imposes a hardship; (ii) for classifications or types of checks; or (iii) in other circumstances as may be necessary in the interest of the **City**.

ARTICLE 77. RECORDS RETENTION

77.1 The **Contractor** agrees to retain all books, records, and other documents relevant to this **Contract** for six years after the final payment or termination of this **Contract**, whichever is later. **City**, state, and federal auditors and any other persons duly authorized by the **City** shall have full access to and the right to examine any such books, records, and other documents during the retention period.

ARTICLE 78. EXAMINATION AND VIEWING OF SITE, CONSIDERATION OF OTHER SOURCES OF INFORMATION AND CHANGED SITE CONDITIONS

78.1 Pre-Bidding (Investigation) Viewing of Site – Bidders must carefully view and examine the **Site** of the proposed **Work**, as well as its adjacent area, and seek other usual sources of information, for they will be conclusively presumed to have full knowledge of any and all conditions and hazards on, about or above the **Site** relating to or affecting in any way the performance of the **Work** to be done under the **Contract** that were or should have been known by a reasonably prudent bidder. To arrange a date for visiting the **Site**, bidders are to contact the **Agency** contact person specified in the bid documents.

78.2 Should the **Contractor** encounter during the progress of the Work site conditions or environmental hazards at the **Site** materially differing from any shown on the **Contract Drawings** or indicated in the **Specifications** or such conditions or environmental hazards as could not reasonably have been anticipated by the **Contractor**, which conditions or hazards will materially affect the cost of the **Work** to be done under the **Contract**, the attention of the **Commissioner** must be called immediately to such conditions or hazards before they are disturbed. The **Commissioner** shall thereupon promptly investigate the conditions or hazards. If the **Commissioner** finds that they do so materially differ, and that they could not have been reasonably anticipated by the **Contractor**, the **Contract** may be modified with the **Commissioner**'s written approval.

ARTICLE 79. PARTICIPATION BY MINORITY-OWNED AND WOMEN-OWNED BUSINESS ENTERPRISES IN CITY PROCUREMENT

NOTICE TO ALL PROSPECTIVE CONTRACTORS

ARTICLE I. M/WBE PROGRAM

Local Law No. 129 of 2005 added and Local Law 1 of 2013 amended Section 6-129 of the Administrative Code of the City of New York (hereinafter "Section 6-129"). Section 6-129 establishes the program for participation in City procurement ("M/WBE Program") by minority- owned business enterprises ("MBEs") and women-owned business enterprises ("WBEs"), certified in accordance with Section 1304 of the New York City Charter. As stated in Section 6-129, the intent of the program is to address the impact of discrimination on the City's procurement process, and to promote the public interest in avoiding fraud and favoritism in the procurement process, increasing competition for City business, and lowering contract costs. The contract provisions contained herein are pursuant to Section 6-129, and the rules of the Department of Small Business Services ("DSBS") promulgated thereunder.

If this Contract is subject to the M/WBE Program established by Section 6-129, the specific requirements of MBE and/or WBE participation for this Contract are set forth in Schedule B of the Contract (entitled the "M/WBE Utilization Plan"), and are detailed below. The Contractor must comply with all applicable MBE and WBE requirements for this Contract.

All provisions of Section 6-129 are hereby incorporated in the Contract by reference and all terms used herein that are not defined herein shall have the meanings given such terms in Section 6-129. Article I, Part A, below, sets forth provisions related to the participation goals for construction, standard and professional services contracts. Article I, Part B, below, sets forth miscellaneous provisions related to the M/WBE Program.

PART A

PARTICIPATION GOALS FOR CONSTRUCTION, STANDARD AND PROFESSIONAL SERVICES CONTRACTS OR TASK ORDERS

1. The **MBE and/or WBE Participation Goals** established for this Contract or Task Orders issued pursuant to this Contract, ("**Participation Goals**"), as applicable, are set forth on Schedule B, Part I to this Contract (see Page 1, line 1 Total Participation Goals) or will be set forth on Schedule B, Part I to Task Orders issued pursuant to this Contract, as applicable.

The **Participation Goals** represent a percentage of the total dollar value of the Contract or Task Order, as applicable, that may be achieved by awarding subcontracts to firms certified with New York City Department of Small Business Services as MBEs and/or WBEs, and/or by crediting the participation of prime contractors and/or qualified joint ventures as provided in Section 3 below, unless the goals have been waived or modified by Agency in accordance with Section 6-129 and Part A, Sections 10 and 11 below, respectively.

2. If **Participation Goals** have been established for this Contract or Task Orders issued pursuant to this Contract, Contractor agrees or shall agree as a material term of the Contract that Contractor shall be subject to the **Participation Goals**, unless the goals are waived or modified by Agency in accordance with Section 6-129 and Part A, Sections 10 and 11 below, respectively.

3. If **Participation Goals** have been established for this Contract or Task Order issued pursuant to this Contract, a Contractor that is an MBE and/or WBE shall be permitted to count its own participation toward fulfillment of the relevant **Participation Goal**, provided that in accordance with Section 6-129 the value of Contractor's participation shall be determined by subtracting from the total value of the Contract or Task Order, as applicable, any amounts that the Contractor pays to direct subcontractors (as defined in Section 6-129(c)(13)), and provided further that a Contractor that is certified as both an MBE and a WBE may count its own participation either toward the goal for MBEs or the goal for WBEs, but not both.

A Contractor that is a qualified joint venture (as defined in Section 6-129(c)(30)) shall be permitted to count a percentage of its own participation toward fulfillment of the relevant **Participation Goal**. In accordance with Section 6-129, the value of Contractor's participation shall be determined by subtracting from the total value of the Contract or Task Order, as applicable, any amounts that Contractor pays to direct subcontractors, and then multiplying the remainder by the percentage to be applied to total profit to determine the amount to which an MBE or WBE is entitled pursuant to the joint venture agreement, provided that where a participant in a joint venture is certified as both an MBE and a WBE, such amount shall be counted either toward the goal for MBEs or the goal for WBEs, but not both.

4. A. If **Participation Goals** have been established for this Contract, a prospective contractor shall be required to submit with its bid or proposal, as applicable, a completed Schedule B, M/WBE Utilization Plan, Part II (see Pages 2-4) indicating: (a) whether the contractor is an MBE or WBE, or qualified joint venture; (b) the percentage of work it intends to award to direct subcontractors; and (c) in cases where the contractor intends to award direct subcontracts, a description of the type and dollar value of work designated for participation by MBEs and/or WBEs, and the time frames in which such work is scheduled to begin and end. In the event that this M/WBE Utilization Plan indicates that the bidder or proposer, as applicable, does not intend to meet the **Participation Goals**, the bid or proposal, as applicable, shall be deemed non-responsive, unless Agency has granted the bidder or proposer, as applicable, a pre- award waiver of the Participation Goals in accordance with Section 6-129 and Part A, Section 10 below.

B. (i) If this Contract is for a master services agreement or other requirements type contract that will result in the issuance of Task Orders that will be individually registered ("Master Services Agreement") and is subject to M/WBE **Participation Goals**, a prospective contractor shall be required to submit with its bid or proposal, as applicable, a completed Schedule B, M/WBE Participation Requirements for Master Services Agreements That Will Require Individually Registered Task Orders, Part II (page 2) indicating the prospective contractor's certification and required affirmations to make all reasonable good faith efforts to meet participation goals established on each individual Task Order issued pursuant to this Contract, or if a partial waiver is obtained or such goals are modified by the Agency, to meet the modified **Participation Goals** by soliciting and obtaining the participation of certified MBE and/or WBE firms. In the event that the Schedule B indicates that the bidder or proposer, as applicable, does not intend to meet the **Participation Goals** that may be established on Task Orders issued pursuant to this Contract, the bid or proposal, as applicable, shall be deemed nonresponsive.

(ii) **Participation Goals** on a Master Services Agreement will be established for individual Task Orders issued after the Master Services Agreement is awarded. If **Participation Goals** have been established on a Task Order, a contractor shall be required to submit a Schedule B – M/WBE Utilization Plan For Independently Registered Task Orders That Are Issued Pursuant to Master Services Agreements, Part II (see Pages 2-4) indicating: (a) whether the contractor is an MBE or WBE, or qualified joint venture; (b) the percentage of work it intends to award to direct subcontractors; and (c) in cases where the contractor intends to award direct subcontracts, a description of the type and dollar value of work designated for participation by MBEs and/or WBEs, and the time frames in which such work is scheduled to begin and end. The contractor must engage in good faith efforts to meet the **Participation Goals** as established for the Task Order unless Agency has granted the contractor a pre-award waiver of the Participation Goals in accordance with Section 6-129 and Part A, Section 10 below.

C. THE BIDDER/PROPOSER MUST COMPLETE THE SCHEDULE B INCLUDED HEREIN (SCHEDULE B, PART II). A SCHEDULE B SUBMITTED BY THE BIDDER/PROPOSER WHICH DOES NOT INCLUDE THE VENDOR CERTIFICATION AND REQUIRED AFFIRMATIONS (SEE SECTION V OF PART II) WILL BE DEEMED TO BE NON-RESPONSIVE, UNLESS A FULL WAIVER OF THE PARTICIPATION GOALS IS GRANTED (SCHEDULE B, PART III). IN THE EVENT THAT THE CITY DETERMINES THAT THE BIDDER/PROPOSER HAS SUBMITTED A SCHEDULE B WHERE THE VENDOR CERTIFICATION AND REQUIRED AFFIRMATIONS ARE COMPLETED BUT OTHER ASPECTS OF THE SCHEDULE B ARE NOT COMPLETE, OR CONTAIN A COPY OR COMPUTATION ERROR THAT IS AT ODDS WITH THE VENDOR CERTIFICATION AND AFFIRMATIONS, THE BIDDER/PROPOSER WILL BE NOTIFIED BY THE AGENCY AND WILL BE GIVEN FOUR (4) CALENDAR DAYS FROM RECEIPT OF NOTIFICATION TO CURE THE SPECIFIED DEFICIENCIES AND RETURN A COMPLETED SCHEDULE B TO THE AGENCY. FAILURE TO DO SO WILL RESULT IN A DETERMINATION THAT THE BID/PROPOSAL IS NON-RESPONSIVE. RECEIPT OF NOTIFICATION IS DEFINED AS THE DATE NOTICE IS E-MAILED OR FAXED (IF THE BIDDER/PROPOSER HAS PROVIDED AN E-MAIL ADDRESS OR FAX NUMBER), OR NO LATER THAN FIVE (5) CALENDAR DAYS FROM THE DATE OF MAILING OR UPON DELIVERY, IF DELIVERED.

5. Where an **M/WBE** Utilization Plan has been submitted, the Contractor shall, within 30 days of issuance by Agency of a notice to proceed, submit a list of proposed persons or entities to which it intends to award subcontracts within the subsequent 12 months. In the case of multiyear contracts, such list shall also be submitted every year thereafter. The Agency may also require the Contractor to report periodically about the contracts awarded by its direct subcontractors to indirect subcontractors (as defined in Section 6-129(c)(22)). **PLEASE NOTE: If this Contract is a public works project subject to GML §101(5) (i.e., a contract valued at or below $3M for projects in New York City) or if the Contract is subject to a project labor agreement in accordance with Labor Law §222, and the bidder is required to identify at the time of bid submission its intended subcontractors for the Wicks trades (plumbing and gas fitting; steam heating, hot water heating, ventilating and air conditioning (HVAC); and electric wiring), the Contractor must identify all those to which it intends to award construction subcontracts for any portion of the Wicks trade work at the time of bid submission, regardless of what point in the life of the contract such subcontracts will occur. In identifying intended subcontractors in the bid submission, bidders may satisfy any Participation Goals established for this Contract by proposing one or more subcontractors that are MBEs and/or WBEs for any portion of the Wicks trade work.** In the event that the Contractor's selection of a subcontractor is disapproved, the Contractor shall have a reasonable time to propose alternate subcontractors.

6. MBE and WBE firms must be certified by DSBS in order for the Contractor to credit such firms' participation toward the attainment of the **Participation Goals**. Such certification must occur prior to the

firms' commencement of work. A list of MBE and WBE firms may be obtained from the DSBS website at www.nyc.gov/buycertified, by emailing DSBS at buyer@sbs.nyc.gov, by calling (212) 513-6356, or by visiting or writing DSBS at 110 William St., New York, New York, 10038, 7th floor. Eligible firms that have not yet been certified may contact DSBS in order to seek certification by visiting www.nyc.gov/getcertified, emailing MWBE@sbs.nyc.gov, or calling the DSBS certification helpline at (212) 513-6311. A firm that is certified as both an MBE and a WBE may be counted either toward the goal for MBEs or the goal for WBEs, but not both. No credit shall be given for participation by a graduate MBE or graduate WBE, as defined in Section 6-129(c)(20).

7. Where an **M/WBE** Utilization Plan has been submitted, the Contractor shall, with each voucher for payment, and/or periodically as Agency may require, submit statements, certified under penalty of perjury, which shall include, but not be limited to,: the total amount the Contractor paid to its direct subcontractors, and, where applicable pursuant to Section 6-129(j), the total amount direct subcontractors paid to indirect subcontractors; the names, addresses and contact numbers of each MBE or WBE hired as a subcontractor by the Contractor, and, where applicable, hired by any of the Contractor's direct subcontractors; and the dates and amounts paid to each MBE or WBE. The Contractor shall also submit, along with its voucher for final payment: the total amount it paid to subcontractors, and, where applicable pursuant to Section 6-129(j), the total amount its direct subcontractors paid directly to their indirect subcontractors; and a final list, certified under penalty of perjury, which shall include the name, address and contact information of each subcontractor that is an MBE or WBE, the work performed by, and the dates and amounts paid to each.

8. If payments made to, or work performed by, MBEs or WBEs are less than the amount specified in the Contractor's **M/WBE** Utilization Plan, Agency shall take appropriate action, in accordance with Section 6-129 and Article II below, unless the Contractor has obtained a modification of its **M/WBE** Utilization Plan in accordance with Section 6-129 and Part A, Section 11 below.

9. Where an **M/WBE** Utilization Plan has been submitted, and the Contractor requests a change order the value of which exceeds the greater of 10 percent of the Contract or Task Order, as applicable, or $500,000, Agency shall review the scope of work for the Contract or Task Order, as applicable, and the scale and types of work involved in the change order, and determine whether the **Participation Goals** should be modified.

10. Pre-award waiver of the **Participation Goals**. (a) A bidder or proposer, or contractor with respect to a Task Order, may seek a pre-award full or partial waiver of the **Participation Goals** in accordance with Section 6-129, which requests that Agency change one or more **Participation Goals** on the grounds that the **Participation Goals** are unreasonable in light of the availability of certified firms to perform the services required, or by demonstrating that it has legitimate business reasons for proposing a lower level of subcontracting in its M/WBE Utilization Plan.

(b) To apply for a full or partial waiver of the **Participation Goals**, a bidder, proposer, or contractor, as applicable, must complete Part III (Page 5) of Schedule B and submit such request no later than seven (7) calendar days prior to the date and time the bids, proposals, or Task Orders are due, in writing to the Agency by email at poped@ddc.nyc.gov or via facsimile at (718) 391-1886. Bidders, proposers, or contractors, as applicable, who have submitted requests will receive an Agency response by no later than two (2) calendar days prior to the due date for bids, proposals, or Task Orders; provided, however, that if that date would fall on a weekend or holiday, an Agency response will be provided by close-of-business on the business day before such weekend or holiday date.

(c) If the Agency determines that the **Participation Goals** are unreasonable in light of the availability of certified firms to perform the services required, it shall revise the solicitation and extend the deadline for bids and proposals, or revise the Task Order, as applicable.

(d) Agency may grant a full or partial waiver of the **Participation Goals** to a bidder, proposer or contractor, as applicable, who demonstrates—before submission of the bid, proposal or Task Order, as applicable—that it has legitimate business reasons for proposing the level of subcontracting in its **M/WBE** Utilization Plan. In making its determination, Agency shall consider factors that shall include, but not be limited to, whether the bidder, proposer or contractor, as applicable, has the capacity and the bona fide intention to perform the Contract without any subcontracting, or to perform the Contract without awarding the amount of subcontracts represented by the **Participation Goals**. In making such determination, Agency may consider whether the **M/WBE** Utilization Plan is consistent with past subcontracting practices of the bidder, proposer or contractor, as applicable, whether the bidder, proposer or contractor, as applicable, has made efforts to form a joint venture with a certified firm, and whether the bidder, proposer, or contractor, as applicable, has made good faith efforts to identify other portions of the Contract that it intends to subcontract.

11. Modification of **M/WBE** Utilization Plan. (a) A Contractor may request a modification of its **M/WBE** Utilization Plan after award of this Contract. **PLEASE NOTE: If this Contract is a public works project subject to GML §101(5) (i.e., a contract valued at or below $3M for projects in New York City) or if the Contract is subject to a project labor agreement in accordance with Labor Law §222, and the bidder is required to identify at the time of bid submission its intended subcontractors for the Wicks trades (plumbing and gas fitting; steam heating, hot water heating, ventilating and air conditioning (HVAC); and electric wiring), the Contractor may request a Modification of its M/WBE Utilization Plan as part of its bid submission**. The Agency may grant a request for Modification of a Contractor's **M/WBE** Utilization Plan if it determines that the Contractor has established, with appropriate documentary and other evidence, that it made reasonable, good faith efforts to meet the **Participation Goals.** In making such determination, Agency shall consider evidence of the following efforts, as applicable, along with any other relevant factors:

(i) The Contractor advertised opportunities to participate in the Contract, where appropriate, in general circulation media, trade and professional association publications and small business media, and publications of minority and women's business organizations;
(ii) The Contractor provided notice of specific opportunities to participate in the Contract, in a timely manner, to minority and women's business organizations;
(iii) The Contractor sent written notices, by certified mail or facsimile, in a timely manner, to advise MBEs or WBEs that their interest in the Contract was solicited;
(iv) The Contractor made efforts to identify portions of the work that could be substituted for portions originally designated for participation by MBEs and/or WBEs in the M/WBE Utilization Plan, and for which the Contractor claims an inability to retain MBEs or WBEs;
(v) The Contractor held meetings with MBEs and/or WBEs prior to the date their bids or proposals were due, for the purpose of explaining in detail the scope and requirements of the work for which their bids or proposals were solicited;
(vi) The Contractor made efforts to negotiate with MBEs and/or WBEs as relevant to perform specific subcontracts, or act as suppliers or service providers;
(vii) Timely written requests for assistance made by the Contractor to Agency's M/WBE liaison officer and to DSBS;
(viii) Description of how recommendations made by DSBS and Agency were acted upon and an explanation of why action upon such recommendations did not lead to the desired level of participation of MBEs and/or WBEs.

Agency's M/WBE officer shall provide written notice to the Contractor of the determination.

(b) The Agency may modify the **Participation Goals** when the scope of the work has been changed by the Agency in a manner that affects the scale and types of work that the Contractor indicated in its **M/WBE** Utilization Plan would be awarded to subcontractors.

12. If this Contract is for an indefinite quantity of construction, standard or professional services or is a requirements type contract and the Contractor has submitted an **M/WBE** Utilization Plan and has committed to subcontract work to MBEs and/or WBEs in order to meet the **Participation Goals**, the Contractor will not be deemed in violation of the M/WBE Program requirements for this Contract with regard to any work which was intended to be subcontracted to an MBE and/or WBE to the extent that the Agency has determined that such work is not needed.

13. If **Participation Goals** have been established for this Contract or a Task Order issued pursuant to this Contract, at least once annually during the term of the Contract or Task Order, as applicable, Agency shall review the Contractor's progress toward attainment of its M/WBE Utilization Plan, including but not limited to, by reviewing the percentage of work the Contractor has actually awarded to MBE and/or WBE subcontractors and the payments the Contractor made to such subcontractors.

14. If **Participation Goals** have been established for this Contract or a Task Order issued pursuant to this Contract, Agency shall evaluate and assess the Contractor's performance in meeting those goals, and such evaluation and assessment shall become part of the Contractor's overall contract performance evaluation.

PART B: MISCELLANEOUS

1. The Contractor shall take notice that, if this solicitation requires the establishment of an **M/WBE** Utilization Plan, the resulting contract may be audited by DSBS to determine compliance with Section 6-129. See §6-129(e)(10). Furthermore, such resulting contract may also be examined by the City's Comptroller to assess compliance with the **M/WBE** Utilization Plan.

2. Pursuant to DSBS rules, construction contracts that include a requirement for an **M/WBE** Utilization Plan shall not be subject to the law governing Locally Based Enterprises set forth in Section 6-108.1 of the Administrative Code of the City of New York.

3. DSBS is available to assist contractors and potential contractors in determining the availability of MBEs and/or WBEs to participate as subcontractors, and in identifying opportunities that are appropriate for participation by MBEs and/or WBEs in contracts.

4. Prospective contractors are encouraged to enter into qualified joint venture agreements with MBEs and/or WBEs as defined by Section 6-129(c)(30).

5. By submitting a bid or proposal the Contractor hereby acknowledges its understanding of the M/WBE Program requirements set forth herein and the pertinent provisions of Section 6-129, and any rules promulgated thereunder, and if awarded this Contract, the Contractor hereby agrees to comply with the M/WBE Program requirements of this Contract and pertinent provisions of Section 6-129, and any rules promulgated thereunder, all of which shall be deemed to be material terms of this Contract. The Contractor hereby agrees to make all reasonable, good faith efforts to solicit and obtain the participation of MBEs and/or WBEs to meet the required **Participation Goals**.

ARTICLE II. ENFORCEMENT

1. If Agency determines that a bidder or proposer, as applicable, has, in relation to this procurement, violated Section 6-129 or the DSBS rules promulgated pursuant to Section 6-129, Agency may disqualify such bidder or proposer, as applicable, from competing for this Contract and the Agency may revoke such bidder's or proposer's prequalification status, if applicable.

2. Whenever Agency believes that the Contractor or a subcontractor is not in compliance with Section 6-129 or the DSBS rules promulgated pursuant to Section 6-129, or any provision of this Contract that implements Section 6-129, including, but not limited to any **M/WBE** Utilization Plan, Agency shall send a written notice to the Contractor describing the alleged noncompliance and offering the Contractor an opportunity to be heard. Agency shall then conduct an investigation to determine whether such Contractor or subcontractor is in compliance.

3. In the event that the Contractor has been found to have violated Section 6-129, the DSBS rules promulgated pursuant to Section 6-129, or any provision of this Contract that implements Section 6-129, including, but not limited to, any **M/WBE** Utilization Plan, Agency may determine that one of the following actions should be taken:

(a) entering into an agreement with the Contractor allowing the Contractor to cure the violation;
(b) revoking the Contractor's pre-qualification to bid or make proposals for future contracts;
(c) making a finding that the Contractor is in default of the Contract;
(d) terminating the Contract;
(e) declaring the Contractor to be in breach of Contract;
(f) withholding payment or reimbursement;
(g) determining not to renew the Contract;
(h) assessing actual and consequential damages;
(i) assessing liquidated damages or reducing fees, provided that liquidated damages may be based on amounts representing costs of delays in carrying out the purposes of the M/WBE Program, or in meeting the purposes of the Contract, the costs of meeting utilization goals through additional procurements, the administrative costs of investigation and enforcement, or other factors set forth in the Contract;
(j) exercising rights under the Contract to procure goods, services or construction from another contractor and charge the cost of such contract to the Contractor that has been found to be in noncompliance; or
(k) taking any other appropriate remedy.

4. If an **M/WBE** Utilization Plan has been submitted, and pursuant to this Article II, Section 3, the Contractor has been found to have failed to fulfill its **Participation Goals** contained in its **M/WBE** Utilization Plan or the **Participation Goals** as modified by Agency pursuant to Article I, Part A, Section 11, Agency may assess liquidated damages in the amount of ten percent (10%) of the difference between the dollar amount of work required to be awarded to MBE and/or WBE firms to meet the **Participation Goals** and the dollar amount the Contractor actually awarded and paid, and/or credited, to MBE and/or WBE firms. In view of the difficulty of accurately ascertaining the loss which the City will suffer by reason of Contractor's failure to meet the **Participation Goals**, the foregoing amount is hereby fixed and agreed as the liquidated damages that the City will suffer by reason of such failure, and not as a penalty. Agency may deduct and retain out of any monies which may become due under this Contract the amount of any such liquidated damages; and in case the amount which may become due under this Contract shall be less than the amount of liquidated damages suffered by the City, the Contractor shall be liable to pay the difference.

5. Whenever Agency has reason to believe that an MBE and/or WBE is not qualified for certification, or is participating in a contract in a manner that does not serve a commercially useful function (as defined in Section 6-129(c)(8)), or has violated any provision of Section 6- 129, Agency shall notify the Commissioner of DSBS who shall determine whether the certification of such business enterprise should be revoked.

6. Statements made in any instrument submitted to Agency pursuant to Section 6-129 shall be submitted under penalty of perjury and any false or misleading statement or omission shall be grounds for the application of any applicable criminal and/or civil penalties for perjury. The making of a false or fraudulent statement by an MBE and/or WBE in any instrument submitted pursuant to Section 6-129 shall, in addition, be grounds for revocation of its certification.

7. The Contractor's record in implementing its **M/WBE** Utilization Plan shall be a factor in the evaluation of its performance. Whenever Agency determines that a Contractor's compliance with an **M/WBE** Utilization Plan has been unsatisfactory, Agency shall, after consultation with the City Chief Procurement Officer, file an advice of caution form for inclusion in VENDEX as caution data.

IN WITNESS WHEREOF, the Commissioner, on behalf of the City of New York, and the Contractor, have executed this agreement in quadruplicate, two parts of which are to remain with the Commissioner, another to be filed with the Comptroller of the City, and the fourth to be delivered to the Contractor.

THE CITY OF NEW YORK

By: Lorraine Grillo
Commissioner

CONTRACTOR:

By: Robert V. Flamia
(Member of Firm or Officer of Corporation)

Title: President / CEO

(Where Contractor is a Corporation, add):
Attest:

Michael Dickhaus
Secretary

(Seal)

ACKNOWLEDGEMENT OF PRINCIPAL, IF A CORPORATION

State of NJ County of Morris ss:

On this 7th day of Jan., 2021 before me personally came Robert V. Gamba to me known who, being by me duly sworn did depose and say that he resides at 60 Beachmont Terrace, North Caldwell, NJ that he is the President/C.E.O. of the corporation described in and which executed the foregoing instrument; that he knows the seal of said corporation; that one of the seals affixed to said instrument is such seal; that it was so affixed by order of the directors of said corporation, and that he signed his name thereto by like order.

Karen A. Meyer
Notary Public or Commissioner of Deeds

KAREN A. MEYER
NOTARY PUBLIC OF NEW JERSEY
My Commission Expires April 5, 2024

ACKNOWLEDGEMENT OF PRINCIPAL, IF A PARTNERSHIP

State of _____ County of _____ ss:

On this _____ day of _____, _____, before me personally appeared _____ to me known, and known to me to be one of the members of the firm of _____ _____ described in and who executed the foregoing instrument; and he acknowledged to me that he executed the same as and for the act and deed of said firm.

_____
Notary Public or Commissioner of Deeds

ACKNOWLEDGEMENT OF PRINCIPAL, IF AN INDIVIDUAL

State of _____ County of _____ ss:

On this _____ day of _____, _____, before me personally appeared _____ to me known, and known to me to be the person described in and who executed the foregoing instrument; and acknowledged that he executed the same.

_____
Notary Public or Commissioner of Deeds

ACKNOWLEDGEMENT BY COMMISSIONER

State of _____ County of _____ ss:

On this _____ day of _____, _____, before me personally came _____ to me known, and known to be the Deputy Commissioner of the Department of Design and Construction of The City of New York, the person described as such in and who as such executed the foregoing instrument and acknowledged to me that he executed the same as Deputy Commissioner for the purposes therein mentioned.

_____

Notary Public or Commissioner of Deeds

AUTHORITY

MAYOR'S CERTIFICATE NO. CBX DATED
BUDGET DIRECTOR'S CERTIFICATE NO. DATED

APPROPRIATION
COMMISSIONER'S CERTIFICATE

In conformity with the provisions of Section 6-101 of the Administrative Code of the City of New York, it is hereby certified that the estimated cost of the work, materials and supplies required by the within Contract, amounting to

one hundred twenty-seven million eight hundred eighty-eight thousand

five hundred sixty-seven

Dollars ($127,888,567.00)

is chargeable to the fund of the Department of Design and Construction entitled Code

S136-367

Department of Design and Construction

I hereby certify that the specifications contained herein comply with the terms and conditions of the BUDGET.

Lorraine Grillo
Commissioner

COMPTROLLER'S CERTIFICATE

The City of New York

Pursuant to the provisions of Section 6-101 of the Administrative Code of the City of New York, I hereby certify that there remains unapplied and unexpended a balance of the above mentioned fund applicable to this Contract sufficient to pay the estimated expense of executing the same viz:

$

Comptroller

MAYOR'S CERTIFICATE OR CERTIFICATE OF THE DIRECTOR OF THE BUDGET

Performance Bond #1 (Pages 100 to 103): Use if the total contract price is $5 Million Or Less. Performance Bond #1 has been approved by the U.S. Small Business Administration ("SBA") for participation in its Bond Guarantee Program.

PERFORMANCE BOND #1

KNOW ALL PERSONS BY THESE PRESENTS:,
That we, _____

_____

_____

hereinafter referred to as the "Principal,"
and, _____

_____

_____

hereinafter referred to as the "Surety" ("Sureties") are held and firmly bound to THE CITY OF NEW YORK, hereinafter referred to as the "City" or to its successors and assigns in the penal sum
of _____

_____

_____

($_____) Dollars, lawful money of the United States for the payment of which said sum of money well and truly to be made, we, and each of us, bind ourselves, our heirs, executors, administrators, successors and assigns, jointly and severally, firmly by these presents.

WHEREAS, the Principal is about to enter, or has entered, into a Contract in writing with the City for

_____

_____

a copy of which Contract is annexed to and hereby made a part of this bond as though herein set forth in full;

NOW, THEREFORE, the conditions of this obligation are such that if the Principal, his or its representatives or assigns, shall well and faithfully perform the said Contract and all modifications, amendments, additions and alterations thereto that may hereafter be made, according to its terms and its true intent and meaning, including repair and or replacement of defective work and guarantees of maintenance for the periods stated in the Contract, and shall fully indemnify and save harmless the City from all cost and damage which it may suffer by reason of the Principal's default of the Contract, and shall fully reimburse and repay the City for all outlay and expense which the City may incur in making

<u>Performance Bond #1 (Pages 100 to 103)</u>: Use if the total contract price is $5 Million Or Less. Performance Bond #1 has been approved by the U.S. Small Business Administration ("SBA") for participation in its Bond Guarantee Program.

good any such default and shall protect the said City of New York against, and pay any and all amounts, damages, cost and judgments which may or shall be recovered against said City or its officers or agents or which the said City of New York may be called upon to pay any person or corporation by reason of any damages arising or growing out of the Principal's default of the Contract, then this obligation shall be null and void, otherwise to remain in full force and effect.

The Surety (Sureties), for value received, hereby stipulates and agrees, upon written notice from the City that the City has determined that the Principal is in default of the Contract, to (1) pay the City the cost to complete the contract as determined by the City in excess of the balance of the Contract held by the City, plus any damages or costs to which the City is entitled, up to the full amount of the above penal sum, (2) fully perform and complete the Work to be performed under the Contract, pursuant to the terms, conditions, and covenants thereof, or (3) tender a completion Contractor that is acceptable to the City. The Surety (Sureties) further agrees, at its option, either to notify the City that it elects to pay the city the cost of completion plus any applicable damages and costs under option (1) above, or to commence and diligently perform the Work specified in the Contract, including physical site work, within twenty-five (25) business days after written notice thereof from the City and, if the Surety elects to fully perform and complete the Work, then to complete all Work within the time set forth in the Contract or such other time as agreed to between the City and Surety in accordance with the Contract. If the Surety elects to tender payment pursuant to (1) above, then the Surety shall tender such amount within fifteen (15) business days notification from the City of the cost of completion. The Surety and the City reserve all rights and defenses each may have against the other; provided, however, that the Surety expressly agrees that its reservation of rights shall not provide a basis for non-performance of its obligation to pay the City the cost of completion, to commence and complete all Work as provided herein, or to tender a completion contractor.

The Surety (Sureties), for value received, for itself and its successors and assigns, hereby stipulates and agrees that the obligation of said Surety (Sureties) and its bond shall be in no way impaired or affected by any extension of time, modification, omission, addition, or change in or to the said Contract or the Work to be performed thereunder, or by any payment thereunder before the time required therein, or by any waiver of any provisions thereof, or any moneys due or to become due thereunder; and said Surety (Sureties) does hereby waive notice of any and all of such extensions, modifications, omissions, additions, changes, payments, and waivers, and hereby expressly stipulates and agrees that any and all things done and omitted to be done by and in relation to subcontractors shall have the same effect as to said Surety (Sureties) as though done or omitted to be done by or in relation to said Principal. Notwithstanding the above, if the City makes payments to the Principal before the time required by the contract that in the aggregate exceed $100,000 or 10% of the Contract price, whichever is less, and that have not become earned prior to the Principal being found to be in default, then all payments made to the Principal before the time required by the Contract shall be added to the remaining contract value available to be paid for the completion of the Contract as if such sums had not been paid to the Principal, but shall not provide a basis for non-performance of its obligation to pay the City the cost of completion, to commence and to complete all Work as provided herein, or to tender a completion contractor.

Performance Bond #1 (Pages 100 to 103): Use if the total contract price is $5 Million Or Less. Performance Bond #1 has been approved by the U.S. Small Business Administration ("SBA") for participation in its Bond Guarantee Program.

IN WITNESS WHEREOF, The Principal and the Surety (Sureties) have hereunto set their hands and seals, and such of them as are corporations have caused their corporate seals to be hereunto affixed and these presents to be signed by their proper officers, this

_____ day of _____, 20_____.

(Seal)

_____(L.S.)
Principal

By:_____.

(Seal)

Surety

By:_____.
_____.

(Seal)

Surety

By:_____.
_____.

(Seal)

Surety

By:_____.
_____.

(Seal)

Surety

By:_____.

(Seal)

Surety

By:_____.

Bond Premium Rate _____.

Bond Premium Cost _____.

If the Contractor (Principal) is a partnership, the bond should be signed by each of the individuals who are partners.

If the Contractor (Principal) is a corporation, the bond should be signed in its correct corporate name by a duly authorized officer, agent, or attorney-in-fact.

There should be executed an appropriate number of counterparts of the bond corresponding to the number of counterparts of the Contract.

Performance Bond #1 (Pages 100 to 103): Use if the total contract price is $5 Million Or Less. Performance Bond #1 has been approved by the U.S. Small Business Administration ("SBA") for participation in its Bond Guarantee Program.m.

ACKNOWLEDGMENT OF PRINCIPAL IF A CORPORATION

State of _____ County of _____ ss:

On this _____ day of _____, 20_____ before me personally came _____,
to me known, who, being by me duly sworn did depose and say that he/she resides at _____
_____; that he/she is the _____
of the corporation described in and which executed the foregoing instrument; and that he/she signed his/her name to the foregoing instrument by order of the directors of said corporation as the duly authorized and binding act thereof.

_____
Notary Public or Commissioner of Deeds.

ACKNOWLEDGMENT OF PRINCIPAL IF A PARTNERSHIP

State of _____ County of _____ ss:

On this _____ day of _____, 20 _____ before me personally came _____,
to me known, who, being by me duly sworn did dispose and say that he/she resides at _____
_____; that he/she is _____ partner of _____, a limited/general partnership existing under the laws of the State of _____, the partnership described in and which executed the foregoing instrument; and that he/she signed his/her name to the foregoing instrument as the duly authorized and binding act of said partnership.

_____
Notary Public or Commissioner of Deeds.

ACKNOWLEDGMENT OF PRINCIPAL IF AN INDIVIDUAL

State of _____ County of _____ ss:

On this _____ day of _____, 20_____ before me personally came _____,
to me known, who,.being by me duly sworn did depose and say that he/she resides at _____
_____, and that he/she is the individual whose name is subscribed to the within instrument and acknowledged to me that by his/her signature on the instrument, said individual executed the instrument.

_____
Notary Public or Commissioner of Deeds

Each executed bond should be accompanied by: (a) appropriate acknowledgments of the respective parties; (b) appropriate duly certified copy of Power of Attorney or other certificate of authority where bond is executed by agent, officer or other representative of Principal or Surety; (c) a duly certified extract from By-Laws or resolutions of Surety under which Power of Attorney or other certificate of authority of its agent, officer or representative was issued, and (d) certified copy of latest published financial statement of assets and liabilities of Surety.

* * * * * * * *

Affix Acknowledgments and Justification of Sureties.

Performance Bond #2 (Pages 104 to 107): Use if the total contract price is more than $5 Million.

PERFORMANCE BOND #2

Bond No. 9335212

KNOW ALL PERSONS BY THESE PRESENTS:,
That we, Prismatic Development Corporation

60 U.S. Highway 46

Fairfield, NJ 07004

hereinafter referred to as the "Principal,"
and, Zurich American Insurance Company / Fidelity and Deposit Company of Maryland

1299 Zurich Way, 5th Floor

Schaumburg, IL 60196 - 1056

hereinafter referred to as the "Surety" ("Sureties") are held and firmly bound to THE CITY OF NEW YORK, hereinafter referred to as the "City" or to its successors and assigns in the penal sum of One Hundred Twenty Seven Million Eight Hundred Eighty-Eight Thousand Five Hundred Sixty Seven

and 00/100

($127,888,567.00) Dollars, lawful money of the United States for the payment of which said sum of money well and truly to be made, we, and each of us, bind ourselves, our heirs, executors, administrators, successors and assigns, jointly and severally, firmly by these presents.

WHEREAS, the Principal is about to enter, or has entered, into a Contract in writing with the City for

Staten Island 1 & 3 Garage - Phase 2

1000 West Service Road, Staten Island, NY 10314 - DDC PIN: 8502020TR0001C

a copy of which Contract is annexed to and hereby made a part of this bond as though herein set forth in full;

NOW, THEREFORE, the conditions of this obligation are such that if the Principal, his or its representatives or assigns, shall well and faithfully perform the said Contract and all modifications, amendments, additions and alterations thereto that may hereafter be made, according to its terms and its true intent and meaning, including repair and or replacement of defective work and guarantees of maintenance for the periods stated in the Contract, and shall fully indemnify and save harmless the City from all cost and damage which it may suffer by reason of the Principal's default of the Contract, and shall fully reimburse and repay the City for all outlay and expense which the City may incur in making

Performance Bond #2 (Pages 104 to 107): Use if the total contract price is more than $5 Million.

good any such default and shall protect the said City of New York against, and pay any and all amounts, damages, cost and judgments which may or shall be recovered against said City or its officers or agents or which the said City of New York may be called upon to pay any person or corporation by reason of any damages arising or growing out of the Principal's default of the Contract, then this obligation shall be null and void, otherwise to remain in full force and effect.

The Surety (Sureties), for value received, hereby stipulates and agrees, upon written notice from the City that the City has determined that the Principal is in default of the Contract, to either (1) pay the full amount of the above penal sum in complete discharge and exoneration of this bond and of all the liabilities of the Surety relating to this bond, or (2) fully perform and complete the Work to be performed under the Contract, pursuant to the terms, conditions, and covenants thereof. The Surety (Sureties) further agrees, at its option, either to tender the penal sum or to commence and diligently perform the Work specified in the Contract, including physical site work, within twenty-five (25) business days after written notice thereof from the City and to complete all Work within the time set forth in the Contract or such other time as agreed to between the City and Surety in accordance with the Contract. The Surety and the City reserve all rights and defenses each may have against the other; provided, however, that the Surety expressly agrees that its reservation of rights shall not provide a basis for non-performance of its obligation to commence and to complete all Work as provided herein.

The Surety (Sureties), for value received, for itself and its successors and assigns, hereby stipulates and agrees that the obligation of said Surety (Sureties) and its bond shall be in no way impaired or affected by any extension of time, modification, omission, addition, or change in or to the said Contract or the Work to be performed thereunder, or by any payment thereunder before the time required therein, or by any waiver of any provisions thereof, or by any assignment, subletting or other transfer thereof or of any Work to be performed or any moneys due or to become due thereunder; and said Surety (Sureties) does hereby waive notice of any and all of such extensions, modifications, omissions, additions, changes, payments, waivers, assignments, subcontracts and transfers, and hereby expressly stipulates and agrees that any and all things done and omitted to be done by and in relation to assignees, subcontractors, and other transferees shall have the same effect as to said Surety (Sureties) as though done or omitted to be done by or in relation to said Principal.

Performance Bond #2 (Pages 104 to 107): Use if the total contract price is more than $5 Million.

IN WITNESS WHEREOF, The Principal and the Surety (Sureties) have hereunto set their hands and seals, and such of them as are corporations have caused their corporate seals to be hereunto affixed and these presents to be signed by their proper officers, this

30th day of December 2020.

(Seal)

Prismatic Development Corporation (L.S.)
Principal

By: _____.

(Seal)

Zurich American Insurance Company / Fidelity and Deposit Company of Maryland
Surety

By: _____.
Jane L. Fedorczyk, Attorney-in-Fact

(Seal)

Surety

By: _____.

(Seal)

Surety

By: _____.

(Seal)

Surety

By: _____.

(Seal)

Surety

By: _____.

Bond Premium Rate $7.50 per thousand.

Bond Premium Cost $1,016,714.00.

If the Contractor (Principal) is a partnership, the bond should be signed by each of the individuals who are partners.

If the Contractor (Principal) is a corporation, the bond should be signed in its correct corporate name by a duly authorized officer, agent, or attorney-in-fact.

There should be executed an appropriate number of counterparts of the bond corresponding to the number of counterparts of the Contract.

Performance Bond #2 (Pages 104 to 107): Use if the total contract price is more than $5 Million.

ACKNOWLEDGMENT OF PRINCIPAL IF A CORPORATION

State of NJ County of Morris ss:

On this 7th day of January, 20 21 before me personally came Robert V. Gamba,
to me known, who, being by me duly sworn did depose and say that he resides
at 60 Beachmont Terrace
North Caldwell, NJ ; that he/she is the President / C.E.O.
of the corporation described in and which executed the foregoing instrument; that he/she signed his/her name to the foregoing instrument by order of the directors of said corporation as the duly authorized and binding act thereof.

Karen A. Meyer
Notary Public or Commissioner of Deeds.

KAREN A. MEYER
NOTARY PUBLIC OF NEW JERSEY
My Commission Expires April 5, 2024

ACKNOWLEDGMENT OF PRINCIPAL IF A PARTNERSHIP

State of _____ County of _____ ss:

On this _____ day of _____, 20 _____ before me personally came _____,
to me known, who, being by me duly sworn did depose and say that he/she resides
at _____

_____; that he/she is _____ partner of _____, a limited/general partnership existing under the laws of the State of _____, the partnership described in and which executed the foregoing instrument; and that he/she signed his/her name to the foregoing instrument as the duly authorized and binding act of said partnership.

_____
Notary Public or Commissioner of Deeds

ACKNOWLEDGMENT OF PRINCIPAL IF AN INDIVIDUAL

State of _____ County of _____ ss:

On this _____ day of _____, 20_____ before me personally came _____,
to me known, who, being by me duly sworn did depose and say that he/she resides
at _____
_____, and that he/she is the individual whose name is subscribed to the within instrument and acknowledged to me that by his/her signature on the instrument, said individual executed the instrument.

_____
Notary Public or Commissioner of Deeds

Each executed bond should be accompanied by: (a) appropriate acknowledgments of the respective parties; (b) appropriate duly certified copy of Power of Attorney or other certificate of authority where bond is executed by agent, officer or other representative of Principal or Surety; (c) a duly certified extract from By-Laws or resolutions of Surety under which Power of Attorney or other certificate of authority of its agent, officer or representative was issued, and (d) certified copy of latest published financial statement of assets and liabilities of Surety.

* * * * * * * *

Affix Acknowledgments and Justification of Sureties.

ACKNOWLEDGMENT OF SURETY COMPANY

STATE OF NEW JERSEY

COUNTY OF SOMERSET

On this **30th** day of **December 2020**, before me personally came **Jane L. Fedorczyk**, to me known, who, being by me duly sworn, did depose and say; that she is the Attorney-in-Fact of the **Zurich American Insurance Company / Fidelity and Deposit Company of Maryland** the corporation described in which executed the above instrument; that she knows the seal of said corporation; that the seal affixed to said instrument is such corporate seal; that it was so affixed by the Board of Directors of said corporation; and that she signed her name thereto by the authority of the Power of Attorney of said Company, of which a Certified Copy is hereto attached, and that she signed said Instrument as an Attorney-in-Fact of said company by like authority.

.....

Notary Public

ANN MARIE KEANE
NOTARY PUBLIC
STATE OF NEW JERSEY
MY COMMISSION EXPIRES MAY 19, 2025

ZURICH AMERICAN INSURANCE COMPANY
COLONIAL AMERICAN CASUALTY AND SURETY COMPANY
FIDELITY AND DEPOSIT COMPANY OF MARYLAND
POWER OF ATTORNEY

KNOW ALL MEN BY THESE PRESENTS: That the ZURICH AMERICAN INSURANCE COMPANY, a corporation of the State of New York, the COLONIAL AMERICAN CASUALTY AND SURETY COMPANY, a corporation of the State of Illinois, and the FIDELITY AND DEPOSIT COMPANY OF MARYLAND a corporation of the State of Illinois (herein collectively called the "Companies"), by Robert D. Murray, Vice President, in pursuance of authority granted by Article V, Section 8, of the By-Laws of said Companies, which are set forth on the reverse side hereof and are hereby certified to be in full force and effect on the date hereof, do hereby nominate, constitute, and appoint **William X. LINNEY, III, Robert B. PITTS, John J. SCIORTINO, JR., Jane L. FEDORCZYK, Frederick E. NICHOLSON, Joseph T. CHARCZENKO, AnnMarie KEANE, Elizabeth RIGA, Joseph J. KENT and Gary V. RISPOLI, all of Branchburg, New Jersey,** EACH, its true and lawful agent and Attorney-in-Fact, to make, execute, seal and deliver, for, and on its behalf as surety, and as its act and deed: any and all bonds and undertakings, and the execution of such bonds or undertakings in pursuance of these presents, shall be as binding upon said Companies, as fully and amply, to all intents and purposes, as if they had been duly executed and acknowledged by the regularly elected officers of the ZURICH AMERICAN INSURANCE COMPANY at its office in New York, New York., the regularly elected officers of the COLONIAL AMERICAN CASUALTY AND SURETY COMPANY at its office in Owings Mills, Maryland., and the regularly elected officers of the FIDELITY AND DEPOSIT COMPANY OF MARYLAND at its office in Owings Mills, Maryland., in their own proper persons.

The said Vice President does hereby certify that the extract set forth on the reverse side hereof is a true copy of Article V, Section 8, of the By-Laws of said Companies, and is now in force.

IN WITNESS WHEREOF, the said Vice-President has hereunto subscribed his/her names and affixed the Corporate Seals of the said **ZURICH AMERICAN INSURANCE COMPANY, COLONIAL AMERICAN CASUALTY AND SURETY COMPANY, and FIDELITY AND DEPOSIT COMPANY OF MARYLAND**, this 22nd day of March, A.D. 2019.

ATTEST:
ZURICH AMERICAN INSURANCE COMPANY
COLONIAL AMERICAN CASUALTY AND SURETY COMPANY
FIDELITY AND DEPOSIT COMPANY OF MARYLAND

By: Robert D. Murray
Vice President

By: Dawn E. Brown
Secretary

State of Maryland
County of Baltimore

On this 22nd day of March, A.D. 2019, before the subscriber, a Notary Public of the State of Maryland, duly commissioned and qualified, **Robert D. Murray, Vice President and Dawn E. Brown, Secretary** of the Companies, to me personally known to be the individuals and officers described in and who executed the preceding instrument, and acknowledged the execution of same, and being by me duly sworn, deposeth and saith, that he/she is the said officer of the Company aforesaid, and that the seals affixed to the preceding instrument are the Corporate Seals of said Companies, and that the said Corporate Seals and the signature as such officer were duly affixed and subscribed to the said instrument by the authority and direction of the said Corporations.

IN TESTIMONY WHEREOF, I have hereunto set my hand and affixed my Official Seal the day and year first above written.

Constance A. Dunn, Notary Public
My Commission Expires: July 9, 2019

EXTRACT FROM BY-LAWS OF THE COMPANIES

"Article V, Section 8, Attorneys-in-Fact. The Chief Executive Officer, the President, or any Executive Vice President or Vice President may, by written instrument under the attested corporate seal, appoint attorneys-in-fact with authority to execute bonds, policies, recognizances, stipulations, undertakings, or other like instruments on behalf of the Company, and may authorize any officer or any such attorney-in-fact to affix the corporate seal thereto; and may with or without cause modify of revoke any such appointment or authority at any time."

CERTIFICATE

I, the undersigned, Secretary of the ZURICH AMERICAN INSURANCE COMPANY, the COLONIAL AMERICAN CASUALTY AND SURETY COMPANY, and the FIDELITY AND DEPOSIT COMPANY OF MARYLAND, do hereby certify that the foregoing Power of Attorney is still in full force and effect on the date of this certificate; and I do further certify that Article V, Section 8, of the By-Laws of the Companies is still in force.

This Power of Attorney and Certificate may be signed by facsimile under and by authority of the following resolution of the Board of Directors of the ZURICH AMERICAN INSURANCE COMPANY at a meeting duly called and held on the 15th day of December 1998.

RESOLVED: "That the signature of the President or a Vice President and the attesting signature of a Secretary or an Assistant Secretary and the Seal of the Company may be affixed by facsimile on any Power of Attorney...Any such Power or any certificate thereof bearing such facsimile signature and seal shall be valid and binding on the Company."

This Power of Attorney and Certificate may be signed by facsimile under and by authority of the following resolution of the Board of Directors of the COLONIAL AMERICAN CASUALTY AND SURETY COMPANY at a meeting duly called and held on the 5th day of May, 1994, and the following resolution of the Board of Directors of the FIDELITY AND DEPOSIT COMPANY OF MARYLAND at a meeting duly called and held on the 10th day of May, 1990.

RESOLVED: "That the facsimile or mechanically reproduced seal of the company and facsimile or mechanically reproduced signature of any Vice-President, Secretary, or Assistant Secretary of the Company, whether made heretofore or hereafter, wherever appearing upon a certified copy of any power of attorney issued by the Company, shall be valid and binding upon the Company with the same force and effect as though manually affixed.

IN TESTIMONY WHEREOF, I have hereunto subscribed my name and affixed the corporate seals of the said Companies, this 30th day of December, 2020.

By: Brian M. Hodges
Vice President

TO REPORT A CLAIM WITH REGARD TO A SURETY BOND, PLEASE SUBMIT A COMPLETE DESCRIPTION OF THE CLAIM INCLUDING THE PRINCIPAL ON THE BOND, THE BOND NUMBER, AND YOUR CONTACT INFORMATION TO:

Zurich Surety Claims
1299 Zurich Way
Schaumburg, IL 60196-1056
www.reportsfclaims@zurichna.com
800-626-4577

ZURICH AMERICAN INSURANCE COMPANY
COMPARATIVE BALANCE SHEET
4 WORLD TRADE CENTER, 150 GREENWICH STREET, NEW YORK, NY 10007
As of December 31, 2019 and December 31, 2018

	12/31/2019	12/31/2018
Assets		
Bonds	$ 16,780,375,969	$ 17,540,109,648
Preferred Stock	-	-
Common Stock	3,121,559,258	3,132,639,174
Real Estate	1,273,640,596	1,373,151,270
Other Invested Assets	1,185,313,467	1,113,225,492
Derivatives	21,358	642,656
Short-term Investments	14,532,665	24,895,313
Receivable for securities	114,199,089	75,504,004
Cash and cash equivalents	42,548,382	(38,621,060)
Securities lending reinvested collateral assets	55,769,285	47,379,583
Employee Trust for Deferred Compensation Plan	129,612,266	142,053,861
Total Cash and Invested Assets	$ 22,717,572,333	$ 23,410,979,940
Premiums Receivable	$ 4,775,851,073	$ 4,800,865,144
Funds Held with Reinsurers	97,862	371,693
Reinsurance Recoverable	1,497,744,413	1,298,188,705
Accrued Investment Income	127,170,427	126,363,306
Federal Income Tax Recoverable	565,755,651	503,312,859
Due from Affiliates	204,233,875	205,170,893
Other Assets	527,556,278	602,852,006
Total Assets	$ 30,415,981,911	$ 30,948,104,546
Liabilities and Policyholders' Surplus		
Liabilities:		
Loss and LAE Reserves	$ 12,626,869,059	$ 13,849,911,195
Unearned Premium Reserve	3,845,794,904	3,819,936,876
Funds Held with Reinsurers	385,953,985	559,639,569
Loss In Course of Payment	1,442,194,686	959,528,132
Commission Reserve	124,215,143	120,056,749
Federal Income Tax Payable	-	-
Remittances and Items Unallocated	147,106,142	19,668,701
Payable to parent, subs and affiliates	294,896,500	106,578,289
Provision for Reinsurance	110,765,261	213,799,231
Ceded Reinsurance Premiums Payable	1,821,418,177	1,939,296,998
Securities Lending Collateral Liability	55,769,285	47,379,583
Other Liabilities	1,887,566,082	2,136,803,941
Total Liabilities	$ 22,742,549,225	$ 23,772,599,265
Policyholders' Surplus:		
Common Capital Stock	$ 5,000,000	$ 5,000,000
Paid-In and Contributed Surplus	4,394,131,321	4,394,131,321
Surplus Notes	-	-
Special Surplus Funds	2,910,000	5,106,000
Cumulative Unrealized Gain	118,847,749	52,396,417
Unassigned Surplus	3,152,543,616	2,718,871,543
Total Policyholders' Surplus	$ 7,673,432,686	$ 7,175,505,281
Total Liabilities and Policyholders' Surplus	$ 30,415,981,911	$ 30,948,104,546

I, LAURA J. LAZARCZYK, Corporate Secretary of ZURICH AMERICAN INSURANCE COMPANY do hereby certify that the foregoing statement is a correct exhibit of the assets and liabilities of the said Company, on the 31st day of December, 2019, according to the best of my information, knowledge and belief.

Laura J Lazarczyk
Corporate Secretary

State of Illinois
County of Cook } SS:

Subscribed and sworn to, before me, a Notary Public of the State of Illinois, in the City of Schaumburg, this 25th day of February, 2020.

Darryl Joiner
Notary public

DARRYL JOINER
OFFICIAL SEAL
Notary Public - State of Illinois
My Commission Expires 2/24/2022

THE FIDELITY AND DEPOSIT COMPANY

OF MARYLAND
1299 Zurich Way Schaumburg, IL 60196

Statement of Financial Condition
As Of December 31, 2019

ASSETS

Bonds		$ 255,279,821
Stocks		21,280,401
Cash and Short Term Investments		2,878,421
Reinsurance Recoverable		25,356,035
Federal Income Tax Recoverable		140,480
Other Accounts Receivable		20,383,843
TOTAL ADMITTED ASSETS		$ 325,319,001

LIABILITIES, SURPLUS AND OTHER FUNDS

Reserve for Taxes and Expenses		$ 795,381
Ceded Reinsurance Premiums Payable		43,024,327
Remittances and Items Unallocated		0
Payable to parents, subs and affiliates		0
Securities Lending Collateral Liability		0
TOTAL LIABILITIES		$ 43,819,708
Capital Stock, Paid Up	$ 5,000,000	
Surplus	276,499,293	
Surplus as regards Policyholders		281,499,293
TOTAL		$ 325,319,001

Securities carried at $164,223,431 in the above statement are deposited with various states as required by law.

Securities carried on the basis prescribed by the National Association of Insurance Commissioners. On the basis of market quotations for all bonds and stocks owned, the Company's total admitted assets at December 31, 2019 would be $322,248,132 and surplus as regards policyholders $288,428,424.

I, LAURA J. LAZARCZYK, Corporate Secretary of the FIDELITY AND DEPOSIT COMPANY OF MARYLAND, do hereby certify that the foregoing statement is a correct exhibit of the assets and liabilities of the said Company on the 31st day of December, 2019.

Laura J Lazarczyk
Corporate Secretary

State of Illinois
City of Schaumburg } SS:

Subscribed and sworn to, before me, a Notary Public of the State of Illinois, in the City of Schaumburg, this 25th day of February, 2020.

Darryl Joiner
Notary Public

DARRYL JOINER
OFFICIAL SEAL
Notary Public - State of Illinois
My Commission Expires 2/24/2022

Payment Bond (Pages 108 to 111): Use for any contract for which a Payment Bond is required.

PAYMENT BOND

Bond No. 9335212

KNOW ALL PERSONS BY THESE PRESENTS, That we, Prismatic Development Corporation

60 U.S. Highway 46

Fairfield, NJ 07004

hereinafter referred to as the "Principal", and

Zurich American Insurance Company / Fidelity and Deposit Company of Maryland

1299 Zurich Way, 5th Floor

Schaumburg, IL 60196 - 1056

hereinafter referred to as the "Surety" ("Sureties") are held and firmly bound to THE CITY OF NEW YORK, hereinafter referred to as the "City" or to its successors and assigns, in the penal sum of

One Hundred Twenty Seven Million Eight Hundred Eighty-Eight Thousand Five Hundred Sixty Seven

and 00/100

($127,888,567.00) Dollars, lawful money of the United States, for the payment of which said sum of money well and truly to be made, we, and each of us, bind ourselves, our heirs, executors, administrators, successors and assigns, jointly and severally, firmly by these presents.

WHEREAS, the Principal is about to enter, or has entered, into a Contract in writing with the City for

Staten Island 1 & 3 Garage - Phase 2

1000 West Service Road, Staten Island, NY 10314 - DDC PIN: 8502020TR0001C

a copy of which Contract is annexed to and hereby made a part of this bond as though herein set forth in full;

NOW, THEREFORE, the conditions of this obligation are such that if the Principal, his or its representatives or assigns and other Subcontractors to whom Work under this Contract is sublet and his or their successors and assigns shall promptly pay or cause to be paid all lawful claims for

(a) Wages and compensation for labor performed and services rendered by all persons engaged in the prosecution of the Work under said Contract, and any amendment or extension thereof or addition thereto, whether such persons be agents servants or employees of the Principal or any such Subcontractor, including all persons so engaged who perform the work of laborers or mechanics at or in the vicinity of the site

of the Project regardless of any contractual relationship between the Principal or such Subcontractors, or his or their successors or assigns, on the one hand and such laborers or mechanics on the other, but not including office employees not regularly stationed at the site of the project; and

(b) Materials and supplies (whether incorporated in the permanent structure or not), as well as teams, fuels, oils, implements or machinery furnished, used or consumed by said Principal or any subcontractor at or in the vicinity of the site of the Project in the prosecution of the Work under said Contract and any amendment or extension thereof or addition thereto; then this obligation shall be void, otherwise to remain in full force and effect.

This bond is subject to the following additional conditions, limitations and agreements:

(a) The Principal and Surety (Sureties) agree that this bond shall be for the benefit of any materialmen or laborer having a just claim, as well as the City itself.

(b) All persons who have performed labor, rendered services or furnished materials and supplies, as aforesaid, shall have a direct right of action against the Principal and his, its or their successors and assigns, and the Surety (Sureties) herein, or against either or both or any of them and their successors and assigns. Such persons may sue in their own name, and may prosecute the suit to judgment and execution without the necessity of joining with any other persons as party plaintiff.

(c) The Principal and Surety (Sureties) agree that neither of them will hold the City liable for any judgment for costs of otherwise, obtained by either or both of them against a laborer or materialman in a suit brought by either a laborer or materialman under this bond for moneys allegedly due for performing work or furnishing material.

(d) The Surety (Sureties) or its successors and assigns shall not be liable for any compensation recoverable by an employee or laborer under the Workmen's Compensation Law.

(e) In no event shall the Surety (Sureties), or its successors or assigns, be liable for a greater sum than the penalty of this bond or be subject to any suit, action or proceeding hereon that is instituted by any person, firm, or corporation hereunder later than two years after the complete performance of said Contract and final settlement thereof.

The Principal, for himself and his successors and assigns, and the Surety (Sureties), for itself and its successors and assigns, do hereby expressly waive any objection that might be interposed as to the right of the City to require a bond containing the foregoing provisions, and they do hereby further expressly waive any defense which they or either of them might interpose to an action brought hereon by any person, firm or corporation, including subcontractors, materialmen and third persons, for work, labor, services, supplies or material performed rendered, or furnished as aforesaid upon the ground that there is no law authorizing the City to require the foregoing provisions to be place in this bond.

And the Surety (Sureties), for value received, for itself and its successors and assigns, hereby stipulates and agrees that the obligation of said Surety (Sureties), and its bonds shall be in no way impaired or affected by any extension of time, modification, omission, addition, or change in or of the said Contract or the work to be performed thereunder, or by any payment thereunder before the time required therein, or by any waiver of any provisions thereof, or by any assignment, subletting or other transfer thereof or of any part thereof, or of any Work to be performed, or any moneys due to become due thereunder and said Surety (Sureties) does hereby waive notice of any and all of such extensions, modifications, omissions, additions, changes, payments, waivers, assignments, subcontracts and transfers, and hereby expressly stipulates and agrees that any and all things done and omitted to be done by and in relation to assignees, Subcontractors, and other transferees shall have the same effect as to said Surety (Sureties) as though done or omitted to be done or in relation to said Principal.

Payment Bond (Pages 108 to 111): Use for any contract for which a Payment Bond is required.

IN WITNESS WHEREOF, the Principal and the Surety (Sureties) have hereunto set their hands and seals, and such of them as are corporations have caused their corporate seals to be hereunto affixed and these presents to be signed by their proper officers, this 30th day of December, 2020.

(Seal) Prismatic Development Corporation (L.S.)
Principal
By: _____

(Seal) Zurich American Insurance Company / Fidelity and Deposit Company of Maryland
Surety
By: _____
Jane L. Fedorczyk, Attorney-in-Fact

(Seal) _____
Surety
By: _____

(Seal) _____
Surety
By: _____

(Seal) _____
Surety
By: _____

If the Contractor (Principal) is a partnership, the bond should be signed by each of the individuals who are partners.

If the Contractor (Principal) is a corporation, the bond should be signed in its correct corporate name by a duly authorized officer, agent, or attorney-in-fact.

There should be executed an appropriate number of counterparts of the bond corresponding to the number of counterparts of the Contract.

Payment Bond (Pages 108 to 111): Use for any contract for which a Payment Bond is required.

ACKNOWLEDGMENT OF PRINCIPAL, IF A CORPORATION

State of NJ County of Morris ss:

On this 7th day of January, 2021, before me personally came Robert V. Gamba to me known, who, being by me duly sworn did depose and say that he resides at 60 Beachmont Terrace, North Caldwell, NJ that he is the President /C.E.O. of the corporation described in and which executed the foregoing instrument; that he knows the seal of said corporation; that one of the seals affixed to said instrument is such seal; that it was so affixed by order of the directors of said corporation, and that he signed his name thereto by like order.

Karen A. Meyer

Notary Public or Commissioner of Deeds

KAREN A. MEYER
NOTARY PUBLIC OF NEW JERSEY
My Commission Expires April 5, 2024

ACKNOWLEDGMENT OF PRINCIPAL, IF A PARTNERSHIP

State of _____ County of _____ ss:

On this _____ day of _____, _____, before me personally appeared _____ to me known, and known to me to be one of the members of the firm of _____ described in and who executed the foregoing instrument; and he acknowledged to me that he executed the same as and for the act and deed of said firm.

_____

Notary Public or Commissioner of Deeds

ACKNOWLEDGMENT OF PRINCIPAL, IF AN INDIVIDUAL

State of _____ County of _____ ss:

On this _____ day of _____, _____, before me personally appeared _____ to me known, and known to me to be the person described in and who executed the foregoing instrument; and acknowledged that he executed the same.

_____

Notary Public or Commissioner of Deeds

Each executed bond should be accompanied by: (a) appropriate acknowledgments of the respective parties; (b) appropriate duly certified copy of Power of Attorney or other certificate of authority where bond is executed by agent, officer or other representative of Principal or Surety; (c) a duly certified extract from By-Laws or resolutions of Surety under which Power of Attorney or other certificate of authority of its agent, officer or representative was issued, and (d) certified copy of latest published financial statement of assets and liabilities of Surety.

* * * * * * * *

Affix Acknowledgments and Justification of Sureties.

ACKNOWLEDGMENT OF SURETY COMPANY

STATE OF NEW JERSEY

COUNTY OF SOMERSET

On this **30th** day of **December 2020**, before me personally came **Jane L. Fedorczyk**, to me known, who, being by me duly sworn, did depose and say; that she is the Attorney-in-Fact of the **Zurich American Insurance Company / Fidelity and Deposit Company of Maryland** the corporation described in which executed the above instrument; that she knows the seal of said corporation; that the seal affixed to said instrument is such corporate seal; that it was so affixed by the Board of Directors of said corporation; and that she signed her name thereto by the authority of the Power of Attorney of said Company, of which a Certified Copy is hereto attached, and that she signed said Instrument as an Attorney-in-Fact of said company by like authority.

.....

Notary Public

ANN MARIE KEANE
NOTARY PUBLIC
STATE OF NEW JERSEY
MY COMMISSION EXPIRES MAY 19, 2025

ZURICH AMERICAN INSURANCE COMPANY
COLONIAL AMERICAN CASUALTY AND SURETY COMPANY
FIDELITY AND DEPOSIT COMPANY OF MARYLAND
POWER OF ATTORNEY

KNOW ALL MEN BY THESE PRESENTS: That the ZURICH AMERICAN INSURANCE COMPANY, a corporation of the State of New York, the COLONIAL AMERICAN CASUALTY AND SURETY COMPANY, a corporation of the State of Illinois, and the FIDELITY AND DEPOSIT COMPANY OF MARYLAND a corporation of the State of Illinois (herein collectively called the "Companies"), by Robert D. Murray, Vice President, in pursuance of authority granted by Article V, Section 8, of the By-Laws of said Companies, which are set forth on the reverse side hereof and are hereby certified to be in full force and effect on the date hereof, do hereby nominate, constitute, and appoint **William X. LINNEY, III, Robert B. PITTS, John J. SCIORTINO, JR., Jane L. FEDORCZYK, Frederick E. NICHOLSON, Joseph T. CHARCZENKO, AnnMarie KEANE, Elizabeth RIGA, Joseph J. KENT and Gary V. RISPOLI, all of Branchburg, New Jersey,** EACH, its true and lawful agent and Attorney-in-Fact, to make, execute, seal and deliver, for, and on its behalf as surety, and as its act and deed: any and all bonds and undertakings, and the execution of such bonds or undertakings in pursuance of these presents, shall be as binding upon said Companies, as fully and amply, to all intents and purposes, as if they had been duly executed and acknowledged by the regularly elected officers of the ZURICH AMERICAN INSURANCE COMPANY at its office in New York, New York., the regularly elected officers of the COLONIAL AMERICAN CASUALTY AND SURETY COMPANY at its office in Owings Mills, Maryland., and the regularly elected officers of the FIDELITY AND DEPOSIT COMPANY OF MARYLAND at its office in Owings Mills, Maryland., in their own proper persons.

The said Vice President does hereby certify that the extract set forth on the reverse side hereof is a true copy of Article V, Section 8, of the By-Laws of said Companies, and is now in force.

IN WITNESS WHEREOF, the said Vice-President has hereunto subscribed his/her names and affixed the Corporate Seals of the said **ZURICH AMERICAN INSURANCE COMPANY, COLONIAL AMERICAN CASUALTY AND SURETY COMPANY, and FIDELITY AND DEPOSIT COMPANY OF MARYLAND**, this 22nd day of March, A.D. 2019.

ATTEST:
ZURICH AMERICAN INSURANCE COMPANY
COLONIAL AMERICAN CASUALTY AND SURETY COMPANY
FIDELITY AND DEPOSIT COMPANY OF MARYLAND

By: Robert D. Murray
Vice President

By: Dawn E. Brown
Secretary

State of Maryland
County of Baltimore

On this 22nd day of March, A.D. 2019, before the subscriber, a Notary Public of the State of Maryland, duly commissioned and qualified, **Robert D. Murray, Vice President and Dawn E. Brown, Secretary** of the Companies, to me personally known to be the individuals and officers described in and who executed the preceding instrument, and acknowledged the execution of same, and being by me duly sworn, deposeth and saith, that he/she is the said officer of the Company aforesaid, and that the seals affixed to the preceding instrument are the Corporate Seals of said Companies, and that the said Corporate Seals and the signature as such officer were duly affixed and subscribed to the said instrument by the authority and direction of the said Corporations.

IN TESTIMONY WHEREOF, I have hereunto set my hand and affixed my Official Seal the day and year first above written.

Constance A. Dunn, Notary Public
My Commission Expires: July 9, 2019

EXTRACT FROM BY-LAWS OF THE COMPANIES

"Article V, Section 8, Attorneys-in-Fact. The Chief Executive Officer, the President, or any Executive Vice President or Vice President may, by written instrument under the attested corporate seal, appoint attorneys-in-fact with authority to execute bonds, policies, recognizances, stipulations, undertakings, or other like instruments on behalf of the Company, and may authorize any officer or any such attorney-in-fact to affix the corporate seal thereto; and may with or without cause modify of revoke any such appointment or authority at any time."

CERTIFICATE

I, the undersigned, Secretary of the ZURICH AMERICAN INSURANCE COMPANY, the COLONIAL AMERICAN CASUALTY AND SURETY COMPANY, and the FIDELITY AND DEPOSIT COMPANY OF MARYLAND, do hereby certify that the foregoing Power of Attorney is still in full force and effect on the date of this certificate; and I do further certify that Article V, Section 8, of the By-Laws of the Companies is still in force.

This Power of Attorney and Certificate may be signed by facsimile under and by authority of the following resolution of the Board of Directors of the ZURICH AMERICAN INSURANCE COMPANY at a meeting duly called and held on the 15th day of December 1998.

RESOLVED: "That the signature of the President or a Vice President and the attesting signature of a Secretary or an Assistant Secretary and the Seal of the Company may be affixed by facsimile on any Power of Attorney...Any such Power or any certificate thereof bearing such facsimile signature and seal shall be valid and binding on the Company."

This Power of Attorney and Certificate may be signed by facsimile under and by authority of the following resolution of the Board of Directors of the COLONIAL AMERICAN CASUALTY AND SURETY COMPANY at a meeting duly called and held on the 5th day of May, 1994, and the following resolution of the Board of Directors of the FIDELITY AND DEPOSIT COMPANY OF MARYLAND at a meeting duly called and held on the 10th day of May, 1990.

RESOLVED: "That the facsimile or mechanically reproduced seal of the company and facsimile or mechanically reproduced signature of any Vice-President, Secretary, or Assistant Secretary of the Company, whether made heretofore or hereafter, wherever appearing upon a certified copy of any power of attorney issued by the Company, shall be valid and binding upon the Company with the same force and effect as though manually affixed.

IN TESTIMONY WHEREOF, I have hereunto subscribed my name and affixed the corporate seals of the said Companies, this 30th day of December, 2020.

Brian M Hodges

By: Brian M. Hodges
Vice President

TO REPORT A CLAIM WITH REGARD TO A SURETY BOND, PLEASE SUBMIT A COMPLETE DESCRIPTION OF THE CLAIM INCLUDING THE PRINCIPAL ON THE BOND, THE BOND NUMBER, AND YOUR CONTACT INFORMATION TO:

Zurich Surety Claims
1299 Zurich Way
Schaumburg, IL 60196-1056
www.reportsfclaims@zurichna.com
800-626-4577

ZURICH AMERICAN INSURANCE COMPANY
COMPARATIVE BALANCE SHEET
4 WORLD TRADE CENTER, 150 GREENWICH STREET, NEW YORK, NY 10007
As of December 31, 2019 and December 31, 2018

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Common Stock	3,121,559,258	3,132,639,174
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Employee Trust for Deferred Compensation Plan	129,612,266	142,053,861
Total Cash and Invested Assets	$ 22,717,572,333	$ 23,410,979,940
Premiums Receivable	$ 4,775,851,073	$ 4,800,865,144
Funds Held with Reinsurers	97,862	371,693
Reinsurance Recoverable	1,497,744,413	1,298,188,705
Accrued Investment Income	127,170,427	126,363,306
Federal Income Tax Recoverable	565,755,651	503,312,859
Due from Affiliates	204,233,875	205,170,893
Other Assets	527,556,278	602,852,006
Total Assets	$ 30,415,981,911	$ 30,948,104,546
Liabilities and Policyholders' Surplus		
Liabilities:		
Loss and LAE Reserves	$ 12,626,869,059	$ 13,849,911,195
Unearned Premium Reserve	3,845,794,904	3,819,936,876
Funds Held with Reinsurers	385,953,985	559,639,569
Loss In Course of Payment	1,442,194,686	959,528,132
Commission Reserve	124,215,143	120,056,749
Federal Income Tax Payable	-	-
Remittances and Items Unallocated	147,106,142	19,668,701
Payable to parent, subs and affiliates	294,896,500	106,578,289
Provision for Reinsurance	110,765,261	213,799,231
Ceded Reinsurance Premiums Payable	1,821,418,177	1,939,296,998
Securities Lending Collateral Liability	55,769,285	47,379,583
Other Liabilities	1,887,566,082	2,136,803,941
Total Liabilities	$ 22,742,549,225	$ 23,772,599,265
Policyholders' Surplus:		
Common Capital Stock	$ 5,000,000	$ 5,000,000
Paid-In and Contributed Surplus	4,394,131,321	4,394,131,321
Surplus Notes	-	-
Special Surplus Funds	2,910,000	5,106,000
Cumulative Unrealized Gain	118,847,749	52,396,417
Unassigned Surplus	3,152,543,616	2,718,871,543
Total Policyholders' Surplus	$ 7,673,432,686	$ 7,175,505,281
Total Liabilities and Policyholders' Surplus	$ 30,415,981,911	$ 30,948,104,546

I, LAURA J. LAZARCZYK, Corporate Secretary of ZURICH AMERICAN INSURANCE COMPANY do hereby certify that the foregoing statement is a correct exhibit of the assets and liabilities of the said Company, on the 31st day of December, 2019, according to the best of my information, knowledge and belief.

Laura J Lazarczyk
Corporate Secretary

State of Illinois
County of Cook } SS:

Subscribed and sworn to, before me, a Notary Public of the State of Illinois, in the City of Schaumburg, this 25th day of February, 2020.

Daryl Joiner
Notary public

DARRYL JOINER
OFFICIAL SEAL
Notary Public - State of Illinois
My Commission Expires 2/24/2022

THE FIDELITY AND DEPOSIT COMPANY

OF MARYLAND
1299 Zurich Way Schaumburg, IL 60196

Statement of Financial Condition
As Of December 31, 2019

ASSETS

Bonds		$ 255,279,821
Stocks		21,280,401
Cash and Short Term Investments		2,878,421
Reinsurance Recoverable		25,356,035
Federal Income Tax Recoverable		140,480
Other Accounts Receivable		20,383,843
TOTAL ADMITTED ASSETS		$ 325,319,001

LIABILITIES, SURPLUS AND OTHER FUNDS

Reserve for Taxes and Expenses		$ 795,381
Ceded Reinsurance Premiums Payable		43,024,327
Remittances and Items Unallocated		0
Payable to parents, subs and affiliates		0
Securities Lending Collateral Liability		0
TOTAL LIABILITIES		$ 43,819,708
Capital Stock, Paid Up	$ 5,000,000	
Surplus	276,499,293	
Surplus as regards Policyholders		281,499,293
TOTAL		$ 325,319,001

Securities carried at $164,223,431 in the above statement are deposited with various states as required by law.

Securities carried on the basis prescribed by the National Association of Insurance Commissioners. On the basis of market quotations for all bonds and stocks owned, the Company's total admitted assets at December 31, 2019 would be $322,248,132 and surplus as regards policyholders $288,428,424.

I, LAURA J. LAZARCZYK, Corporate Secretary of the FIDELITY AND DEPOSIT COMPANY OF MARYLAND, do hereby certify that the foregoing statement is a correct exhibit of the assets and liabilities of the said Company on the 31st day of December, 2019.

Laura J Lazarczyk
Corporate Secretary

State of Illinois
City of Schaumburg } SS:

Subscribed and sworn to, before me, a Notary Public of the State of Illinois, in the City of Schaumburg, this 25th day of February, 2020.

Daryl Joiner
Notary Public

DARRYL JOINER
OFFICIAL SEAL
Notary Public - State of Illinois
My Commission Expires 2/24/2022

CERTIFICATE OF LIABILITY INSURANCE

DATE (MM/DD/YYYY) 01/05/2021

THIS CERTIFICATE IS ISSUED AS A MATTER OF INFORMATION ONLY AND CONFERS NO RIGHTS UPON THE CERTIFICATE HOLDER. THIS CERTIFICATE DOES NOT AFFIRMATIVELY OR NEGATIVELY AMEND, EXTEND OR ALTER THE COVERAGE AFFORDED BY THE POLICIES BELOW. THIS CERTIFICATE OF INSURANCE DOES NOT CONSTITUTE A CONTRACT BETWEEN THE ISSUING INSURER(S), AUTHORIZED REPRESENTATIVE OR PRODUCER, AND THE CERTIFICATE HOLDER.

IMPORTANT: If the certificate holder is an ADDITIONAL INSURED, the policy(ies) must have ADDITIONAL INSURED provisions or be endorsed. If SUBROGATION IS WAIVED, subject to the terms and conditions of the policy, certain policies may require an endorsement. A statement on this certificate does not confer rights to the certificate holder in lieu of such endorsement(s).

PRODUCER 1-908-566-1010 Construction Risk Partners Campus View Plaza 1250 Route 28, Suite 201 Branchburg, NJ 08876	CONTACT NAME: Marjorie Pierson PHONE (A/C, No, Ext): 908-566-1010 FAX (A/C, No): 908-566-1020 E-MAIL ADDRESS: certs@constructionriskpartners.com
INSURED Prismatic Development Corp. 60 US Highway 46 Fairfield, NJ 07004	INSURER(S) AFFORDING COVERAGE / NAIC # INSURER A: CHARTER OAK FIRE INS CO 25615 INSURER B: TRAVELERS IND CO OF AMER 25666 INSURER C: STARR IND & LIAB CO 38318 INSURER D: INSURER E: INSURER F:

COVERAGES **CERTIFICATE NUMBER:** 61147002 **REVISION NUMBER:**

THIS IS TO CERTIFY THAT THE POLICIES OF INSURANCE LISTED BELOW HAVE BEEN ISSUED TO THE INSURED NAMED ABOVE FOR THE POLICY PERIOD INDICATED. NOTWITHSTANDING ANY REQUIREMENT, TERM OR CONDITION OF ANY CONTRACT OR OTHER DOCUMENT WITH RESPECT TO WHICH THIS CERTIFICATE MAY BE ISSUED OR MAY PERTAIN, THE INSURANCE AFFORDED BY THE POLICIES DESCRIBED HEREIN IS SUBJECT TO ALL THE TERMS, EXCLUSIONS AND CONDITIONS OF SUCH POLICIES. LIMITS SHOWN MAY HAVE BEEN REDUCED BY PAID CLAIMS.

INSR LTR	TYPE OF INSURANCE	ADDL INSD	SUBR WVD	POLICY NUMBER	POLICY EFF (MM/DD/YYYY)	POLICY EXP (MM/DD/YYYY)	LIMITS	
A	X COMMERCIAL GENERAL LIABILITY CLAIMS-MADE [ ] OCCUR [X] X Contractual Liability GEN'L AGGREGATE LIMIT APPLIES PER: POLICY [ ] PRO-JECT [X] LOC [ ] OTHER:	X	X	DT-CO-7381M747-COF-20	10/18/20	10/18/21	EACH OCCURRENCE DAMAGE TO RENTED PREMISES (Ea occurrence) MED EXP (Any one person) PERSONAL & ADV INJURY GENERAL AGGREGATE PRODUCTS - COMP/OP AGG 	$ 2,000,000 $ 1,000,000 $ 5,000 $ 2,000,000 $ 4,000,000 $ 4,000,000 $
B	AUTOMOBILE LIABILITY X ANY AUTO OWNED AUTOS ONLY [ ] SCHEDULED AUTOS HIRED AUTOS ONLY [X] NON-OWNED AUTOS ONLY	X	X	810-6N446115-20-26-G	10/18/20	10/18/21	COMBINED SINGLE LIMIT (Ea accident) BODILY INJURY (Per person) BODILY INJURY (Per accident) PROPERTY DAMAGE (Per accident) 	$ 1,000,000 $ $ $ $
C	[ ] UMBRELLA LIAB [X] OCCUR X EXCESS LIAB [ ] CLAIMS-MADE DED [ ] RETENTION $	X	X	1000584693201	10/18/20	10/18/21	EACH OCCURRENCE AGGREGATE 	$ 5,000,000 $ 5,000,000 $
	WORKERS COMPENSATION AND EMPLOYERS' LIABILITY ANYPROPRIETOR/PARTNER/EXECUTIVE OFFICER/MEMBEREXCLUDED? (Mandatory in NH) Y/N [N] If yes, describe under DESCRIPTION OF OPERATIONS below	N/A					PER STATUTE [ ] OTH-ER E.L. EACH ACCIDENT E.L. DISEASE - EA EMPLOYEE E.L. DISEASE - POLICY LIMIT	 $ $ $

DESCRIPTION OF OPERATIONS / LOCATIONS / VEHICLES (ACORD 101, Additional Remarks Schedule, may be attached if more space is required)

Re: S136-367
City of New York, including its officials and employees, The People of the State of New York; the State of New York; the State of New York and the Commissioner of Transportation of New York State, and all employees of the Commissioner of Transportation both officially and personally are additional insureds as required by written contract.

CERTIFICATE HOLDER

New York City Department of Design & Construction
Agency Chief Contracting Office
Attn: Risk Manager, Fourth Floor
30 - 30 Thomson Ave.

Long Island City, NY 11101
USA

CANCELLATION

SHOULD ANY OF THE ABOVE DESCRIBED POLICIES BE CANCELLED BEFORE THE EXPIRATION DATE THEREOF, NOTICE WILL BE DELIVERED IN ACCORDANCE WITH THE POLICY PROVISIONS.

AUTHORIZED REPRESENTATIVE

Pete Lorenzo

NEW YORK STATE | Workers' Compensation Board

CERTIFICATE OF NYS WORKERS' COMPENSATION INSURANCE COVERAGE

1a. Legal Name & Address of Insured (use street address only) Prismatic Development Corp 60 US Highway 46 Fairfield, NJ 07004 Work Location of Insured *(Only required if coverage is specifically limited to certain locations in New York State, i.e., a Wrap-Up Policy)*	1b. Business Telephone Number of Insured 973-882-1133 1c. NYS Unemployment Insurance Employer Registration Number of Insured 1d. Federal Employer Identification Number of Insured or Social Security Number 222433095
2. Name and Address of Entity Requesting Proof of Coverage (Entity Being Listed as the Certificate Holder) New York City Department of Design & Construction Agency Chief Contracting Office Attn: Risk Manager, Fourth Floor 30 - 30 Thomson Ave. Long Island City, NY 11101	3a. Name of Insurance Carrier Phoenix Insurance Company 3b. Policy Number of Entity Listed in Box "1a" UB-8J677927-20-26-GP 3c. Policy effective period 10/18/20 to 10/18/21 3d. The Proprietor, Partners or Executive Officers are ☒ included. (Only check box if all partners/officers included) ☐ all excluded or certain partners/officers excluded.

This certifies that the insurance carrier indicated above in box "3" insures the business referenced above in box "1a" for workers' compensation under the New York State Workers' Compensation Law. **(To use this form, New York (NY) must be listed under Item 3A on the INFORMATION PAGE of the workers' compensation insurance policy).** The Insurance Carrier or its licensed agent will send this Certificate of Insurance to the entity listed above as the certificate holder in box "2".

The insurance carrier must notify the above certificate holder and the Workers' Compensation Board within 10 days IF a policy is canceled due to nonpayment of premiums or within 30 days IF there are reasons other than nonpayment of premiums that cancel the policy or eliminate the insured from the coverage indicated on this Certificate. (These notices may be sent by regular mail.) **Otherwise, this Certificate is valid for one year after this form is approved by the insurance carrier or its licensed agent, or until the policy expiration date listed in box "3c", whichever is earlier.**

This certificate is issued as a matter of information only and confers no rights upon the certificate holder. This certificate does not amend, extend or alter the coverage afforded by the policy listed, nor does it confer any rights or responsibilities beyond those contained in the referenced policy.

This certificate may be used as evidence of a Workers' Compensation contract of insurance only while the underlying policy is in effect.

Please Note: Upon cancellation of the workers' compensation policy indicated on this form, if the business continues to be named on a permit, license or contract issued by a certificate holder, the business must provide that certificate holder with a new Certificate of Workers' Compensation Coverage or other authorized proof that the business is complying with the mandatory coverage requirements of the New York State Workers' Compensation Law.

Under penalty of perjury, I certify that I am an authorized representative or licensed agent of the insurance carrier referenced above and that the named insured has the coverage as depicted on this form.

Approved by: Patricia Moore
(Print name of authorized representative or licensed agent of insurance carrier)

Approved by: Pat Moore 1/5/21
(Signature) (Date)

Title: Assistant Account Associate

Telephone Number of authorized representative or licensed agent of insurance carrier: 908-566-1010

Please Note: Only insurance carriers and their licensed agents are authorized to issue Form C-105.2. Insurance brokers are NOT authorized to issue it.

Workers' Compensation Law

Section 57. Restriction on issue of permits and the entering into contracts unless compensation is secured.

1. The head of a state or municipal department, board, commission or office authorized or required by law to issue any permit for or in connection with any work involving the employment of employees in a hazardous employment defined by this chapter, and notwithstanding any general or special statute requiring or authorizing the issue of such permits, shall not issue such permit unless proof duly subscribed by an insurance carrier is produced in a form satisfactory to the chair, that compensation for all employees has been secured as provided by this chapter. Nothing herein, however, shall be construed as creating any liability on the part of such state or municipal department, board, commission or office to pay any compensation to any such employee if so employed.

2. The head of a state or municipal department, board, commission or office authorized or required by law to enter into any contract for or in connection with any work involving the employment of employees in a hazardous employment defined by this chapter, notwithstanding any general or special statute requiring or authorizing any such contract, shall not enter into any such contract unless proof duly subscribed by an insurance carrier is produced in a form satisfactory to the chair, that compensation for all employees has been secured as provided by this chapter.

CITY OF NEW YORK

CERTIFICATION BY INSURANCE BROKER OR AGENT

The undersigned insurance broker or agent represents to the City of New York that the attached Certificate of Insurance is accurate in all material respects.

Construction Risk Partners LLC
[Name of broker or agent (typewritten)]

1250 Route 28, Suite 201, Branchburg, NJ 08876
[Address of broker or agent (typewritten)]

certs@constructionriskpartners.com
[Email address of broker or agent (typewritten)]

908-566-1010/908-566-1020
[Phone number/Fax number of broker or agent (typewritten)]

Patricia Moore
[Signature of authorized official, broker, or agent]

Patricia Moore, Assistant Account Associate
[Name and title of authorized official, broker, or agent (typewritten)]

State of .....NJ.....)
) ss.:
County of ..Somerset.....)

Sworn to before me this 15th day of January 2021

NOTARY PUBLIC FOR THE STATE OF New Jersey

NANCY L HUDDY
NOTARY PUBLIC-STATE OF NEW JERSEY
MY COMMISSION EXPIRES
JANUARY 22, 2021

NEW YORK STATE | Workers' Compensation Board

CERTIFICATE OF INSURANCE COVERAGE
DISABILITY AND PAID FAMILY LEAVE BENEFITS LAW

PART 1. To be completed by Disability and Paid Family Leave Benefits Carrier or Licensed Insurance Agent of that Carrier

1a. Legal Name & Address of Insured (use street address only)

Prismatic Development Corp
60 Route 46 East
Fairfield, NJ 07004

Work Location of Insured *(Only required if coverage is specifically limited to certain locations in New York State, i.e., Wrap-Up Policy)*

1b. Business Telephone Number of Insured

973-882-1133

1c. Federal Employer Identification Number of Insured or Social Security Number

222433095

2. Name and Address of Entity Requesting Proof of Coverage (Entity Being Listed as the Certificate Holder)

NYC Department of Design & Construction
30-30 Thomson Avenue
Long Island City, NY 11101

3a. Name of Insurance Carrier

Arch Insurance Company

3b. Policy Number of Entity Listed in Box "1a"

11DBL0479000

3c. Policy effective period

4/1/2020 to 3/31/2021

4. Policy provides the following benefits:

- [X] A. Both disability and paid family leave benefits.
- [ ] B. Disability benefits only.
- [ ] C. Paid family leave benefits only.

5. Policy covers:

- [X] A. All of the employer's employees eligible under the NYS Disability and Paid Family Leave Benefits Law.
- [ ] B. Only the following class or classes of employer's employees:

Under penalty of perjury, I certify that I am an authorized representative or licensed agent of the insurance carrier referenced above and that the named insured has NYS Disability and/or Paid Family Leave Benefits insurance coverage as described above.

Date Signed 1/5/2021 By _____
(Signature of insurance carrier's authorized representative or NYS Licensed Insurance Agent of that insurance carrier)

Telephone Number 201-743-3937 Name and Title James Iannicelli, AVP Accident & Health

IMPORTANT: If Boxes 4A and 5A are checked, and this form is signed by the insurance carrier's authorized representative or NYS Licensed Insurance Agent of that carrier, this certificate is COMPLETE. Mail it directly to the certificate holder.

If Box 4B, 4C or 5B is checked, this certificate is NOT COMPLETE for purposes of Section 220, Subd. 8 of the NYS Disability and Paid Family Leave Benefits Law. It must be mailed for completion to the Workers' Compensation Board, Plans Acceptance Unit, PO Box 5200, Binghamton, NY 13902-5200.

PART 2. To be completed by the NYS Workers' Compensation Board (Only if Box 4C or 5B of Part 1 has been checked)

State of New York
Workers' Compensation Board

According to information maintained by the NYS Workers' Compensation Board, the above-named employer has complied with the NYS Disability and Paid Family Leave Benefits Law with respect to all of his/her employees.

Date Signed _____ By _____
(Signature of Authorized NYS Workers' Compensation Board Employee)

Telephone Number _____ Name and Title _____

Please Note: *Only insurance carriers licensed to write NYS disability and paid family leave benefits insurance policies and NYS licensed insurance agents of those insurance carriers are authorized to issue Form DB-120.1.* ***Insurance brokers are NOT authorized to issue this form.***

DB-120.1 (10-17)

OFFICE OF THE COMPTROLLER

CITY OF NEW YORK

CONSTRUCTION APPRENTICE PREVAILING WAGE SCHEDULE

Pursuant to Labor Law § 220 (3-e), only apprentices who are individually registered in a bona fide program to which the employer contractor is a participant and registered with the New York State Department of Labor, may be paid at the apprentice rates in this schedule. Apprentices who are not so registered must be paid as journey persons in accordance with the trade classification of the work they actually performed.

Apprentice ratios are established to ensure the proper safety, training and supervision of apprentices. A ratio establishes the number of journey workers required for each apprentice in a program and on a job site. Ratios are interpreted as follows: in the case of a 1:1, 1:4 ratio, there must be one journey worker for the first apprentice, and four additional journey workers for each subsequent apprentice.

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BOILERMAKER
(Ratio of Apprentice to Journeyperson: 1 to 1, 1 to 3)

Boilermaker (First Year)

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate Per Hour: 65% of Journeyperson's rate
Supplemental Benefit Rate Per Hour: $31.76

Boilermaker (Second Year: 1st Six Months)

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate Per Hour: 70% of Journeyperson's rate
Supplemental Benefit Rate Per Hour: $33.59

Boilermaker (Second Year: 2nd Six Months)

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate Per Hour: 75% of Journeyperson's rate
Supplemental Benefit Rate Per Hour: $35.43

Boilermaker (Third Year: 1st Six Months)

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate Per Hour: 80% of Journeyperson's rate
Supplemental Benefit Rate Per Hour: $37.25

Boilermaker (Third Year: 2nd Six Months)

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate Per Hour: 85% of Journeyperson's rate
Supplemental Benefit Rate Per Hour: $39.08

Boilermaker (Fourth Year: 1st Six Months)

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate Per Hour: 90% of Journeyperson's rate
Supplemental Benefit Rate Per Hour: $40.93

Boilermaker (Fourth Year: 2nd Six Months)

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate Per Hour: 95% of Journeyperson's rate
Supplemental Benefit Rate Per Hour: $42.75

(Local #5)

BRICKLAYER
(Ratio of Apprentice to Journeyperson: 1 to 1, 1 to 4)

Bricklayer (First 750 Hours)

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate Per Hour: 50% of Journeyperson's rate
Supplemental Benefit Rate Per Hour: $20.61

Bricklayer (Second 750 Hours)

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate Per Hour: 60% of Journeyperson's rate
Supplemental Benefit Rate Per Hour: $20.61

Bricklayer (Third 750 Hours)

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate Per Hour: 70% of Journeyperson's rate
Supplemental Benefit Rate Per Hour: $20.61

Bricklayer (Fourth 750 Hours)

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate Per Hour: 80% of Journeyperson's rate
Supplemental Benefit Rate Per Hour: $20.61

Bricklayer (Fifth 750 Hours)

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate Per Hour: 90% of Journeyperson's rate
Supplemental Benefit Rate Per Hour: $20.61

Bricklayer (Sixth 750 Hours)

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate Per Hour: 95% of Journeyperson's rate
Supplemental Benefit Rate Per Hour: $20.61

(Bricklayer District Council)

CARPENTER
(Ratio of Apprentice to Journeyperson: 1 to 1, 1 to 4)

Carpenter (First Year)

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate Per Hour: 40% of Journeyperson's rate
Supplemental Benefit Rate Per Hour For Building Apprentice: $31.44
Supplemental Benefit Rate Per Hour For Heavy Apprentice: $33.49

Carpenter (Second Year)

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate Per Hour: 50% of Journeyperson's rate
Supplemental Benefit Rate Per Hour For Building Apprentice: $31.44
Supplemental Benefit Rate Per Hour For Heavy Apprentice: $33.49

Carpenter (Third Year)

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate Per Hour: 65% of Journeyperson's rate
Supplemental Benefit Rate Per Hour For Building Apprentice: $31.44
Supplemental Benefit Rate Per Hour For Heavy Apprentice: $33.49

Carpenter (Fourth Year)

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate Per Hour: 80% of Journeyperson's rate
Supplemental Benefit Rate Per Hour For Building Apprentice: $31.44
Supplemental Benefit Rate Per Hour For Heavy Apprentice: $33.49

(Carpenters District Council)

CARPENTER - HIGH RISE CONCRETE FORMS
(Ratio of Apprentice to Journeyperson: 1 to 1, 2 to 5)

Carpenter - High Rise (First Year)

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate per Hour: $17.52
Supplemental Benefit Rate per Hour: $16.30

Carpenter - High Rise (Second Year)

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate per Hour: $23.95
Supplemental Benefit Rate per Hour: $16.43

Carpenter - High Rise (Third Year)

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate per Hour: $30.53
Supplemental Benefit Rate per Hour: $16.56

Carpenter - High Rise (Fourth Year)

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate per Hour: $38.15
Supplemental Benefit Rate per Hour: $16.71

(Carpenters District Council)

CEMENT MASON
(Ratio of Apprentice to Journeyperson: 1 to 1, 1 to 4)

Cement Mason (First Year)

Effective Period: 7/1/2019 - 6/30/2020
Wage and Supplemental Rate Per Hour: 50% of Journeyperson's Rate

Cement Mason (Second Year)

Effective Period: 7/1/2019 - 6/30/2020
Wage and Supplemental Rate Per Hour: 60% of Journeyperson's Rate

Cement Mason (Third Year)

Effective Period: 7/1/2019 - 6/30/2020
Wage and Supplemental Rate Per Hour: 70% of Journeyperson's Rate

(Local #780)

CEMENT AND CONCRETE WORKER
(Ratio of Apprentice to Journeyperson: 1 to 1, 1 to 3)

Cement & Concrete Worker (First 1333 hours)

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate Per Hour: 50% of Journeyperson's rate
Supplemental Benefit Rate Per Hour: $20.00

Cement & Concrete Worker (Second 1333 hours)

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate Per Hour: 65% of Journeyperson's rate
Supplemental Benefit Rate Per Hour: $25.45

Cement & Concrete Worker (Last 1334 hours)

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate Per Hour: 80% of Journeyperson's rate
Supplemental Benefit Rate Per Hour: $26.95

Cement & Concrete Worker (Hired after 2/6/2016 - First 1334 hours)

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate Per Hour: 53% of Journeyperson's rate
Supplemental Benefit Rate Per Hour: $14.04

Cement & Concrete Worker (Hired after 2/6/2016 - Second 1334 hours)

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate Per Hour: 69% of Journeyperson's rate
Supplemental Benefit Rate Per Hour: $18.97

Cement & Concrete Worker (Hired after 2/6/2016 - Last 1334 hours)

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate Per Hour: 85% of Journeyperson's rate
Supplemental Benefit Rate Per Hour: $20.05

(Cement Concrete Workers District Council)

DERRICKPERSON & RIGGER (STONE)
(Ratio of Apprentice to Journeyperson: 1 to 1, 1 to 4)

Derrickperson & Rigger (stone) - First Year

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate Per Hour: 50% of Journeyperson's rate
Supplemental Benefit Rate Per Hour: 50% of Journeyperson's rate

Derrickperson & Rigger (stone) - Second Year: 1st Six Months

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate Per Hour: 70% of Journeyperson's rate
Supplemental Benefit Rate Per Hour: 75% of Journeyperson's rate

Derrickperson & Rigger (stone) - Second Year: 2nd Six Months

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate Per Hour: 80% of Journeyperson's rate
Supplemental Benefit Rate Per Hour: 75% of Journeyperson's rate

Derrickperson & Rigger (stone) - Third Year

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate Per Hour: 90% of Journeyperson's rate
Supplemental Benefit Rate Per Hour: 75% of Journeyperson's rate

(Local #197)

DOCKBUILDER/PILE DRIVER
(Ratio of Apprentice to Journeyperson: 1 to 1, 1 to 6)

Dockbuilder/Pile Driver (First Year)

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate Per Hour: 40% of Journeyperson's rate
Supplemental Benefit Rate Per Hour: $34.12

Dockbuilder/Pile Driver (Second Year)

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate Per Hour: 50% of Journeyperson's rate
Supplemental Benefit Rate Per Hour: $34.12

Dockbuilder/Pile Driver (Third Year)

Effective Period: 7/1/2019 - 6/30/2020

Wage Rate Per Hour: 65% of Journeyperson's rate
Supplemental Benefit Rate Per Hour: $34.12

Dockbuilder/Pile Driver (Fourth Year)

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate Per Hour: 80% of Journeyperson's rate
Supplemental Benefit Rate Per Hour: $34.12

(Carpenters District Council)

ELECTRICIAN
(Ratio of Apprentice to Journeyperson: 1 to 1, 1 to 3)

Electrician (First Term: 0-6 Months)

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate per Hour: $15.75
Supplemental Benefit Rate per Hour: $14.03
Overtime Supplemental Rate Per Hour: $15.07

Electrician (First Term: 7-12 Months)

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate per Hour: $16.25
Supplemental Benefit Rate per Hour: $14.28
Overtime Supplemental Rate Per Hour: $15.36

Electrician (Second Term: 0-6 Months)

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate per Hour: $17.25
Supplemental Benefit Rate per Hour: $14.79
Overtime Supplemental Rate Per Hour: $15.94

Electrician (Second Term: 7-12 Months)

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate per Hour: $18.25
Supplemental Benefit Rate per Hour: $15.30
Overtime Supplemental Rate Per Hour: $16.51

Electrician (Third Term: 0-6 Months)

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate per Hour: $19.25
Supplemental Benefit Rate per Hour: $15.81
Overtime Supplemental Rate Per Hour: $17.09

Electrician (Third Term: 7-12 Months)

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate per Hour: $20.25
Supplemental Benefit Rate per Hour: $16.32
Overtime Supplemental Rate Per Hour: $17.67

Electrician (Fourth Term: 0-6 Months)

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate per Hour: $21.25
Supplemental Benefit Rate per Hour: $16.83
Overtime Supplemental Rate Per Hour: $18.24

Electrician (Fourth Term: 7-12 Months)

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate per Hour: $23.25
Supplemental Benefit Rate per Hour: $17.85
Overtime Supplemental Rate Per Hour: $19.39

Electrician (Fifth Term: 0-12 Months)

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate per Hour: $24.50
Supplemental Benefit Rate per Hour: $21.07
Overtime Supplemental Rate Per Hour: $22.62

Electrician (Fifth Term: 13-18 Months)

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate per Hour: $29.00
Supplemental Benefit Rate per Hour: $23.43
Overtime Supplemental Rate Per Hour: $25.26

Overtime Description

Overtime Wage paid at time and one half the regular rate

(Local #3)

ELEVATOR CONSTRUCTOR
(Ratio of Apprentice to Journeyperson: 1 to 1, 1 to 2)

Elevator (Constructor) - First Year

Effective Period: 7/1/2019 - 3/16/2020
Wage Rate Per Hour: 50% of Journeyperson's rate
Supplemental Rate Per Hour: $31.52

Effective Period: 3/17/2020 - 6/30/2020
Wage Rate Per Hour: 50% of Journeyperson's rate
Supplemental Rate Per Hour: $32.14

Elevator (Constructor) - Second Year

Effective Period: 7/1/2019 - 3/16/2020
Wage Rate Per Hour: 55% of Journeyperson's rate
Supplemental Rate Per Hour: $32.03

Effective Period: 3/17/2020 - 6/30/2020
Wage Rate Per Hour: 55% of Journeyperson's rate
Supplemental Rate Per Hour: $32.67

Elevator (Constructor) - Third Year

Effective Period: 7/1/2019 - 3/16/2020
Wage Rate Per Hour: 65% of Journeyperson's rate
Supplemental Rate Per Hour: $33.06

Effective Period: 3/17/2020 - 6/30/2020
Wage Rate Per Hour: 65% of Journeyperson's rate
Supplemental Rate Per Hour: $33.74

Elevator (Constructor) - Fourth Year

Effective Period: 7/1/2019 - 3/16/2020
Wage Rate Per Hour: 75% of Journeyperson's rate
Supplemental Rate Per Hour: $34.08

Effective Period: 3/17/2020 - 6/30/2020
Wage Rate Per Hour: 75% of Journeyperson's rate
Supplemental Rate Per Hour: $34.80

(Local #1)

ELEVATOR REPAIR & MAINTENANCE
(Ratio of Apprentice to Journeyperson: 1 to 1, 1 to 2)

Elevator Service/Modernization Mechanic (First Year)

Effective Period: 7/1/2019 - 3/16/2020
Wage Rate Per Hour: 50% of Journeyperson's rate
Supplemental Benefit Per Hour: $31.47

Effective Period: 3/17/2020 - 6/30/2020
Wage Rate Per Hour: 50% of Journeyperson's rate
Supplemental Benefit Per Hour: $32.09

Elevator Service/Modernization Mechanic (Second Year)

Effective Period: 7/1/2019 - 3/16/2020
Wage Rate Per Hour: 55% of Journeyperson's rate
Supplemental Benefit Per Hour: $31.98

Effective Period: 3/17/2020 - 6/30/2020
Wage Rate Per Hour: 55% of Journeyperson's rate
Supplemental Benefit Per Hour: $32.62

Elevator Service/Modernization Mechanic (Third Year)

Effective Period: 7/1/2019 - 3/16/2020
Wage Rate Per Hour: 65% of Journeyperson's rate
Supplemental Benefit Per Hour: $32.99

Effective Period: 3/17/2020 - 6/30/2020
Wage Rate Per Hour: 65% of Journeyperson's rate
Supplemental Benefit Per Hour: $33.67

Elevator Service/Modernization Mechanic (Fourth Year)

Effective Period: 7/1/2019 - 3/16/2020
Wage Rate Per Hour: 75% of Journeyperson's rate
Supplemental Benefit Per Hour: $34.01

Effective Period: 3/17/2020 - 6/30/2020
Wage Rate Per Hour: 75% of Journeyperson's rate
Supplemental Benefit Per Hour: $34.73

(Local #1)

ENGINEER
(Ratio of Apprentice to Journeyperson: 1 to 1, 1 to 5)

Engineer - First Year

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate per Hour: $25.38
Supplemental Benefit Rate per Hour: $26.69

Engineer - Second Year

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate per Hour: $31.72
Supplemental Benefit Rate per Hour: $26.69

Engineer - Third Year

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate per Hour: $34.89
Supplemental Benefit Rate per Hour: $26.69

Engineer - Fourth Year

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate per Hour: $38.06
Supplemental Benefit Rate per Hour: $26.69

(Local #15)

ENGINEER - OPERATING
(Ratio of Apprentice to Journeyperson: 1 to 1, 1 to 5)

Operating Engineer - First Year

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate Per Hour 40% of Journeyperson's Rate
Supplemental Benefit Per Hour: $22.45

Operating Engineer - Second Year

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate Per Hour: 50% of Journeyperson's Rate

Supplemental Benefit Per Hour: $22.45

Operating Engineer - Third Year

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate Per Hour: 60% of Journeyperson's Rate
Supplemental Benefit Per Hour: $22.45

(Local #14)

FLOOR COVERER
(Ratio of Apprentice to Journeyperson: 1 to 1, 1 to 4)

Floor Coverer (First Year)

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate Per Hour: 40% of Journeyperson's rate
Supplemental Rate Per Hour: $31.24

Floor Coverer (Second Year)

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate Per Hour: 50% of Journeyperson's rate
Supplemental Rate Per Hour: $31.24

Floor Coverer (Third Year)

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate Per Hour: 65% of Journeyperson's rate
Supplemental Rate Per Hour: $31.24

Floor Coverer (Fourth Year)

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate Per Hour: 80% of Journeyperson's rate
Supplemental Rate Per Hour: $31.24

(Carpenters District Council)

GLAZIER
(Ratio of Apprentice to Journeyperson: 1 to 1, 1 to 3)

Glazier (First Year)

Effective Period: 7/1/2019 - 6/30/2020
Wage and Supplemental Rate Per Hour: 40% of Journeyperson's rate

Glazier (Second Year)

Effective Period: 7/1/2019 - 6/30/2020
Wage and Supplemental Rate Per Hour: 50% of Journeyperson's rate

Glazier (Third Year)

Effective Period: 7/1/2019 - 6/30/2020
Wage and Supplemental Rate Per Hour: 60% of Journeyperson's rate

Glazier (Fourth Year)

Effective Period: 7/1/2019 - 6/30/2020
Wage and Supplemental Rate Per Hour: 80% of Journeyperson's rate

(Local #1281)

HAZARDOUS MATERIAL HANDLER
(Ratio of Apprentice Journeyperson: 1 to 1, 1 to 3)

Handler (First 1000 Hours)

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate Per Hour: 78% of Journeyperson's rate
Supplemental Benefit Rate Per Hour: $14.25

Handler (Second 1000 Hours)

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate Per Hour: 80% of Journeyperson's rate
Supplemental Benefit Rate Per Hour: $14.25

Handler (Third 1000 Hours)

Effective Period: 7/1/2019 - 6/30/2020

Wage Rate Per Hour: 83% of Journeyperson's rate
Supplemental Benefit Rate Per Hour: $14.25

Handler (Fourth 1000 Hours)

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate Per Hour: 89% of Journeyperson's rate
Supplemental Benefit Rate Per Hour: $14.25

(Local #78)

HEAT & FROST INSULATOR
(Ratio of Apprentice to Journeyperson: 1 to 1, 1 to 3)

Heat & Frost Insulator (First Year)

Effective Period: 7/1/2019 - 6/30/2020
Wage and Supplemental Rate Per Hour: 35% of Journeyperson's rate

Heat & Frost Insulator (Second Year)

Effective Period: 7/1/2019 - 6/30/2020
Wage and Supplemental Rate Per Hour: 45% of Journeyperson's rate

Heat & Frost Insulator (Third Year)

Effective Period: 7/1/2019 - 6/30/2020
Wage and Supplemental Rate Per Hour: 55% of Journeyperson's rate

Heat & Frost Insulator (Fourth Year)

Effective Period: 7/1/2019 - 6/30/2020
Wage and Supplemental Rate Per Hour: 65% of Journeyperson's rate

(Local #12)

HOUSE WRECKER
(TOTAL DEMOLITION)
(Ratio of Apprentice to Journeyperson: 1 to 1, 1 to 3)

House Wrecker - First Year

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate per Hour: $21.17
Supplemental Benefit Rate per Hour: $19.09

House Wrecker - Second Year

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate per Hour: $22.32
Supplemental Benefit Rate per Hour: $19.09

House Wrecker - Third Year

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate per Hour: $23.97
Supplemental Benefit Rate per Hour: $19.09

House Wrecker - Fourth Year

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate per Hour: $26.53
Supplemental Benefit Rate per Hour: $19.09

(Mason Tenders District Council)

IRON WORKER - ORNAMENTAL
(Ratio of Apprentice to Journeyperson: 1 to 1, 1 to 4)

Iron Worker (Ornamental) - 1st Ten Months

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate Per Hour: 50% of Journeyperson's rate
Supplemental Rate Per Hour: $40.20

Iron Worker (Ornamental) - 11 -16 Months

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate Per Hour: 55% of Journeyperson's rate
Supplemental Rate Per Hour: $41.44

Iron Worker (Ornamental) - 17 - 22 Months

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate Per Hour: 60% of Journeyperson's rate
Supplemental Rate Per Hour: $42.68

Iron Worker (Ornamental) - 23 - 28 Months

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate Per Hour: 70% of Journeyperson's rate
Supplemental Rate Per Hour: $45.17

Iron Worker (Ornamental) - 29 - 36 Months

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate Per Hour: 80% of Journeyperson's rate
Supplemental Rate Per Hour: $47.65

(Local #580)

IRON WORKER - STRUCTURAL
(Ratio of Apprentice to Journeyperson: 1 to 1, 1 to 6)

Iron Worker (Structural) - 1st Six Months

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate per Hour: $26.62
Supplemental Benefit Rate per Hour: $53.09

Iron Worker (Structural) - 7- 18 Months

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate per Hour: $27.22
Supplemental Benefit Rate per Hour: $53.09

Iron Worker (Structural) - 19 - 36 months

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate per Hour: $27.83
Supplemental Benefit Rate per Hour: $53.09

(Local #40 and #361)

LABORER (FOUNDATION, CONCRETE, EXCAVATING, STREET PIPE LAYER & COMMON)

(Ratio Apprentice to Journeyperson: 1 to 1, 1 to 3)

Laborer (Foundation, Concrete, Excavating, Street Pipe Layer & Common) - First 1000 hours

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate Per Hour: 50% of Journeyperson's rate
Supplemental Rate Per Hour: $44.48

Laborer (Foundation, Concrete, Excavating, Street Pipe Layer & Common) - Second 1000 hours

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate Per Hour: 60% of Journeyperson's rate
Supplemental Rate Per Hour: $44.48

Laborer (Foundation, Concrete, Excavating, Street Pipe Layer & Common) - Third 1000 hours

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate Per Hour: 75% of Journeyperson's rate
Supplemental Rate Per Hour: $44.48

Laborer (Foundation, Concrete, Excavating, Street Pipe Layer & Common) - Fourth 1000 hours

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate Per Hour: 90% of Journeyperson's rate
Supplemental Rate Per Hour: $44.48

(Local #731)

MARBLE MECHANICS

(Ratio of Apprentice to Journeyperson: 1 to 1, 1 to 4)

Cutters & Setters - First 750 Hours

Effective Period: 7/1/2019 - 6/30/2020
Wage and Supplemental Rate Per Hour: 40% of Journeyperson's rate

NO BENEFITS PAID DURING THE FIRST TWO MONTHS (PROBATIONARY PERIOD)

Cutters & Setters - Second 750 Hours

Effective Period: 7/1/2019 - 6/30/2020
Wage and Supplemental Rate Per Hour: 45% of Journeyperson's rate

Cutters & Setters - Third 750 Hours

Effective Period: 7/1/2019 - 6/30/2020
Wage and Supplemental Rate Per Hour: 50% of Journeyperson's rate

Cutters & Setters - Fourth 750 Hours

Effective Period: 7/1/2019 - 6/30/2020
Wage and Supplemental Rate Per Hour: 55% of Journeyperson's rate

Cutters & Setters - Fifth 750 Hours

Effective Period: 7/1/2019 - 6/30/2020
Wage and Supplemental Rate Per Hour: 60% of Journeyperson's rate

Cutters & Setters - Sixth 750 Hours

Effective Period: 7/1/2019 - 6/30/2020
Wage and Supplemental Rate Per Hour: 65% of Journeyperson's rate

Cutters & Setters - Seventh 750 Hours

Effective Period: 7/1/2019 - 6/30/2020
Wage and Supplemental Rate Per Hour: 70% of Journeyperson's rate

Cutters & Setters - Eighth 750 Hours

Effective Period: 7/1/2019 - 6/30/2020
Wage and Supplemental Rate Per Hour: 75% of Journeyperson's rate

Cutters & Setters - Ninth 750 Hours

Effective Period: 7/1/2019 - 6/30/2020
Wage and Supplemental Rate Per Hour: 85% of Journeyperson's rate

Cutters & Setters - Tenth 750 Hours

Effective Period: 7/1/2019 - 6/30/2020
Wage and Supplemental Rate Per Hour: 95% of Journeyperson's rate

Polishers & Finishers - First 900 Hours

Effective Period: 7/1/2019 - 6/30/2020
Wage and Supplemental Rate Per Hour: 70% of Journeyperson's rate

NO BENEFITS PAID DURING THE FIRST TWO MONTHS (PROBATIONARY PERIOD)

Polishers & Finishers - Second 900 Hours

Effective Period: 7/1/2019 - 6/30/2020
Wage and Supplemental Rate Per Hour: 80% of Journeyperson's rate

Polishers & Finishers - Third 900 Hours

Effective Period: 7/1/2019 - 6/30/2020
Wage and Supplemental Rate Per Hour: 90% of Journeyperson's rate

(Local #7)

MASON TENDER
(Ratio of Apprentice to Journeyperson: 1 to 1, 1 to 3)

Mason Tender - First Year

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate per Hour: $21.39
Supplemental Benefit Rate per Hour: $19.90

Mason Tender - Second Year

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate per Hour: $22.54
Supplemental Benefit Rate per Hour: $19.90

Mason Tender - Third Year

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate per Hour: $24.29
Supplemental Benefit Rate per Hour: $19.90

Mason Tender - Fourth Year

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate per Hour: $26.95
Supplemental Benefit Rate per Hour: $19.90

(Local #79)

METALLIC LATHER
(Ratio of Apprentice to Journeyperson: 1 to 1, 1 to 3)

Metallic Lather (First Year)

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate per Hour: $23.04
Supplemental Benefit Rate per Hour: $20.00

Metallic Lather (Second Year)

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate per Hour: $28.38
Supplemental Benefit Rate per Hour: $20.66

Metallic Lather (Third Year)

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate per Hour: $34.68
Supplemental Benefit Rate per Hour: $21.32

Metallic Lather (Fourth Year)

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate per Hour: $37.18
Supplemental Benefit Rate per Hour: $21.82

(Local #46)

MILLWRIGHT
(Ratio of Apprentice to Journeyperson: 1 to 1, 1 to 4)

Millwright (First Year)

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate per Hour: $29.16
Supplemental Benefit Rate per Hour: $34.66

Millwright (Second Year)

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate per Hour: $34.46
Supplemental Benefit Rate per Hour: $38.31

Millwright (Third Year)

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate per Hour: $39.76
Supplemental Benefit Rate per Hour: $42.61

Millwright (Fourth Year)

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate per Hour: $50.36
Supplemental Benefit Rate per Hour: $49.27

(Local #740)

PAINTER
(Ratio of Apprentice to Journeyperson: 1 to 1, 1 to 3)

Painter - Brush & Roller - First Year

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate per Hour: $17.20
Supplemental Benefit Rate per Hour: $15.05

Painter - Brush & Roller - Second Year

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate per Hour: $21.50
Supplemental Benefit Rate per Hour: $19.39

Painter - Brush & Roller - Third Year

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate per Hour: $25.80
Supplemental Benefit Rate per Hour: $22.79

Painter - Brush & Roller - Fourth Year

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate per Hour: $34.40
Supplemental Benefit Rate per Hour: $29.16

(District Council of Painters)

PAINTER - METAL POLISHER
(Ratio of Apprentice to Journeyperson: 1 to 1, 1 to 3)

Metal Polisher (First Year)

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate per Hour: $13.00
Supplemental Benefit Rate per Hour: $5.13

Metal Polisher (Second Year)

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate per Hour: $13.00
Supplemental Benefit Rate per Hour: $5.13

Metal Polisher (Third Year)

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate per Hour: $15.75
Supplemental Benefit Rate per Hour: $5.13

(Local 8A-28)

PAINTER - STRUCTURAL STEEL
(Ratio of Apprentice to Journeyperson: 1 to 1, 1 to 3)

Painters - Structural Steel (First Year)

Effective Period: 7/1/2019 - 6/30/2020
Wage and Supplemental Rate Per Hour: 40% of Journeyperson's rate

Painters - Structural Steel (Second Year)

Effective Period: 7/1/2019 - 6/30/2020
Wage and Supplemental Rate Per Hour: 60% of Journeyperson's rate

Painters - Structural Steel (Third Year)

Effective Period: 7/1/2019 - 6/30/2020
Wage and Supplemental Rate Per Hour: 80% of Journeyperson's rate

(Local #806)

PAVER AND ROADBUILDER
(Ratio of Apprentice to Journeyperson: 1 to 1, 1 to 3)

Paver and Roadbuilder - First Year (Minimum 1000 hours)

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate per Hour: $28.86
Supplemental Benefit Rate per Hour: $21.40

Paver and Roadbuilder - Second Year (Minimum 1000 hours)

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate per Hour: $30.50
Supplemental Benefit Rate per Hour: $21.40

(Local #1010)

PLASTERER
(Ratio of Apprentice to Journeyperson: 1 to 1, 1 to 3)

Plasterer - First Year: 1st Six Months

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate Per Hour: 40% of Journeyperson's rate
Supplemental Rate Per Hour: $13.88

Plasterer - First Year: 2nd Six Months

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate Per Hour: 45% of Journeyperson's rate
Supplemental Rate Per Hour: $14.36

Plasterer - Second Year: 1st Six Months

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate Per Hour: 55% of Journeyperson's rate
Supplemental Rate Per Hour: $16.44

Plasterer - Second Year: 2nd Six Months

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate Per Hour: 60% of Journeyperson's rate
Supplemental Rate Per Hour: $17.53

Plasterer - Third Year: 1st Six Months

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate Per Hour: 70% of Journeyperson's rate
Supplemental Rate Per Hour: $19.72

Plasterer - Third Year: 2nd Six Months

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate Per Hour: 75% of Journeyperson's rate
Supplemental Rate Per Hour: $20.81

(Local #530)

PLASTERER - TENDER
(Ratio of Apprentice to Journeyperson: 1 to 1, 1 to 3)

Plasterer Tender - First Year

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate per Hour: $21.39
Supplemental Benefit Rate per Hour: $19.90

Plasterer Tender - Second Year

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate per Hour: $22.54
Supplemental Benefit Rate per Hour: $19.90

Plasterer Tender - Third Year

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate per Hour: $24.29
Supplemental Benefit Rate per Hour: $19.90

Plasterer Tender - Fourth Year

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate per Hour: $26.95
Supplemental Benefit Rate per Hour: $19.90

(Local #79)

PLUMBER
(Ratio of Apprentice to Journeyperson: 1 to 1, 1 to 3)

Plumber - First Year: 1st Six Months

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate per Hour: $16.28
Supplemental Benefit Rate per Hour: $5.43

Plumber - First Year: 2nd Six Months

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate per Hour: $19.28
Supplemental Benefit Rate per Hour: $6.43

Plumber - Second Year

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate per Hour: $27.23
Supplemental Benefit Rate per Hour: $19.80

Plumber - Third Year

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate per Hour: $29.33
Supplemental Benefit Rate per Hour: $19.80

Plumber - Fourth Year

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate per Hour: $32.18
Supplemental Benefit Rate per Hour: $19.80

Plumber - Fifth Year: 1st Six Months

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate per Hour: $33.58
Supplemental Benefit Rate per Hour: $19.80

Plumber - Fifth Year: 2nd Six Months

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate per Hour: $45.65
Supplemental Benefit Rate per Hour: $19.80

(Plumbers Local #1)

POINTER, WATERPROOFER, CAULKER, SANDBLASTER, STEAMBLASTER

(Exterior Building Renovation)
(Ratio of Apprentice to Journeyperson: 1 to 1, 1 to 4)

Pointer, Waterproofer, Caulker, Sandblaster, Steamblaster - First Year

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate per Hour: $26.36
Supplemental Benefit Rate per Hour: $14.00

Pointer, Waterproofer, Caulker, Sandblaster, Steamblaster - Second Year

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate per Hour: $29.42
Supplemental Benefit Rate per Hour: $18.97

Pointer, Waterproofer, Caulker, Sandblaster, Steamblaster - Third Year

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate per Hour: $34.80
Supplemental Benefit Rate per Hour: $21.72

Pointer, Waterproofer, Caulker, Sandblaster, Steamblaster - Fourth Year

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate per Hour: $41.93
Supplemental Benefit Rate per Hour: $22.72

(Bricklayer District Council)

ROOFER
(Ratio of Apprentice to Journeyperson: 1 to 1, 1 to 2)

Roofer - First Year

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate Per Hour: 35% of Journeyperson's rate
Supplemental Benefit Rate Per Hour: $3.36

Roofer - Second Year

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate Per Hour: 50% of Journeyperson's rate
Supplemental Benefit Rate Per Hour: $16.92

Roofer - Third Year

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate Per Hour: 60% of Journeyperson's rate
Supplemental Benefit Rate Per Hour: $20.29

Roofer - Fourth Year

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate Per Hour: 75% of Journeyperson's rate
Supplemental Benefit Rate Per Hour: $25.37

(Local #8)

SHEET METAL WORKER
(Ratio of Apprentice to Journeyperson: 1 to 1, 1 to 3)

Sheet Metal Worker (0-6 Months)

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate Per Hour: 25% of Journeyperson's rate
Supplemental Rate Per Hour: $6.51

Sheet Metal Worker (7-18 Months)

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate Per Hour: 35% of Journeyperson's rate
Supplemental Rate Per Hour: $18.57

Sheet Metal Worker (19-30 Months)

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate Per Hour: 45% of Journeyperson's rate
Supplemental Rate Per Hour: $25.40

Sheet Metal Worker (31-36 Months)

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate Per Hour: 55% of Journeyperson's rate
Supplemental Rate Per Hour: $29.95

Sheet Metal Worker (37-42 Months)

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate Per Hour: 55% of Journeyperson's rate
Supplemental Rate Per Hour: $29.95

Sheet Metal Worker (43-48 Months)

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate Per Hour: 70% of Journeyperson's rate
Supplemental Rate Per Hour: $36.83

Sheet Metal Worker (49-54 Months)

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate Per Hour: 70% of Journeyperson's rate
Supplemental Rate Per Hour: $36.83

Sheet Metal Worker (55-60 Months)

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate Per Hour: 80% of Journeyperson's rate
Supplemental Rate Per Hour: $41.42

(Local #28)

SIGN ERECTOR
(Ratio of Apprentice to Journeyperson: 1 to 1, 1 to 4)

Sign Erector - First Year: 1st Six Months

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate Per Hour: 35% of Journeyperson's rate
Supplemental Rate Per Hour: $15.75

Sign Erector - First Year: 2nd Six Months

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate Per Hour: 40% of Journeyperson's rate
Supplemental Rate Per Hour: $17.86

Sign Erector - Second Year: 1st Six Months

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate Per Hour: 45% of Journeyperson's rate
Supplemental Rate Per Hour: $19.98

Sign Erector - Second Year: 2nd Six Months

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate Per Hour: 50% of Journeyperson's rate
Supplemental Rate Per Hour: $22.12

Sign Erector - Third Year: 1st Six Months

Effective Period: 7/1/2019 - 6/30/2020

Wage Rate Per Hour: 55% of Journeyperson's rate
Supplemental Rate Per Hour: $29.92

Sign Erector - Third Year: 2nd Six Months

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate Per Hour: 60% of Journeyperson's rate
Supplemental Rate Per Hour: $32.56

Sign Erector - Fourth Year: 1st Six Months

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate Per Hour: 65% of Journeyperson's rate
Supplemental Rate Per Hour: $35.92

Sign Erector - Fourth Year: 2nd Six Months

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate Per Hour: 70% of Journeyperson's rate
Supplemental Rate Per Hour: $38.65

Sign Erector - Fifth Year

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate Per Hour: 75% of Journeyperson's rate
Supplemental Rate Per Hour: $41.33

Sign Erector - Sixth Year

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate Per Hour: 80% of Journeyperson's rate
Supplemental Rate Per Hour: $44.01

(Local #137)

STEAMFITTER
(Ratio of Apprentice to Journeyperson: 1 to 1, 1 to 3)

Steamfitter - First Year

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate and Supplemental Per Hour: 40% of Journeyperson's rate

Steamfitter - Second Year

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate and Supplemental Rate Per Hour: 50% of Journeyperson's rate.

Steamfitter - Third Year

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate and Supplemental Rate per Hour: 65% of Journeyperson's rate.

Steamfitter - Fourth Year

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate and Supplemental Rate Per Hour: 80% of Journeyperson's rate.

Steamfitter - Fifth Year

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate and Supplemental Rate Per Hour: 85% of Journeyperson's rate.

(Local #638)

STONE MASON - SETTER
(Ratio Apprentice of Journeyperson: 1 to 1, 1 to 2)

Stone Mason - Setters - First 750 Hours

Effective Period: 7/1/2019 - 6/30/2020
Wage and Supplemental Rate Per Hour: 50% of Journeyperson's rate

Stone Mason - Setters - Second 750 Hours

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate Per Hour: 60% of Journeyperson's rate
Supplemental Rate Per Hour: 50% of Journeyperson's rate

Stone Mason - Setters - Third 750 Hours

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate Per Hour: 70% of Journeyperson's rate
Supplemental Rate Per Hour: 50% of Journeyperson's rate

Stone Mason - Setters - Fourth 750 Hours

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate Per Hour: 80% of Journeyperson's rate
Supplemental Rate Per Hour: 50% of Journeyperson's rate

Stone Mason - Setters - Fifth 750 Hours

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate Per Hour: 90% of Journeyperson's rate
Supplemental Rate Per Hour: 50% of Journeyperson's rate

Stone Mason - Setters - Sixth 750 Hours

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate Per Hour: 100% of Journeyperson's rate
Supplemental Rate Per Hour: 50% of Journeyperson's rate

(Bricklayers District Council)

TAPER
(Ratio of Apprentice to Journeyperson: 1 to 1, 1 to 4)

Drywall Taper - First Year

Effective Period: 7/1/2019 - 6/30/2020
Wage and Supplemental Rate Per Hour: 40% of Journeyperson's rate

Drywall Taper - Second Year

Effective Period: 7/1/2019 - 6/30/2020
Wage and Supplemental Rate Per Hour: 60% of Journeyperson's rate

Drywall Taper - Third Year

Effective Period: 7/1/2019 - 6/30/2020
Wage and Supplemental Rate Per Hour: 80% of Journeyperson's rate

(Local #1974)

TILE LAYER - SETTER
(Ratio of Apprentice to Journeyperson: 1 to 1, 1 to 4)

Tile Layer - Setter - First 750 Hours

Effective Period: 7/1/2019 - 6/30/2020
Wage and Supplemental Rate Per Hour: 50% of Journeyperson's rate

Tile Layer - Setter - Second 750 Hours

Effective Period: 7/1/2019 - 6/30/2020
Wage and Supplemental Rate Per Hour: 55% of Journeyperson's rate

Tile Layer - Setter - Third 750 Hours

Effective Period: 7/1/2019 - 6/30/2020
Wage and Supplemental Rate Per Hour: 65% of Journeyperson's rate

Tile Layer - Setter - Fourth 750 Hours

Effective Period: 7/1/2019 - 6/30/2020
Wage and Supplemental Rate Per Hour: 75% of Journeyperson's rate

Tile Layer - Setter - Fifth 750 Hours

Effective Period: 7/1/2019 - 6/30/2020
Wage and Supplemental Rate Per Hour: 85% of Journeyperson's rate

Tile Layer - Setter - Sixth 750 Hours

Effective Period: 7/1/2019 - 6/30/2020
Wage and Supplemental Rate Per Hour: 95% of Journeyperson's rate

(Local #7)

TIMBERPERSON
(Ratio of Apprentice to Journeyperson: 1 to 1, 1 to 6)

Timberperson - First Year

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate Per Hour: 40% of Journeyperson's rate
Supplemental Rate Per Hour: $33.76

Timberperson - Second Year

Effective Period: 7/1/2019 - 6/30/2020

Wage Rate Per Hour: 50% of Journeyperson's rate
Supplemental Rate Per Hour: $33.76

Timberperson - Third Year

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate Per Hour: 65% of Journeyperson's rate
Supplemental Rate Per Hour: $33.76

Timberperson - Fourth Year

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate Per Hour: 80% of Journeyperson's rate
Supplemental Rate Per Hour: $33.76

(Local #1536)

OFFICE OF THE COMPTROLLER, CITY OF NEW YORK
CONSTRUCTION WORKER PREVAILING WAGE SCHEDULE

LABOR LAW ARTICLE 8 - NYC PUBLIC WORKS

Workers, Laborers and Mechanics employed on a public work project must receive not less than the prevailing rate of wage and benefits for the classification of work performed by each upon such public work. Pursuant to Labor Law Article 8 the Comptroller of the City of New York has promulgated this schedule solely for Workers, Laborers and Mechanics engaged by private contractors on New York City public work projects. Prevailing rates are required to be annexed to and form part of the public work contract pursuant to § 220 (3).

This schedule is a compilation of separate determinations of the prevailing rate of wage and supplements made by the Comptroller for each trade classification listed herein pursuant to New York State Labor Law section § 220 (5). The source of the wage and supplement rates, whether a collective bargaining agreement, survey data or other, is listed at the end of each classification.

Agency Chief Contracting Officers should contact the Bureau of Labor Law's Classification Unit with any questions concerning trade classifications, prevailing rates or prevailing practices with respect to procurement on New York City public work contracts. Contractors are advised to review the Comptroller's Prevailing Wage Schedule before bidding on public work contracts. Contractors with questions concerning trade classifications, prevailing rates or prevailing practices with respect to public work contracts in the procurement stage must contact the contracting agency responsible for the procurement.

Any error as to compensation under the prevailing wage law or other information as to trade classification, made by the contracting agency in the contract documents or in any other communication, will not preclude a finding against the contractor of prevailing wage violation.

Any questions concerning trade classifications, prevailing rates or prevailing practices on New York City public work contracts that have already been awarded may be directed to the Bureau of Labor Law's Classification Unit by calling (212) 669-4443. All callers must have the agency name and contract registration number available when calling with questions on public work contracts. Please direct all other compliance issues to: Bureau of Labor Law, Attn: Wasyl Kinach, P.E., Office of the Comptroller, 1 Centre Street, Room 651, New York, N.Y. 10007; Fax (212) 669-4002.

The appropriate schedule of prevailing wages and benefits must be posted at all public work sites pursuant to Labor Law § 220 (3-a) (a).

This schedule is applicable to work performed during the effective period, unless otherwise noted. Changes to this schedule are published on our web site comptroller.nyc.gov/wages. Contractors must pay the wages and supplements in effect when the worker, laborer, mechanic performs the work. Preliminary schedules for future one-year periods appear in the City Record on or about June 1 each succeeding year. Final schedules appear on or about July 1 in the City Record and on our web site comptroller.nyc.gov/wages.

The Comptroller's Office has attempted to include all overtime, shift and night differential, Holiday, Saturday, Sunday or other premium time work. However, this schedule does not set forth every prevailing practice with respect to such rates with which employers must comply. All such practices are nevertheless part of the employer's prevailing wage obligation and contained in the collective bargaining agreements of the prevailing wage unions. These collective bargaining agreements are available for inspection by appointment. Requests for appointments may be made by calling (212) 669-4443, Monday through Friday between the hours of 9 a.m. and 5 p.m.

Prevailing rates and ratios for apprentices are published in the Construction Apprentice Prevailing Wage Schedule. Pursuant to Labor Law § 220 (3-e), only apprentices who are individually registered in a bona fide program to which the employer contractor is a participant, registered with the New York State Department of Labor, may be paid at the apprentice rates. Apprentices who are not so registered must be paid as journey persons.

New York City public work projects awarded pursuant to a Project Labor Agreement ("PLA") in accordance with Labor Law section 222 may have different labor standards for shift, premium and overtime work. Please refer to the PLA's pre-negotiated labor agreements for wage and benefit rates applicable to work performed outside of the regular workday. More information is available at the Mayor's Office of Contract Services (MOCS) web page at:

https://www1.nyc.gov/site/mocs/legal-forms/project-labor-agreements.page

All the provisions of Labor Law Article 8 remain applicable to PLA work including, but not limited to, the enforcement of prevailing wage requirements by the Comptroller in accordance with the trade classifications in this schedule; however, we will enforce shift, premium, overtime and other non-standard rates as they appear in a project's pre-negotiated labor agreement.

In order to meet their obligation to provide prevailing supplemental benefits to each covered employee, employers must either:

1) Provide bona fide fringe benefits which cost the employer no less than the prevailing supplemental benefits rate; or
2) Supplement the employee's hourly wage by an amount no less than the prevailing supplemental benefits rate; or
3) Provide a combination of bona fide fringe benefits and wage supplements which cost the employer no less than the prevailing supplemental benefits rate in total.

Although prevailing wage laws do not require employers to provide bona fide fringe benefits (as opposed to wage supplements) to their employees, other laws may. For example, the Employee Retirement Income Security Act, 29 U.S.C. § 1001 et seq., the Patient Protection and Affordable Care Act, 42 U.S.C. § 18001 et seq., and the New York City Paid Sick Leave Law, N.Y.C. Admin. Code § 20-911 et seq., require certain employers to provide certain benefits to their employees. Labor agreements to which employers are a party may also require certain benefits. The Comptroller's Office does not enforce these laws or agreements.

Employers must provide prevailing supplemental benefits at the straight time rate for each hour worked unless otherwise noted in the classification.

Paid Holidays, Vacation and Sick Leave when listed must be paid or provided in addition to the prevailing hourly supplemental benefit rate.

For more information, please refer to the Comptroller's Prevailing Wage Law Regulations in Title 44 of the Rules of the City of New York, Chapter 2, available at comptroller.nyc.gov/wages.

Wasyl Kinach, P.E.
Director of Classifications
Bureau of Labor Law

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ASBESTOS HANDLER
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BLASTER

Blaster

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate per Hour: $55.86
Supplemental Benefit Rate per Hour: $44.48

Blaster- Hydraulic Trac Drill

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate per Hour: $50.00
Supplemental Benefit Rate per Hour: $44.48

Blaster - Wagon: Air Trac: Quarry Bar: Drillrunners

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate per Hour: $49.17
Supplemental Benefit Rate per Hour: $44.48

Blaster - Journeyperson

(Laborer, Chipper/Jackhammer including Walk Behind Self Propelled Hydraulic Asphalt and Concrete Breakers and Hydro (Water) Demolition, Powder Carrier, Hydraulic Chuck Tender, Chuck Tender and Nipper)

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate per Hour: $42.65
Supplemental Benefit Rate per Hour: $44.48

Blaster - Magazine Keepers: (Watch Person)

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate per Hour: $21.33
Supplemental Benefit Rate per Hour: $44.48

Overtime
Time and one half the regular rate after an 8 hour day.
Time and one half the regular rate for Saturday.
Double time the regular rate for Sunday.

Overtime Holidays

Double time the regular rate for work on the following holiday(s).
New Year's Day
Memorial Day
Independence Day
Labor Day
Columbus Day
Thanksgiving Day
Christmas Day

Paid Holidays

Labor Day
Thanksgiving Day

Shift Rates

When two shifts are employed, single time rate shall be paid for each shift. When three shifts are found necessary, each shift shall work seven and one half hours (7 ½), but shall be paid for eight (8) hours of labor, and be permitted one half hour for lunch.

(Local #731)

BOILERMAKER

Boilermaker

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate per Hour: $59.17
Supplemental Benefit Rate per Hour: $44.59
Supplemental Note: For time and one half overtime - $66.44 For double overtime - $88.28

Overtime Description

For Repair and Maintenance work:
Time and one half the regular rate after an 8 hour day.
Time and one half the regular rate for Saturday.
Double time the regular rate for Sunday.
For New Construction work:
Double time the regular rate after an 8 hour day.
Double time the regular time rate for Saturday.
Double time the regular rate for Sunday.

Overtime Holidays

Double time the regular rate for work on the following holiday(s).
New Year's Day
President's Day
Memorial Day
Independence Day

Columbus Day
Election Day
Veteran's Day
Thanksgiving Day
Christmas Day

Quadruple time the regular rate for work on the following holiday(s).
Labor Day

Paid Holidays

Good Friday
Day after Thanksgiving
Day before Christmas
Day before New Year's Day

Shift Rates

When shifts are required, the first shift shall work eight (8) hours at the regular straight-time hourly rate. The second shift shall work seven and one-half (7 ½) hours and receive eight hours at the regular straight time hourly rate plus twenty-five cents ($0.25) per hour. The third shift shall work seven (7) hours and receive eight hours at the regular straight time hourly rate plus fifty cents ($0.50) per hour. A thirty (30) minute lunch period shall not be considered as time worked. Work in excess of the above shall be paid overtime at the appropriate new construction work or repair work overtime wage and supplemental benefit hourly rate.

(Local #5)

BRICKLAYER

Bricklayer

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate per Hour: $56.32
Supplemental Benefit Rate per Hour: $33.11

Overtime

Time and one half the regular rate after a 7 hour day.
Time and one half the regular rate for Saturday.
Double time the regular rate for Sunday.
Saturday may be used as a make-up day at straight time when a day is lost during that week to inclement weather.

Overtime Holidays

Double time the regular rate for work on the following holiday(s).
New Year's Day
President's Day
Memorial Day
Independence Day
Labor Day

Thanksgiving Day
Christmas Day

Paid Holidays
None

Shift Rates
Overtime rates to be paid outside the regular scheduled work day.

(Bricklayer District Council)

CARPENTER - BUILDING COMMERCIAL

Building Commercial

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate per Hour: $52.50
Supplemental Benefit Rate per Hour: $46.38

Overtime
Time and one half the regular rate after an 8 hour day.
Time and one half the regular rate for Saturday.
Double time the regular rate for Sunday.
Saturday may be used as a make-up day at straight time when a day is lost during that week to inclement weather.

Overtime Holidays
Double time the regular rate for work on the following holiday(s).
New Year's Day
Washington's Birthday
Memorial Day
Independence Day
Labor Day
Columbus Day
Presidential Election Day
Thanksgiving Day
Day after Thanksgiving
Christmas Day

Paid Holidays
None

Shift Rates
The employer may work two (2) shifts with the first shift at the straight time wage rate starting at the established time between 7 a.m. and 9 a.m. The second shift will receive one hour at the double time rate of pay for the last hour of the shift; eight (8) hours pay for seven (7) hours of work, nine (9) hours pay for eight (8) hours of work.

When it is not possible to conduct alteration work during regular working hours in a building occupied by tenants, the rule for the second shift will apply.

(Carpenters District Council)

CARPENTER - HEAVY CONSTRUCTION WORK
(Construction of Engineering Structures and Building Foundations)

Heavy Construction Work

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate per Hour: $54.68
Supplemental Benefit Rate per Hour: $51.73

Overtime
Time and one half the regular rate after an 8 hour day.
Time and one half the regular rate for Saturday.
Double time the regular rate for Sunday.
Saturday may be used as a make-up day at straight time when a day is lost during that week to inclement weather.

Overtime Holidays
Double time the regular rate for work on the following holiday(s).
New Year's Day
President's Day
Memorial Day
Independence Day
Labor Day
Columbus Day
Presidential Election Day
Thanksgiving Day
Christmas Day

Paid Holidays
None

Shift Rates
Off shift work commencing between 5:00 P.M. and 11:00 P.M. shall work eight and one half hours allowing for one half hour for lunch. The wage rate shall be 113% of the straight time hourly wage rate.

(Carpenters District Council)

CARPENTER - HIGH RISE CONCRETE FORMS
(Excludes Engineering Structures and Building Foundations)

Carpenter High Rise A

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate per Hour: $50.78
Supplemental Benefit Rate per Hour: $43.44

Carpenter High Rise B

Carpenter High Rise B worker is excluded from high risk operations such as erection decking, perimeter debris netting, leading edge work, self-climbing form systems, and the installation of cocoon systems unless directly supervised by a Carpenter High Rise A worker.

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate per Hour: $40.19
Supplemental Benefit Rate per Hour: $16.75

Overtime
Time and one half the regular rate after an 8 hour day.
Time and one half the regular rate for Saturday.
Double time the regular rate for Sunday.
Saturday may be used as a make-up day at straight time when a day is lost during that week to inclement weather.

Overtime Holidays
Time and one half the regular rate for work on the following holiday(s).
New Year's Day
President's Day
Good Friday
Memorial Day
Independence Day
Labor Day
Columbus Day
Presidential Election Day
Thanksgiving Day
Christmas Day

Paid Holidays
None

Shift Rates
The second shift wage rate shall be 113% of the straight time hourly wage rate. There must be a first shift in order to work a second shift.

(Carpenters District Council)

CARPENTER - SIDEWALK SHED, SCAFFOLD AND HOIST

Carpenter - Hod Hoist

(Assisted by Mason Tender)

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate per Hour: $50.50
Supplemental Benefit Rate per Hour: $39.56

Overtime
Time and one half the regular rate after an 8 hour day.
Time and one half the regular rate for Saturday.
Double time the regular rate for Sunday.
Saturday may be used as a make-up day at straight time when a day is lost during that week to inclement weather.

Overtime Holidays
Double time the regular rate for work on the following holiday(s).
New Year's Day
President's Day
Memorial Day
Independence Day
Labor Day
Columbus Day
Presidential Election Day
Thanksgiving Day
Day after Thanksgiving
Christmas Day

Paid Holidays
None

Shift Rates
The second shift will receive one hour at the double time rate of pay for the last hour of the shift; eight hours pay for seven hours of work, nine hours pay for eight hours of work. There must be a first shift in order to work a second shift.

(Carpenters District Council)

CARPENTER - WOOD WATER STORAGE TANK

Tank Mechanic

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate per Hour: $34.14
Supplemental Benefit Rate per Hour: $19.00

Tank Helper

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate per Hour: $27.30
Supplemental Benefit Rate per Hour: $19.00

Overtime

Time and one half the regular rate after an 8 hour day.
Time and one half the regular rate for Saturday.
Double time the regular rate for Sunday.
Time and one half the regular rate for work on a holiday plus the day's pay.

Paid Holidays

New Year's Day
President's Day
Good Friday
Memorial Day
Independence Day
Labor Day
Columbus Day
Thanksgiving Day
Day after Thanksgiving
1/2 day on Christmas Eve if work is performed in the A.M.
1/2 day on New Year's Eve if work is performed in the A.M.

Vacation

Employed for one (1) year.....one (1) week vacation (40 hours)
Employed for three (3) years.....two (2) weeks vacation (80 hours)
Employed for more than twenty (20) years.....three (3) weeks vacation (120 hours)

SICK LEAVE:
Two (2) sick days after being employed for twenty (20) years.

(Carpenters District Council)

CEMENT & CONCRETE WORKER

Cement & Concrete Worker

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate per Hour: $43.53

Supplemental Benefit Rate per Hour: $28.95
Supplemental Note: $32.45 on Saturdays; $35.95 on Sundays & Holidays

Cement & Concrete Worker - (Hired after 2/6/2016)

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate per Hour: $33.05
Supplemental Benefit Rate per Hour: $20.95
Supplemental Note: $22.45 on Saturdays; $23.95 on Sundays & Holidays

Overtime Description
Time and one half the regular rate after 7 hour day (time and one half the regular rate after an 8 hour day when working with Dockbuilders on pile cap forms and for work below street level to the top of the foundation wall, not to exceed 2 feet or 3 feet above the sidewalk-brick shelf, when working on the foundation and structure.)

Overtime
Time and one half the regular rate for Saturday.
Double time the regular rate for Sunday.

Overtime Holidays
Double time the regular rate for work on the following holiday(s).
New Year's Day
President's Day
Good Friday
Memorial Day
Independence Day
Labor Day
Columbus Day
Presidential Election Day
Thanksgiving Day
Christmas Day

Paid Holidays
1/2 day before Christmas Day
1/2 day before New Year's Day

Shift Rates
On shift work extending over a twenty-four hour period, all shifts are paid at straight time.

(Cement Concrete Workers District Council)

CEMENT MASON

Cement Mason

Effective Period: 7/1/2019 - 6/30/2020

Wage Rate per Hour: $44.97
Supplemental Benefit Rate per Hour: $40.56
Supplemental Note: Supplemental benefit time and one half rate: $71.19; Double time rate: double the base supplemental benefit rate.

Overtime Description

Time and one-half the regular rate after an 8 hour day, double time the regular rate after 10 hours. Time and one-half the regular rate on Saturday, double time the regular rate after 10 hours. Double time the regular rate on Sunday.

Overtime Holidays

Double time the regular rate for work on the following holiday(s).
New Year's Day
President's Day
Good Friday
Memorial Day
Independence Day
Labor Day
Columbus Day
Presidential Election Day
Thanksgiving Day
Christmas Day

Paid Holidays

Any worker who reports to work on Christmas Eve or New Year's Eve pursuant to his employer's instruction shall be entitled to three (3) hours afternoon pay without working.

Shift Rates

For an off shift day, (work at times other than the regular 7:00 A.M. to 3:30 P.M. work day) a cement mason shall be paid at the regular hourly rate plus a 25% per hour differential. Four Days a week at Ten (10)hour day.

(Local #780) (BCA)

CORE DRILLER

Core Driller

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate per Hour: $40.44
Supplemental Benefit Rate per Hour: $26.70

Core Driller Helper

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate per Hour: $32.12
Supplemental Benefit Rate per Hour: $26.70

Core Driller Helper(Third year in the industry)

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate per Hour: $28.91
Supplemental Benefit Rate per Hour: $26.70

Core Driller Helper (Second year in the industry)

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate per Hour: $25.70
Supplemental Benefit Rate per Hour: $26.70

Core Driller Helper (First year in the industry)

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate per Hour: $22.48
Supplemental Benefit Rate per Hour: $26.70

Overtime Description
Time and one half the regular rate for work on a holiday plus Holiday pay when worked.

Overtime
Time and one half the regular rate after an 8 hour day.
Time and one half the regular rate for Saturday.
Double time the regular rate for Sunday.
Time and one half the regular rate for work on the following holiday(s).

Paid Holidays
New Year's Day
Memorial Day
Independence Day
Labor Day
Thanksgiving Day
Christmas Day

Shift Rates
The shift day shall be the continuous eight and one-half (8½) hours from 6:00 A.M. to 2:30 P.M. and from 2:30 P.M. to 11:00 P.M., including one-half (½) hour of employees regular rate of pay for lunch. When two (2) or more shifts are employed, single time shall be paid for each shift, but those employees employed on a shift other than from 8:00 A.M. to 5:00 P.M. shall, in addition, receive seventy-five cents ($0.75) per hour differential for each hour worked. When three (3) shifts are needed, each shift shall work seven and one-half (7 ½) hours paid for eight (8) hours of labor and be permitted one-half (½) hour for mealtime.

(Carpenters District Council)

DERRICKPERSON AND RIGGER

Derrick Person & Rigger

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate per Hour: $50.91
Supplemental Benefit Rate per Hour: $54.11
Supplemental Note: The above supplemental rate applies for work performed in Manhattan, Bronx, Brooklyn and Queens. $55.53 - For work performed in Staten Island.

Derrick Person & Rigger - Site Work

Assists the Stone Mason-Setter in the setting of stone and paving stone.

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate per Hour: $42.59
Supplemental Benefit Rate per Hour: $42.37

Overtime Description
The first two hours of overtime on weekdays and the first seven hours of work on Saturdays are paid at time and one half for wages and supplemental benefits. All additional overtimes is paid at double time for wages and supplemental benefits. Deduct $1.42 from the Staten Island hourly benefits rate before computing overtime.

Overtime
Double time the regular rate for Sunday.

Overtime Holidays
Double time the regular rate for work on the following holiday(s).
New Year's Day
Washington's Birthday
Good Friday
Memorial Day
Independence Day
Labor Day
Thanksgiving Day
Christmas Day

Paid Holidays
1/2 day on Christmas Eve if work is performed in the A.M.

(Local #197)

DIVER

Diver (Marine)

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate per Hour: $69.22
Supplemental Benefit Rate per Hour: $51.73

Diver Tender (Marine)

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate per Hour: $49.14
Supplemental Benefit Rate per Hour: $51.73

Overtime
Time and one half the regular rate after an 8 hour day.
Time and one half the regular rate for Saturday.
Double time the regular rate for Sunday.
Saturday may be used as a make-up day at straight time when a day is lost during that week to inclement weather.

Overtime Holidays
Double time the regular rate for work on the following holiday(s).
New Year's Day
President's Day
Memorial Day
Independence Day
Labor Day
Columbus Day
Presidential Election Day
Thanksgiving Day
Christmas Day

Paid Holidays
None

Shift Rates
When three shifts are utilized each shift shall work seven and one half-hours (7 1/2 hours) and paid for 8 hours, allowing for one half hour for lunch.

(Carpenters District Council)

DOCKBUILDER - PILE DRIVER

Dockbuilder - Pile Driver

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate per Hour: $54.63
Supplemental Benefit Rate per Hour: $51.73

Overtime

Time and one half the regular rate after an 8 hour day.
Time and one half the regular rate for Saturday.
Double time the regular rate for Sunday.
Saturday may be used as a make-up day at straight time when a day is lost during that week to inclement weather.

Overtime Holidays

Double time the regular rate for work on the following holiday(s).
New Year's Day
President's Day
Memorial Day
Independence Day
Labor Day
Columbus Day
Presidential Election Day
Thanksgiving Day
Christmas Day

Paid Holidays

None

Shift Rates

Off shift work commencing between 5:00 P.M. and 11:00 P.M. shall work eight and one half hours allowing for one half hour for lunch. The wage rate shall be 113% of the straight time hourly wage rate.

(Carpenters District Council)

DRIVER: TRUCK (TEAMSTER)

Driver - Dump Truck

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate per Hour: $41.18
Supplemental Benefit Rate per Hour: $49.65
Supplemental Note: Over 40 hours worked: at time and one half rate - $22.08; at double time rate - $29.44

Driver - Tractor Trailer

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate per Hour: $43.84
Supplemental Benefit Rate per Hour: $49.03
Supplemental Note: Over 40 hours worked: at time and one half rate - $19.80; at double time rate - $26.40

Driver - Euclid & Turnapull Operator

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate per Hour: $44.40
Supplemental Benefit Rate per Hour: $49.03
Supplemental Note: Over 40 hours worked: at time and one half rate - $19.80; at double time rate - $26.40

Overtime Description
For Paid Holidays: Holiday pay for all holidays shall be prorated based two hours per day for each day worked in the holiday week, not to exceed 8 hours of holiday pay. For Thanksgiving week, the prorated share shall be 5 1/3 hours of holiday pay for each day worked in Thanksgiving week.

Overtime
Time and one half the regular rate after an 8 hour day.
Time and one half the regular rate for Saturday.
Double time the regular rate for Sunday.

Overtime Holidays
Double time the regular rate for work on the following holiday(s).
New Year's Day
President's Day
Memorial Day
Independence Day
Labor Day
Columbus Day
Veteran's Day
Thanksgiving Day
Day after Thanksgiving
Christmas Day

Paid Holidays
New Year's Day
President's Day
Memorial Day
Independence Day
Labor Day
Columbus Day
Veteran's Day
Thanksgiving Day
Day after Thanksgiving
Christmas Day

Shift Rates
Off single shift work commencing between 6:00 P.M. and 5:00 A.M. shall work eight and one half (8 1/2) hours allowing for one half hour for lunch and be paid 117.3% of the straight time hourly wage rate.

Driver Redi-Mix (Sand & Gravel)

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate per Hour: $39.00

Supplemental Benefit Rate per Hour: **$45.52**
Supplemental Note: Over 40 hours worked: time and one half rate $16.78; double time rate $22.37

Overtime Description
For Paid Holidays: Employees working two (2) days in the calendar week in which the holiday falls are to paid for these holidays, provided they shape each remaining workday during that calendar week.

Overtime
Time and one half the regular rate after an 8 hour day.
Time and one half the regular rate for Saturday.
Double time the regular rate for Sunday.

Overtime Holidays
Double time the regular rate for work on the following holiday(s).
President's Day
Columbus Day
Veteran's Day

Triple time the regular rate for work on the following holiday(s).
New Year's Day
Memorial Day
Independence Day
Labor Day
Thanksgiving Day
Christmas Day

Paid Holidays
New Year's Day
President's Day
Memorial Day
Independence Day
Labor Day
Columbus Day
Election Day
Thanksgiving Day
Christmas Day

(Local #282)

ELECTRICIAN
(Including installation of low voltage cabling carrying data, video and/or voice on building construction/alteration/renovation projects.)

Electrician "A" (Regular Day / Day Shift)

Effective Period: 7/1/2019 - 6/30/2020

Wage Rate per Hour: $56.00
Supplemental Benefit Rate per Hour: $56.54

Electrician "A" (Regular Day Overtime after 7 hrs / Day Shift Overtime after 8 hrs)

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate per Hour: $84.00
Supplemental Benefit Rate per Hour: $60.07

Electrician "A" (Swing Shift)

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate per Hour: $65.71
Supplemental Benefit Rate per Hour: $64.36

Electrician "A" (Swing Shift Overtime After 7.5 hours)

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate per Hour: $98.57
Supplemental Benefit Rate per Hour: $68.51

Electrician "A" (Graveyard Shift)

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate per Hour: $73.60
Supplemental Benefit Rate per Hour: $70.94

Electrician "A" (Graveyard Shift Overtime After 7 hours)

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate per Hour: $110.40
Supplemental Benefit Rate per Hour: $75.59

Overtime
Time and one half the regular rate after a 7 hour day.
Time and one half the regular rate for Saturday.
Time and one half the regular rate for Sunday.

Overtime Holidays
Time and one half the regular rate for work on a holiday.
New Year's Day
Martin Luther King Jr. Day
President's Day
Memorial Day
Independence Day
Labor Day
Columbus Day
Veteran's Day
Thanksgiving Day
Day after Thanksgiving

Christmas Day

Paid Holidays
None

Shift Rates
When so elected by the Employer, one or more shifts of at least five days duration may be scheduled as follows: Day Shift: 8:00 am to 4:30 pm, Swing Shift 4:30 pm to 12:30 am, Graveyard Shift: 12:30 am to 8:00 am.

For multiple shifts of temporary light and/or power, the temporary light and/or power employee shall be paid for 8 hours at the straight time rate. For three or less workers performing 8 hours temporary light and/or power the supplemental benefit rate is $24.92.

Electrician "M" (First 8 hours)

"M" rated work shall be defined as jobbing: electrical work of limited duration and scope, also consisting of repairs and/or replacement of electrical and tele-data equipment. Includes all work necessary to retrofit, service, maintain and repair all kinds of lighting fixtures and local lighting controls and washing and cleaning of foregoing fixtures.

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate per Hour: $29.00
Supplemental Benefit Rate per Hour: $23.43
First and Second Year "M" Wage Rate Per Hour: $24.50
First and Second Year "M" Supplemental Rate: $21.07

Electrician "M" (Overtime After First 8 hours)

"M" rated work shall be defined as jobbing: electrical work of limited duration and scope, also consisting of repairs and/or replacement of electrical and tele-data equipment. Includes all work necessary to retrofit, service, maintain and repair all kinds of lighting fixtures and local lighting controls and washing and cleaning of foregoing fixtures.

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate per Hour: $43.50
Supplemental Benefit Rate per Hour: $25.26
First and Second Year "M" Wage Rate Per Hour: $36.75
First and Second Year "M" Supplemental Rate: $22.62

Overtime
Time and one half the regular rate after an 8 hour day.
Time and one half the regular rate for Saturday.
Time and one half the regular rate for Sunday.

Overtime Holidays
Time and one half the regular rate for work on the following holiday(s).
New Year's Day
Martin Luther King Jr. Day

President's Day
Memorial Day
Independence Day
Labor Day
Columbus Day
Veteran's Day
Thanksgiving Day
Day after Thanksgiving
Christmas Day

Paid Holidays
None

(Local #3)

ELECTRICIAN - ALARM TECHNICIAN
(Scope of Work - Inspect, test, repair, and replace defective, malfunctioning, or broken devices, components and controls of Fire, Burglar and Security Systems)

Alarm Technician

Effective Period: 7/1/2019 - 3/9/2020
Wage Rate per Hour: $33.40
Supplemental Benefit Rate per Hour: $17.68
Supplemental Note: $16.06 only after 8 hours worked in a day

Effective Period: 3/10/2020 - 6/30/2020
Wage Rate per Hour: $33.90
Supplemental Benefit Rate per Hour: $18.43
Supplemental Note: $16.80 only after 8 hours worked in a day

Overtime Description
Time and one half the regular rate for work on the following holidays: Columbus Day, Veterans Day, Day after Thanksgiving.
Double time the regular rate for work on the following holidays: New Year's day, Martin Luther King Jr. Day, President's Day, Memorial Day, Independence Day, Labor Day, Thanksgiving Day, Christmas Day.

Overtime
Time and one half the regular rate after an 8 hour day.
Time and one half the regular rate for Saturday.
Double time the regular rate for Sunday.

Paid Holidays
New Year's Day

Martin Luther King Jr. Day
President's Day
Memorial Day
Independence Day
Labor Day
Columbus Day
Veteran's Day
Thanksgiving Day
Day after Thanksgiving
Christmas Day

Shift Rates

Night Differential is based upon a ten percent (10%) differential between the hours of 4:00 P.M. and 12:30 A.M. and a fifteen percent (15%) differential for the hours 12:00 A.M. to 8:00 A.M.

Vacation

At least 1 year of employment.....ten (10) days
5 years or more of employment.....fifteen (15) days
10 years of employment.....twenty (20) days
Plus one Personal Day per year

Sick Days:
One day per Year. Up to 4 vacation days may be used as sick days.

(Local #3)

ELECTRICIAN-STREET LIGHTING WORKER

Electrician - Electro Pole Electrician

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate per Hour: $56.00
Supplemental Benefit Rate per Hour: $58.44

Electrician - Electro Pole Foundation Installer

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate per Hour: $42.66
Supplemental Benefit Rate per Hour: $43.52

Electrician - Electro Pole Maintainer

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate per Hour: $36.61
Supplemental Benefit Rate per Hour: $39.16

Overtime Description

Electrician - Electro Pole Electrician: Time and one half the regular rate after a 7 hour day and after 5 consecutive days worked per week.
Electrician - Electro Pole Foundation Installer: Time and one half the regular rate after 8 hours within a 24 hour period and Saturday and Sunday.
Electrician - Electro Pole Maintainer: Time and one half the regular rate after a 7 hour day and after 5 consecutive days worked per week. Saturdays and Sundays may be used as a make-up day at straight time when a day is lost during the week to inclement weather.

Overtime Holidays

Time and one half the regular rate for work on the following holiday(s).
New Year's Day
Martin Luther King Jr. Day
President's Day
Memorial Day
Independence Day
Labor Day
Columbus Day
Veteran's Day
Thanksgiving Day
Day after Thanksgiving
Christmas Day

Paid Holidays

None

(Local #3)

ELEVATOR CONSTRUCTOR

Elevator Constructor

Effective Period: 7/1/2019 - 3/16/2020
Wage Rate per Hour: $66.95
Supplemental Benefit Rate per Hour: $36.65

Effective Period: 3/17/2020 - 6/30/2020
Wage Rate per Hour: $69.56
Supplemental Benefit Rate per Hour: $37.47

Overtime Description

For New Construction: work performed after 7 or 8 hour day, Saturday, Sunday or between 4:30pm and 7:00am shall be paid at double time rate.

Existing buildings: work performed after an 8 hour day, Saturday, Sunday or between 5:30pm and 7:00 am shall be paid time and one half.

Overtime

Double time the regular rate for work on the following holiday(s).

Paid Holidays

New Year's Day
President's Day
Good Friday
Memorial Day
Independence Day
Labor Day
Columbus Day
Veteran's Day
Thanksgiving Day
Day after Thanksgiving
Christmas Day

Vacation

Employer contributes 8% of regular basic hourly rate as vacation pay for employees with more than 15 years of service, and 6% for employees with 5 to 15 years of service, and 4% for employees with less than 5 years of service.

(Local #1)

ELEVATOR REPAIR & MAINTENANCE

Elevator Service/Modernization Mechanic

Effective Period: 7/1/2019 - 3/16/2020
Wage Rate per Hour: $52.44
Supplemental Benefit Rate per Hour: $36.55

Effective Period: 3/17/2020 - 6/30/2020
Wage Rate per Hour: $54.56
Supplemental Benefit Rate per Hour: $37.37

Overtime Description

For Scheduled Service Work: Double time - work scheduled in advance by two or more workers performed on Sundays, Holidays, and between midnight and 7:00am.

Overtime

Time and one half the regular rate after an 8 hour day.
Time and one half the regular rate for Saturday.
Time and one half the regular rate for Sunday.
Time and one half the regular rate for work on a holiday plus the day's pay.

Paid Holidays

New Year's Day
President's Day

Good Friday
Memorial Day
Independence Day
Labor Day
Columbus Day
Veteran's Day
Thanksgiving Day
Day after Thanksgiving
Christmas Day

Shift Rates

Afternoon shift - regularly hourly rate plus a (15%) fifteen percent differential. Graveyard shift - time and one half the regular rate.

Vacation

Employer contributes 8% of regular basic hourly rate as vacation pay for employees with more than 15 years of service, and 6% for employees with 5 to 15 years of service, and 4% for employees with less than 5 years of service.

(Local #1)

ENGINEER

Engineer - Heavy Construction Operating Engineer I

Cherrypickers 20 tons and over and Loaders (rubber tired and/or tractor type with a manufacturer's minimum rated capacity of six cubic yards and over).

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate per Hour: $70.71
Supplemental Benefit Rate per Hour: $39.74
Supplemental Note: $72.08 on overtime
Shift Wage Rate: $113.14

Engineer - Heavy Construction Operating Engineer II

Backhoes, Basin Machines, Groover, Mechanical Sweepers, Bobcat, Boom Truck, Barrier Transport (Barrier Mover) & machines of similar nature. Operation of Churn Drills and machines of a similar nature, Stetco Silent Hoist and machines of similar nature, Vac-Alls, Meyers Machines, John Beam and machines of a similar nature, Ross Carriers and Travel Lifts and machines of a similar nature, Bulldozers, Scrapers and Turn-a-Pulls: Tugger Hoists (Used exclusively for handling excavated material); Tractors with attachments, Hyster and Roustabout Cranes, Cherrypickers. Austin Western, Grove and machines of a similar nature, Scoopmobiles, Monorails, Conveyors, Trenchers: Loaders-Rubber Tired and Tractor: Barber Greene and Eimco Loaders and Eimco Backhoes; Mighty Midget and similar breakers and Tampers, Curb and Gutter Pavers and Motor Patrol, Motor Graders and all machines of a similar nature. Locomotives 10 Tons or under. Mini-Max, Break-Tech and machines of a similar nature; Milling machines, robotic and demolition machines and machines of a similar nature, shot blaster, skid steer machines and machines of a similar nature including bobcat, pile rig rubber-tired excavator (37,000 lbs. and under), 2 man auger.

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate per Hour: $68.58
Supplemental Benefit Rate per Hour: $39.74
Supplemental Note: $72.08 on overtime
Shift Wage Rate: $109.73

Engineer - Heavy Construction Operating Engineer III

Minor Equipment such as Tractors, Post Hole Diggers, Ditch Witch (Walk Behind), Road Finishing Machines, Rollers five tons and under, Tugger Hoists, Dual Purpose Trucks, Fork Lifts, and Dempsey Dumpers, Fireperson.

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate per Hour: $65.00
Supplemental Benefit Rate per Hour: $39.74
Supplemental Note: $72.08 on overtime
Shift Wage Rate: $104.00

Engineer - Heavy Construction Maintenance Engineer I

Installing, Repairing, Maintaining, Dismantling and Manning of all equipment including Steel Cutting, Bending and Heat Sealing Machines, Mechanical Heaters, Grout Pumps, Bentonite Pumps & Plants, Screening Machines, Fusion Coupling Machines, Tunnel Boring Machines Moles and Machines of a similar nature, Power Packs, Mechanical Hydraulic Jacks; all drill rigs including but not limited to Churn, Rotary Caisson, Raised Bore & Drills of a similar nature; Personnel, Inspection & Safety Boats or any boats used to perform functions of same, Mine Hoists, Whirlies, all Climbing Cranes, all Tower Cranes, including but not limited to Truck Mounted and Crawler Type and machines of similar nature; Maintaining Hydraulic Drills and machines of a similar nature; Well Point System-Installation and dismantling; Burning, Welding, all Pumps regardless of size and/or motor power, except River Cofferdam Pumps and Wells Point Pumps; Motorized Buggies (three or more); equipment used in the cleaning and televising of sewers, but not limited to jet-rodder/vacuum truck, vacall/vactor, closed circuit television inspection equipment; high powered water pumps, jet pumps; screed machines and concrete finishing machines of a similar nature; vermeers.

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate per Hour: $68.25
Supplemental Benefit Rate per Hour: $39.74
Supplemental Note: $72.08 on overtime
Shift Wage Rate: $109.20

Engineer - Heavy Construction Maintenance Engineer II

On Base Mounted Tower Cranes

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate per Hour: $90.00
Supplemental Benefit Rate per Hour: $39.74
Supplemental Note: $72.08 on overtime
Shift Wage Rate: $144.00

Engineer - Heavy Construction Maintenance Engineer III

On Generators, Light Towers

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate per Hour: $44.64
Supplemental Benefit Rate per Hour: $39.74
Supplemental Note: $72.08 on overtime
Shift Wage Rate: $71.42

Engineer - Heavy Construction Maintenance Engineer IV

On Pumps and Mixers including mud sucking

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate per Hour: $45.83
Supplemental Benefit Rate per Hour: $39.74
Supplemental Note: $72.08 on overtime
Shift Wage Rate: $73.33

Engineer - Steel Erection Maintenance Engineers

Derrick, Travelers, Tower, Crawler Tower and Climbing Cranes

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate per Hour: $65.31
Supplemental Benefit Rate per Hour: $39.74
Supplemental Note: $72.08 on overtime
Shift Wage Rate: $104.50

Engineer - Steel Erection Oiler I

On a Truck Crane

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate per Hour: $61.05
Supplemental Benefit Rate per Hour: $39.74
Supplemental Note: $72.08 on overtime
Shift Wage Rate: $97.68

Engineer - Steel Erection Oiler II

On a Crawler Crane

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate per Hour: $46.18
Supplemental Benefit Rate per Hour: $39.74
Supplemental Note: $72.08 on overtime
Shift Wage Rate: $73.89

Overtime Description

On jobs of more than one shift, if the next shift employee fails to report for work through any cause over which the employer has no control, the employee on duty who works the next shift continues to work at the single time rate.

Overtime

Double time the regular rate after an 8 hour day.
Double time the regular time rate for Saturday.
Double time the regular rate for Sunday.
Double time the regular rate for work on the following holiday(s).

Paid Holidays

New Year's Day
Lincoln's Birthday
President's Day
Memorial Day
Independence Day
Labor Day
Columbus Day
Veteran's Day
Thanksgiving Day
Day after Thanksgiving
Christmas Day
Employees must work at least one day in the payroll week in which the holiday occurs to receive the paid holiday

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Engineer - Building Work Maintenance Engineers I

Installing, repairing, maintaining, dismantling (of all equipment including: Steel Cutting and Bending Machines, Mechanical Heaters, Mine Hoists, Climbing Cranes, Tower Cranes, Linden Peine, Lorain, Liebherr, Mannes, or machines of a similar nature, Well Point Systems, Deep Well Pumps, Concrete Mixers with loading Device, Concrete Plants, Motor Generators when used for temporary power and lights), skid steer machines of a similar nature including bobcat.

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate per Hour: $62.45
Supplemental Benefit Rate per Hour: $39.74
Supplemental Note: $72.08 on overtime

Engineer - Building Work Maintenance Engineers II

On Pumps, Generators, Mixers and Heaters

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate per Hour: $48.26
Supplemental Benefit Rate per Hour: $39.74
Supplemental Note: $72.08 on overtime

Engineer - Building Work Oilers I

All gasoline, electric, diesel or air operated Gradealls: Concrete Pumps, Overhead Cranes in Power Houses: Their duties shall be to assist the Engineer in oiling, greasing and repairing of all machines; Driving Truck Cranes: Driving and Operating Fuel and Grease Trucks, Cherrypickers (hydraulic cranes) over 70,000 GVW, and machines of a similar nature.

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate per Hour: $59.33
Supplemental Benefit Rate per Hour: $39.74
Supplemental Note: $72.08 on overtime

Engineer - Building Work Oilers II

Oilers on Crawler Cranes, Backhoes, Trenching Machines, Gunite Machines, Compressors (three or more in Battery).

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate per Hour: $43.78
Supplemental Benefit Rate per Hour: $39.74
Supplemental Note: $72.08 on overtime

Overtime Description
On jobs of more than one shift, if an Employee fails to report for work through any cause over which the Employer has no control, the Employee on duty will continue to work at the rate of single time.

Overtime
Double time the regular rate after an 8 hour day.
Double time the regular time rate for Saturday.
Double time the regular rate for Sunday.
Double time the regular rate for work on the following holiday(s).

Paid Holidays
New Year's Day
Lincoln's Birthday
President's Day
Memorial Day
Independence Day
Labor Day
Columbus Day
Veteran's Day
Thanksgiving Day
Christmas Day
Employees must work at least one day in the payroll week in which the holiday occurs to receive the paid holiday

Shift Rates
Off Shift: double time the regular hourly rate.

(Local #15)

ENGINEER - CITY SURVEYOR AND CONSULTANT

Party Chief

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate per Hour: $40.41
Supplemental Benefit Rate per Hour: $22.75
Supplemental Note: Overtime Benefit Rate - $27.25 per hour (time & one half) $31.75 per hour (double time).

Instrument Person

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate per Hour: $33.13
Supplemental Benefit Rate per Hour: $22.75
Supplemental Note: Overtime Benefit Rate - $27.25 per hour (time & one half) $31.75 per hour (double time).

Rodperson

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate per Hour: $28.54
Supplemental Benefit Rate per Hour: $22.75
Supplemental Note: Overtime Benefit Rate - $27.25 per hour (time & one half) $31.75 per hour (double time).

Overtime Description

Time and one half the regular rate after an 8 hour day, Time and one half the regular rate for Saturday for the first eight hours worked, Double time the regular time rate for Saturday for work performed in excess of eight hours, Double time the regular rate for Sunday and Double time the regular rate for work on a holiday.

Paid Holidays

New Year's Day
Lincoln's Birthday
President's Day
Memorial Day
Independence Day
Labor Day
Columbus Day
Veteran's Day
Thanksgiving Day
Day after Thanksgiving
Christmas Day
Employees must work at least one day in the payroll week in which the holiday occurs to receive the paid holiday

(Operating Engineer Local #15-D)

ENGINEER - FIELD (BUILDING CONSTRUCTION)
(Construction of Building Projects, Concrete Superstructures, etc.)

Field Engineer - BC Party Chief

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate per Hour: $65.44
Supplemental Benefit Rate per Hour: $35.12
Supplemental Note: Overtime Benefit Rate - $49.33 per hour (time & one half) $63.54 per hour (double time).

Field Engineer - BC Instrument Person

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate per Hour: $50.83
Supplemental Benefit Rate per Hour: $35.12
Supplemental Note: Overtime Benefit Rate - $49.33 per hour (time & one half) $63.54 per hour (double time).

Field Engineer - BC Rodperson

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate per Hour: $32.84
Supplemental Benefit Rate per Hour: $35.12
Supplemental Note: Overtime Benefit Rate - $49.33 per hour (time & one half) $63.54 per hour (double time).

Overtime Description
Time and one half the regular rate after a 7 hour work and time and one half the regular rate for Saturday for the first seven hours worked, Double time the regular time rate for Saturday for work performed in excess of seven hours, Double time the regular rate for Sunday and Double time the regular rate for work on a holiday.

Paid Holidays
New Year's Day
President's Day
Good Friday
Memorial Day
Independence Day
Labor Day
Columbus Day
Veteran's Day
Thanksgiving Day
Christmas Day
Employees must work at least one day in the payroll week in which the holiday occurs to receive the paid holiday

(Operating Engineer Local #15-D)

ENGINEER - FIELD (HEAVY CONSTRUCTION)

(Construction of Roads, Tunnels, Bridges, Sewers, Building Foundations, Engineering Structures etc.)

Field Engineer - HC Party Chief

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate per Hour: $74.18
Supplemental Benefit Rate per Hour: $36.51
Supplemental Note: Overtime benefit rate - $51.29 per hour (time & one half), $66.07 per hour (double time).

Field Engineer - HC Instrument Person

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate per Hour: $54.47
Supplemental Benefit Rate per Hour: $36.51
Supplemental Note: Overtime benefit rate - $51.29 per hour (time & one half), $66.07 per hour (double time).

Field Engineer - HC Rodperson

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate per Hour: $45.70
Supplemental Benefit Rate per Hour: $36.51
Supplemental Note: Overtime benefit rate - $51.29 per hour (time & one half), $66.07 per hour (double time).

Overtime Description

Time and one half the regular rate after an 8 hour day, Time and one half the regular rate for Saturday for the first eight hours worked, Double time the regular time rate for Saturday for work performed in excess of eight hours, Double time the regular rate for Sunday and Double time the regular rate for work on a holiday.

Paid Holidays

New Year's Day
Lincoln's Birthday
President's Day
Memorial Day
Independence Day
Labor Day
Columbus Day
Veteran's Day
Thanksgiving Day
Christmas Day
Employees must work at least one day in the payroll week in which the holiday occurs to receive the paid holiday

(Operating Engineer Local #15-D)

ENGINEER - FIELD (STEEL ERECTION)

Field Engineer - Steel Erection Party Chief

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate per Hour: $69.15
Supplemental Benefit Rate per Hour: $36.01
Supplemental Note: Overtime benefit rate - $50.54 per hour (time & one half), $65.07 per hour (double time).

Field Engineer - Steel Erection Instrument Person

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate per Hour: $53.88
Supplemental Benefit Rate per Hour: $36.01
Supplemental Note: Overtime benefit rate - $50.54 per hour (time & one half), $65.07 per hour (double time).

Field Engineer - Steel Erection Rodperson

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate per Hour: $36.04
Supplemental Benefit Rate per Hour: $36.01
Supplemental Note: Overtime benefit rate - $50.54 per hour (time & one half), $65.07 per hour (double time).

Overtime Description
Time and one half the regular rate for Saturday for the first eight hours worked.
Double time the regular rate for Saturday for work performed in excess of eight hours.

Overtime
Time and one half the regular rate after an 8 hour day.
Double time the regular rate for Sunday.
Double time the regular rate for work on the following holiday(s).

Paid Holidays
New Year's Day
Lincoln's Birthday
President's Day
Memorial Day
Independence Day
Labor Day
Columbus Day
Veteran's Day
Thanksgiving Day
Christmas Day
Employees must work at least one day in the payroll week in which the holiday occurs to receive the paid holiday

(Operating Engineer Local #15-D)

ENGINEER - OPERATING

Operating Engineer - Road & Heavy Construction I

Back Filling Machines, Cranes, Mucking Machines and Dual Drum Paver.

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate per Hour: $81.17
Supplemental Benefit Rate per Hour: $32.95
Supplemental Note: $59.95 overtime hours
Shift Wage Rate: $129.87

Operating Engineer - Road & Heavy Construction II

Backhoes, Power Shovels, Hydraulic Clam Shells, Steel Erection, Moles and machines of a similar nature.

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate per Hour: $84.01
Supplemental Benefit Rate per Hour: $32.95
Supplemental Note: $59.95 overtime hours
Shift Wage Rate: $134.42

Operating Engineer - Road & Heavy Construction III

Mine Hoists, Cranes, etc. (Used as Mine Hoists)

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate per Hour: $86.69
Supplemental Benefit Rate per Hour: $32.95
Supplemental Note: $59.95 overtime hours
Shift Wage Rate: $138.70

Operating Engineer - Road & Heavy Construction IV

Gradealls, Keystones, Cranes on land or water (with digging buckets), Bridge Cranes, Vermeer Cutter and machines of a similar nature, Trenching Machines.

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate per Hour: $84.62
Supplemental Benefit Rate per Hour: $32.95
Supplemental Note: $59.95 overtime hours
Shift Wage Rate: $135.39

Operating Engineer - Road & Heavy Construction V

Pile Drivers & Rigs (employing Dock Builder foreperson): Derrick Boats, Tunnel Shovels.

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate per Hour: $82.96
Supplemental Benefit Rate per Hour: $32.95
Supplemental Note: $59.95 overtime hours
Shift Wage Rate: $132.74

Operating Engineer - Road & Heavy Construction VI

Mixers (Concrete with loading attachment), Concrete Pavers, Cableways, Land Derricks, Power Houses (Low Air Pressure Units).

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate per Hour: $78.85
Supplemental Benefit Rate per Hour: $32.95
Supplemental Note: $59.95 overtime hours
Shift Wage Rate: $126.16

Operating Engineer - Road & Heavy Construction VII

Barrier Movers , Barrier Transport and Machines of a Similar Nature.

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate per Hour: $63.81
Supplemental Benefit Rate per Hour: $32.95
Supplemental Note: $59.95 overtime hours
Shift Wage Rate: $102.10

Operating Engineer - Road & Heavy Construction VIII

Utility Compressors

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate per Hour: $49.67
Supplemental Benefit Rate per Hour: $32.95
Supplemental Note: $59.95 overtime hours
Shift Wage Rate: $62.44

Operating Engineer - Road & Heavy Construction IX

Horizontal Boring Rig

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate per Hour: $75.02
Supplemental Benefit Rate per Hour: $32.95
Supplemental Note: $59.95 overtime hours
Shift Wage Rate: $120.03

Operating Engineer - Road & Heavy Construction X

Elevators (manually operated as personnel hoist).

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate per Hour: $69.01
Supplemental Benefit Rate per Hour: $32.95
Supplemental Note: $59.95 overtime hours
Shift Wage Rate: $110.42

Operating Engineer - Road & Heavy Construction XI

Compressors (Portable 3 or more in battery), Driving of Truck Mounted Compressors, Well-point Pumps, Tugger Machines Well Point Pumps, Churn Drill.

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate per Hour: $53.74
Supplemental Benefit Rate per Hour: $32.95
Supplemental Note: $59.95 overtime hours
Shift Wage Rate: $85.98

Operating Engineer - Road & Heavy Construction XII

All Drills and Machines of a similar nature.

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate per Hour: $79.68
Supplemental Benefit Rate per Hour: $32.95
Supplemental Note: $59.95 overtime hours
Shift Wage Rate: $127.49

Operating Engineer - Road & Heavy Construction XIII

Concrete Pumps, Concrete Plant, Stone Crushers, Double Drum Hoist, Power Houses (other than above).

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate per Hour: $77.19
Supplemental Benefit Rate per Hour: $32.95
Supplemental Note: $59.95 overtime hours
Shift Wage Rate: $123.50

Operating Engineer - Road & Heavy Construction XIV

Concrete Mixer

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate per Hour: $73.82
Supplemental Benefit Rate per Hour: $32.95
Supplemental Note: $59.95 overtime hours
Shift Wage Rate: $118.11

Operating Engineer - Road & Heavy Construction XV

Compressors (Portable Single or two in Battery, not over 100 feet apart), Pumps (River Cofferdam) and Welding Machines, Push Button Machines, All Engines Irrespective of Power (Power-Pac) used to drive auxiliary equipment, Air, Hydraulic, etc.

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate per Hour: $49.99
Supplemental Benefit Rate per Hour: $32.95
Supplemental Note: $59.95 overtime hours
Shift Wage Rate: $79.98

Operating Engineer - Road & Heavy Construction XVI

Concrete Breaking Machines, Hoists (Single Drum), Load Masters, Locomotives (over ten tons) and Dinkies over ten tons, Hydraulic Crane-Second Engineer.

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate per Hour: $70.53
Supplemental Benefit Rate per Hour: $32.95
Supplemental Note: $59.95 overtime hours
Shift Wage Rate: $112.85

Operating Engineer - Road & Heavy Construction XVII

On-Site concrete plant engineer, On-site Asphalt Plant Engineer, and Vibratory console.

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate per Hour: $71.06
Supplemental Benefit Rate per Hour: $32.95
Supplemental Note: $59.95 overtime hours
Shift Wage Rate: $113.70

Operating Engineer - Road & Heavy Construction XVIII

Tower Crane

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate per Hour: $101.71
Supplemental Benefit Rate per Hour: $32.95
Supplemental Note: $59.95 overtime hours
Shift Wage Rate: $162.74

Operating Engineer - Paving I

Asphalt Spreaders, Autogrades (C.M.I.), Roto/Mil

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate per Hour: $78.85
Supplemental Benefit Rate per Hour: $32.95
Supplemental Note: $59.95 overtime hours

Shift Wage Rate: $126.16

Operating Engineer - Paving II

Asphalt Roller

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate per Hour: $76.83
Supplemental Benefit Rate per Hour: $32.95
Supplemental Note: $59.95 overtime hours
Shift Wage Rate: $122.93

Operating Engineer - Paving III

Asphalt Plants

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate per Hour: $65.08
Supplemental Benefit Rate per Hour: $32.95
Supplemental Note: $59.95 overtime hours
Shift Wage Rate: $104.13

Operating Engineer - Concrete I

Cranes

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate per Hour: $84.25
Supplemental Benefit Rate per Hour: $32.95
Supplemental Note: $59.95 overtime hours

Operating Engineer - Concrete II

Compressors

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate per Hour: $50.37
Supplemental Benefit Rate per Hour: $32.95
Supplemental Note: $59.95 overtime hours

Operating Engineer - Concrete III

Micro-traps (Negative Air Machines), Vac-All Remediation System.

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate per Hour: $67.45
Supplemental Benefit Rate per Hour: $32.95
Supplemental Note: $59.95 overtime hours

Operating Engineer - Steel Erection I

Three Drum Derricks

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate per Hour: $87.14
Supplemental Benefit Rate per Hour: $32.95
Supplemental Note: $59.95 overtime hours
Shift Wage Rate: $139.42

Operating Engineer - Steel Erection II

Cranes, 2 Drum Derricks, Hydraulic Cranes, Fork Lifts and Boom Trucks.

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate per Hour: $83.75
Supplemental Benefit Rate per Hour: $32.95
Supplemental Note: $59.95 overtime hours
Shift Wage Rate: $134.00

Operating Engineer - Steel Erection III

Compressors, Welding Machines.

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate per Hour: $49.95
Supplemental Benefit Rate per Hour: $32.95
Supplemental Note: $59.95overtime hours
Shift Wage Rate: $79.92

Operating Engineer - Steel Erection IV

Compressors - Not Combined with Welding Machine.

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate per Hour: $47.58
Supplemental Benefit Rate per Hour: $32.95
Supplemental Note: $59.95 overtime hours
Shift Wage Rate: $76.13

Operating Engineer - Building Work I

Forklifts, Plaster (Platform machine), Plaster Bucket, Concrete Pump and all other equipment used for hoisting material.

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate per Hour: $69.51
Supplemental Benefit Rate per Hour: $32.95
Supplemental Note: $59.95 overtime hours

Operating Engineer - Building Work II

Compressors, Welding Machines (Cutting Concrete-Tank Work), Paint Spraying, Sandblasting, Pumps (with the exclusion of Concrete Pumps), All Engines irrespective of Power (Power-Pac) used to drive Auxiliary Equipment, Air, Hydraulic, Jacking System, etc.

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate per Hour: $52.21
Supplemental Benefit Rate per Hour: $32.95
Supplemental Note: $59.95 overtime hours

Operating Engineer - Building Work III

Double Drum

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate per Hour: $79.02
Supplemental Benefit Rate per Hour: $32.95
Supplemental Note: $59.95 overtime hours

Operating Engineer - Building Work IV

Stone Derrick, Cranes, Hydraulic Cranes Boom Trucks.

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate per Hour: $83.68
Supplemental Benefit Rate per Hour: $32.95
Supplemental Note: $59.95 overtime hours

Operating Engineer - Building Work V

Dismantling and Erection of Cranes, Relief Engineer.

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate per Hour: $77.15
Supplemental Benefit Rate per Hour: $32.95
Supplemental Note: $59.95 overtime hours

Operating Engineer - Building Work VI

4 Pole Hoist, Single Drum Hoists.

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate per Hour: $76.35
Supplemental Benefit Rate per Hour: $32.95
Supplemental Note: $59.95 overtime hours

Operating Engineer - Building Work VII

Rack & Pinion and House Cars

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate per Hour: $60.84
Supplemental Benefit Rate per Hour: $32.95
Supplemental Note: $59.95 overtime hours
For New House Car projects Wage Rate per Hour $48.70

Overtime Description

On jobs of more than one shift, if an Employee fails to report for work through any cause over which the Employer has no control, the Employee on duty will continue to work at the rate of single time.

For House Cars and Rack & Pinion only: Overtime paid at time and one-half for all hours in excess of eight hours in a day, Saturday, Sunday and Holidays worked.

Overtime

Double time the regular rate after an 8 hour day.
Double time the regular time rate for Saturday.
Double time the regular rate for Sunday.
Double time the regular rate for work on the following holiday(s).

Paid Holidays

New Year's Day
Lincoln's Birthday
President's Day
Memorial Day
Independence Day
Labor Day
Columbus Day
Veteran's Day
Thanksgiving Day
Day after Thanksgiving
Christmas Day
Employees must work at least one day in the payroll week in which the holiday occurs to receive the paid holiday

Shift Rates

For Steel Erection Only: Shifts may be worked at the single time rate at other than the regular working hours (8:00 A.M. to 4:30 P.M.) on the following work ONLY: Heavy construction jobs on work below the street level, over railroad tracks and on building jobs.

(Operating Engineer Local #14)

FLOOR COVERER

(Interior vinyl composition tile, sheath vinyl linoleum and wood parquet tile including site preparation and synthetic turf not including site preparation)

Floor Coverer

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate per Hour: $50.50
Supplemental Benefit Rate per Hour: $45.98

Overtime
Time and one half the regular rate after an 8 hour day.
Time and one half the regular rate for Saturday.
Double time the regular rate for Sunday.

Overtime Holidays
Double time the regular rate for work on the following holiday(s).
New Year's Day
President's Day
Memorial Day
Independence Day
Labor Day
Columbus Day
Presidential Election Day
Thanksgiving Day
Day after Thanksgiving
Christmas Day

Paid Holidays
1/2 day on Christmas Eve if work is performed in the A.M.
1/2 day on New Year's Eve if work is performed in the A.M.

Shift Rates
Two shifts may be utilized with the first shift working 8 a.m. to the end of the shift at straight time rate of pay. The wage rate for the second shift consisting of 7 hours shall be paid at 114.29% of straight time wage rate. The wage rate for the second shift consisting of 8 hours shall be paid 112.5% of the straight time wage rate.
There must be a first shift to work the second shift.

(Carpenters District Council)

GLAZIER
(New Construction, Remodeling, and Alteration)

Glazier

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate per Hour: $46.05
Supplemental Benefit Rate per Hour: $43.39
Supplemental Note: Supplemental Benefit Overtime Rate: $65.10

Overtime
Time and one half the regular rate after an 8 hour day.
Time and one half the regular rate for Saturday.
Time and one half the regular rate for Sunday.

Overtime Holidays
Time and one half the regular rate for work on the following holiday(s).
New Year's Day
President's Day
Memorial Day
Independence Day
Thanksgiving Day
Day after Thanksgiving
Christmas Day

Paid Holidays
None

Shift Rates
Shifts shall be any 8 consecutive hours after the normal working day for which the Glazier shall receive 9 hours pay for 8 hours worked.

(Local #1281)

GLAZIER - REPAIR & MAINTENANCE
(For the Installation of Glass - All repair and maintenance work on a particular building, whenever performed, where the total cumulative contract value is under $141,750)

Craft Jurisdiction for repair, maintenance and fabrication

Plate glass replacement, Residential glass replacement, Residential mirrors and shower doors, Storm windows and storm doors, Residential replacement windows, Herculite door repairs, Door closer repairs, Retrofit apartment house (non-commercial buildings), Glass tinting.

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate per Hour: $25.64
Supplemental Benefit Rate per Hour: $22.29

Overtime
Time and one half the regular rate after an 8 hour day.
Time and one half the regular rate for Sunday.
Time and one half the regular rate for work on the following holiday(s).

Time and one half the regular hourly rate after 40 hours in any work week.

Paid Holidays
New Year's Day
President's Day
Memorial Day
Independence Day
Labor Day
Thanksgiving Day
Day after Thanksgiving
Christmas Day
Employees must work at least one day in the payroll week in which the holiday occurs to receive the paid holiday

(Local #1281)

HAZARDOUS MATERIAL HANDLER
(Removal, abatement, encapsulation or decontamination of asbestos, lead, mold, or other toxic or hazardous waste/materials)

Handler

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate per Hour: $36.50
Supplemental Benefit Rate per Hour: $16.45

Overtime
Time and one half the regular rate after an 8 hour day.
Time and one half the regular rate for Sunday.
Time and one half the regular hourly rate after 40 hours in any work week.

Overtime Holidays
Time and one half the regular rate for work on the following holiday(s).
New Year's Day
Good Friday
Memorial Day
Independence Day
Labor Day
Thanksgiving Day
Christmas Day
Easter

Paid Holidays
None

(Local #78 and Local #12A)

HEAT AND FROST INSULATOR

Heat & Frost Insulator

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate per Hour: $61.46
Supplemental Benefit Rate per Hour: $40.46

Overtime Description
Double time shall be paid for supplemental benefits during overtime work.
8th hour paid at time and one half.

Overtime
Double time the regular rate after an 8 hour day.
Double time the regular time rate for Saturday.
Double time the regular rate for Sunday.

Overtime Holidays
Double time the regular rate for work on the following holiday(s).
New Year's Day
Martin Luther King Jr. Day
President's Day
Memorial Day
Independence Day
Columbus Day
Veteran's Day
Thanksgiving Day
Day after Thanksgiving
Christmas Day

Triple time the regular rate for work on the following holiday(s).
Labor Day

Paid Holidays
None

Shift Rates
The first shift shall work seven hours at the regular straight time rate. The second and third shift shall work seven hours the regular straight time hourly rate plus a fourteen percent wage and benefit premium.

(Local #12) (BCA)

HOUSE WRECKER
(TOTAL DEMOLITION)

House Wrecker - Tier A

On all work sites the first, second, eleventh and every third House Wrecker thereafter will be Tier A House Wreckers (i.e. 1st, 2nd, 11th, 14th etc). Other House Wreckers may be Tier B House Wreckers.

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate per Hour: $37.18
Supplemental Benefit Rate per Hour: $29.77

House Wrecker - Tier B

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate per Hour: $26.41
Supplemental Benefit Rate per Hour: $22.18

Overtime
Time and one half the regular rate after an 8 hour day.
Time and one half the regular rate for Saturday.
Double time the regular rate for Sunday.

Overtime Holidays
Double time the regular rate for work on the following holiday(s).
New Year's Day
President's Day
Memorial Day
Independence Day
Labor Day
Thanksgiving Day
Christmas Day

Paid Holidays
None

(Mason Tenders District Council)

IRON WORKER - ORNAMENTAL

Iron Worker - Ornamental

Effective Period: 7/1/2019 - 6/30/2020

Wage Rate per Hour: $45.15
Supplemental Benefit Rate per Hour: $55.62
Supplemental Note: Supplemental benefits are to be paid at the applicable overtime rate when overtime is in effect.

Overtime Description
Time and one half the regular rate after a 7 hour day for a maximum of two hours on any regular work day (the 8th and 9th hour) and double time shall be paid for all work on a regular work day thereafter, time and one half the regular rate for Saturday for the first seven hours of work and double time shall be paid for all work on a Saturday thereafter.

Overtime
Double time the regular rate for Sunday.

Overtime Holidays
Double time the regular rate for work on the following holiday(s).
New Year's Day
President's Day
Memorial Day
Independence Day
Labor Day
Thanksgiving Day
Christmas Day

Paid Holidays
None

Shift Rates
For off shift work - 8 hours pay for 7 hours of work. When two or three shifts are employed on a job, Monday through Friday, the workday for each shift shall be seven hours and paid for ten and one-half hours at the single time rate. When two or three shifts are worked on Saturday, Sunday or holidays, each shift shall be seven hours and paid fifteen and three-quarters hours.

(Local #580)

IRON WORKER - STRUCTURAL

Iron Worker - Structural

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate per Hour: $51.05
Supplemental Benefit Rate per Hour: $76.89
Supplemental Note: Supplemental benefits are to be paid at the applicable overtime rate when overtime is in effect.

Overtime Description

Monday through Friday- the first eight hours are paid at straight time, the 9th and 10th hours are paid at time and one-half the regular rate, all additional weekday overtime is paid at double the regular rate. Saturdays- the first eight hours are paid at time and one-half the regular rate, double time thereafter. Sunday-all shifts are paid at double time.

Overtime

Time and one half the regular rate after an 8 hour day.
Time and one half the regular rate for Saturday.
Double time the regular rate for Sunday.

Overtime Holidays

Double time the regular rate for work on the following holiday(s).
New Year's Day
President's Day
Memorial Day
Independence Day
Labor Day
Thanksgiving Day
Christmas Day

Paid Holidays

1/2 day on Christmas Eve if work is performed in the A.M.
1/2 day on New Year's Eve if work is performed in the A.M.

Shift Rates

Monday through Friday - First Shift: First eight hours are paid at straight time, the 9th & 10th hours are paid at time and a half, double time paid thereafter. Second and third Shifts: First eight hours are paid at time and one-half, double time thereafter. Saturdays: All shifts, first eight hours paid at time and one-half, double time thereafter: Sunday all shifts are paid at double time.

(Local #40 & #361)

LABORER
(Foundation, Concrete, Excavating, Street Pipe Layer and Common)

Laborer

Excavation and foundation work for buildings, heavy construction, engineering work, and hazardous waste removal in connection with the above work. Landscaping tasks in connection with heavy construction work, engineering work and building projects. Projects include, but are not limited to pollution plants, sewers, parks, subways, bridges, highways, etc.

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate per Hour: **$42.65**
Supplemental Benefit Rate per Hour: **$44.48**

Overtime
Time and one half the regular rate after an 8 hour day.
Time and one half the regular rate for Saturday.
Double time the regular rate for Sunday.

Overtime Holidays
Double time the regular rate for work on the following holiday(s).
New Year's Day
Memorial Day
Independence Day
Labor Day
Columbus Day
Thanksgiving Day
Christmas Day

Paid Holidays
Labor Day
Thanksgiving Day

Shift Rates
When two shifts are employed, single time rate shall be paid for each shift. When three shifts are found necessary, each shift shall work seven and one half hours (7 ½), but shall be paid for eight (8) hours of labor, and be permitted one half hour for lunch.

(Local #731)

LANDSCAPING
(Landscaping tasks, as well as tree pruning, tree removing, spraying and maintenance in connection with the planting of street trees and the planting of trees in city parks but not when such activities are performed as part of, or in connection with, other construction or reconstruction projects.)

Landscaper (Year 6 and above)

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate per Hour: $31.75
Supplemental Benefit Rate per Hour: $16.05

Landscaper (Year 3 - 5)

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate per Hour: $30.72
Supplemental Benefit Rate per Hour: $16.05

Landscaper (up to 3 years)

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate per Hour: $28.14
Supplemental Benefit Rate per Hour: $16.05

Groundperson

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate per Hour: $28.14
Supplemental Benefit Rate per Hour: $16.05

Tree Remover / Pruner

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate per Hour: $36.92
Supplemental Benefit Rate per Hour: $16.05

Landscaper Sprayer (Pesticide Applicator)

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate per Hour: $26.59
Supplemental Benefit Rate per Hour: $16.05

Watering - Plant Maintainer

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate per Hour: $21.40
Supplemental Benefit Rate per Hour: $16.05

Overtime Description

For all overtime work performed, supplemental benefits shall include an additional seventy-five ($0.75) cents per hour.

Overtime

Time and one half the regular rate after an 8 hour day.
Time and one half the regular rate for Saturday.
Double time the regular rate for Sunday.
Time and one half the regular rate for work on a holiday plus the day's pay.

Paid Holidays

New Year's Day
Memorial Day
Independence Day
Labor Day
Thanksgiving Day
Christmas Day

Shift Rates

Work performed on a 4pm to 12am shift has a 15% differential. Work performed on a 12am to 8am shift has a 20% differential.

(Local #175)

MARBLE MECHANIC

Marble Setter

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate per Hour: $54.44
Supplemental Benefit Rate per Hour: $40.77

Marble Finisher

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate per Hour: $42.86
Supplemental Benefit Rate per Hour: $38.22

Marble Polisher

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate per Hour: $39.81
Supplemental Benefit Rate per Hour: $30.35

Marble Maintenance Finisher

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate per Hour: $24.31
Supplemental Benefit Rate per Hour: $13.34

Overtime Description
Supplemental Benefit contributions are to be made at the applicable overtime rates. Time and one half the regular rate after a 7 hour day or time and one half the regular rate after an 8 hour day - chosen by Employer at the start of the project and then would last for the full duration of the project.

Overtime
Time and one half the regular rate for Saturday.
Double time the regular rate for Sunday.

Overtime Holidays
Double time the regular rate for work on the following holiday(s).
New Year's Day
President's Day
Good Friday

Memorial Day
Independence Day
Labor Day
Columbus Day
Veteran's Day
Thanksgiving Day
Day after Thanksgiving
Christmas Day

Paid Holidays
None

(Local #7)

MASON TENDER

Mason Tender

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate per Hour: $38.40
Supplemental Benefit Rate per Hour: $31.04

Overtime
Time and one half the regular rate after an 8 hour day.
Time and one half the regular rate for Saturday.
Double time the regular rate for Sunday.
Saturday may be used as a make-up day at straight time when a day is lost during that week to inclement weather.

Overtime Holidays
Double time the regular rate for work on the following holiday(s).
New Year's Day
President's Day
Memorial Day
Independence Day
Labor Day
Thanksgiving Day
Christmas Day

Paid Holidays
None

Shift Rates
The employer may work two (2) shifts with the first shift at the straight time wage rate and the second shift receiving eight (8) hours paid for seven (7) hours work at the straight time wage rate. When it is not possible to conduct alteration work during regular working hours in a building occupied by tenants, the rule for the second shift will apply.

(Local #79)

MASON TENDER (INTERIOR DEMOLITION WORKER)

Mason Tender Tier A

Tier A Interior Demolition Worker performs all burning, chopping, and other technically skilled tasks related to interior demolition work.

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate per Hour: $36.44
Supplemental Benefit Rate per Hour: $24.50

Mason Tender Tier B

Tier B Interior Demolition Worker performs manual work and work incidental to demolition work, such as loading and carting of debris from the work site to an area where it can be loaded in to bins/trucks for removal. Also performs clean-up of the site when demolition is completed.

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate per Hour: $25.63
Supplemental Benefit Rate per Hour: $18.82

Overtime
Time and one half the regular rate after an 8 hour day.
Time and one half the regular rate for Sunday.

Overtime Holidays
Double time the regular rate for work on the following holiday(s).
New Year's Day
President's Day
Memorial Day
Independence Day
Labor Day
Thanksgiving Day
Christmas Day

Paid Holidays
None

(Local #79)

METALLIC LATHER

Metallic Lather

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate per Hour: $46.23
Supplemental Benefit Rate per Hour: $46.67
Supplemental Note: Overtime Supplemental Benefit rate - $57.92

Overtime Description
Overtime would be time and one half the regular rate after a seven (7) or eight (8) hours workday, which would be set at the start of the job.

Overtime
Time and one half the regular rate for Saturday.
Double time the regular rate for Sunday.

Overtime Holidays
Double time the regular rate for work on the following holiday(s).
New Year's Day
Washington's Birthday
Memorial Day
Independence Day
Labor Day
Columbus Day
Thanksgiving Day
Christmas Day

Paid Holidays
1/2 day on Christmas Eve if work is performed in the A.M.
1/2 day on New Year's Eve if work is performed in the A.M.

Shift Rates
There will be no shift differential paid on the first shift if more than one shift is employed. The shift differential will remain $12/hour on the second and third shift for the first eight (8) hours if worked. There will be no pyramiding on overtime worked on second and third shifts. The time and one half (1.5x) rate will be against the base wage rate, not the shift differential

(Local #46)

MILLWRIGHT

Millwright

Effective Period: 7/1/2019 - 6/30/2020

Wage Rate per Hour: $54.20
Supplemental Benefit Rate per Hour: $53.81

Overtime

Time and one half the regular rate after an 8 hour day.
Time and one half the regular rate for Saturday.
Double time the regular rate for Sunday.
Saturday may be used as a make-up day at straight time when a day is lost during that week to inclement weather.

Overtime Holidays

Double time the regular rate for work on the following holiday(s).
New Year's Day
President's Day
Good Friday
Memorial Day
Independence Day
Labor Day
Columbus Day
Presidential Election Day
Thanksgiving Day
Christmas Day

Paid Holidays

1/2 day on Christmas Eve if work is performed in the A.M.
1/2 day on New Year's Eve if work is performed in the A.M.

Shift Rates

The first shift shall receive the straight time rate of pay. The second shift receives the straight time rate of pay plus fifteen (15%) per cent. Members of the second shift shall be allowed one half hour to eat, with this time being included in the hours of the workday established. There must be a first shift to work a second shift. All additional hours worked shall be paid at the time and one-half rate of pay plus fifteen (15%) per cent for weekday hours.

(Local #740)

MOSAIC MECHANIC

Mosaic Mechanic - Mosaic & Terrazzo Mechanic

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate per Hour: $49.91
Supplemental Benefit Rate per Hour: $43.24

Mosaic Mechanic - Mosaic & Terrazzo Finisher

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate per Hour: $48.31
Supplemental Benefit Rate per Hour: $43.24

Mosaic Mechanic - Machine Operator Grinder

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate per Hour: $48.31
Supplemental Benefit Rate per Hour: $43.24

Overtime
Time and one half the regular rate after a 7 hour day.
Time and one half the regular rate for Saturday.
Double time the regular rate for Sunday.

Overtime Holidays
Double time the regular rate for work on the following holiday(s).
New Year's Day
Washington's Birthday
Good Friday
Independence Day
Labor Day
Columbus Day
Veteran's Day
Thanksgiving Day
Day after Thanksgiving
Christmas Day

Paid Holidays
None

(Local #7)

PAINTER

Painter - Brush & Roller

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate per Hour: $43.00
Supplemental Benefit Rate per Hour: $32.49
Supplemental Note: $ 37.75 on overtime

Spray & Scaffold / Decorative / Sandblast

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate per Hour: $46.00

Supplemental Benefit Rate per Hour: $32.49
Supplemental Note: $ 37.75 on overtime

Overtime
Time and one half the regular rate after a 7 hour day.
Time and one half the regular rate for Saturday.
Time and one half the regular rate for Sunday.

Overtime Holidays
Time and one half the regular rate for work on the following holiday(s).
New Year's Day
President's Day
Memorial Day
Independence Day
Labor Day
Columbus Day
Thanksgiving Day
Christmas Day

Paid Holidays
None

(District Council of Painters #9)

PAINTER - LINE STRIPING (ROADWAY)

Striping - Machine Operator

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate per Hour: $35.00
Supplemental Benefit Rate per Hour: $12.37
Supplemental Note: Overtime Supplemental Benefit rate - $8.02; New Hire Rate (0-3 months) - $0.00

Lineperson (Thermoplastic)

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate per Hour: $39.00
Supplemental Benefit Rate per Hour: $12.37
Supplemental Note: Overtime Supplemental Benefit rate - $8.02; New Hire Rate (0-3 months) - $0.00

Overtime Description
For Paid Holidays: Employees will only receive Holiday Pay for holidays not worked if said employee worked both the weekday before and the weekday after the holiday.

Overtime
Time and one half the regular rate after an 8 hour day.

Time and one half the regular rate for Saturday.
Time and one half the regular rate for Sunday.
Time and one half the regular rate for work on the following holiday(s).

Paid Holidays

New Year's Day
Good Friday
Memorial Day
Independence Day
Labor Day
Columbus Day
Presidential Election Day
Thanksgiving Day
Day after Thanksgiving
Christmas Day

Shift Rates

Four (4), ten (10) hour days may be worked at straight time during a week, Monday thru Thursday. Friday may be used as a make-up day.

Vacation

Employees with one to two years service shall accrue vacation based on hours worked: 250 hours worked - 1 day vacation; 500 hours worked - 2 days vacation; 750 hours worked - 3 days vacation; 900 hours worked - 4 days vacation; 1,000 hours worked - 5 days vacation. Employees with two to five years service receive two weeks vacation. Employees with five to twenty years service receive three weeks vacation. Employees with twenty to twenty-five years service receive four weeks vacation. Employees with 25 or more years service receive five weeks vacation. Vacation must be taken during winter months.

(Local #1010)

PAINTER - METAL POLISHER

METAL POLISHER

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate per Hour: $30.58
Supplemental Benefit Rate per Hour: $7.16

METAL POLISHER - NEW CONSTRUCTION

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate per Hour: $31.53
Supplemental Benefit Rate per Hour: $7.16

METAL POLISHER - SCAFFOLD OVER 34 FEET

Effective Period: 7/1/2019 - 6/30/2020

Wage Rate per Hour: $34.08
Supplemental Benefit Rate per Hour: $7.16

Overtime Description
All work performed on Saturdays shall be paid at time-in-a half. The exception being; for suspended scaffold work and work deemed as a construction project; an eight (8) hour shift lost during the week due to circumstances beyond the control of the employer, up to a maximum of eight (8) hours per week, may be worked on Saturday at the straight time rate.

Overtime
Time and one half the regular rate after an 8 hour day.
Time and one half the regular rate for Saturday.
Double time the regular rate for Sunday.
Saturday may be used as a make-up day at straight time when a day is lost during that week to inclement weather.
Triple time the regular rate for work on the following holiday(s).

Paid Holidays
New Year's Day
Martin Luther King Jr. Day
President's Day
Memorial Day
Independence Day
Labor Day
Columbus Day
Veteran's Day
Thanksgiving Day
Day after Thanksgiving
Christmas Day

Shift Rates
Four Days a week at Ten (10) hours straight a day.

Local 8A-28A

PAINTER - SIGN

Sign Painter

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate per Hour: $41.98
Supplemental Benefit Rate per Hour: $20.10

Assistant Sign Painter

Effective Period: 7/1/2019 - 6/30/2020

Wage Rate per Hour: $35.67
Supplemental Benefit Rate per Hour: $18.47

Overtime

Time and one half the regular rate after an 8 hour day.
Time and one half the regular rate for Saturday.
Time and one half the regular rate for Sunday.
Double time the regular rate for work on the following holiday(s).

Paid Holidays

New Year's Day
President's Day
Memorial Day
Independence Day
Labor Day
Columbus Day
Election Day
Thanksgiving Day
Day after Thanksgiving
Christmas Day

Vacation

At least 1 year of employment.....1 week
2 years or more of employment.....2 weeks
8 years or more of employment.....3 weeks

(Local #8A-28A)

PAINTER - STRUCTURAL STEEL

Painters on Structural Steel

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate per Hour: $49.50
Supplemental Benefit Rate per Hour: $41.83

Painter - Power Tool

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate per Hour: $55.50
Supplemental Benefit Rate per Hour: $41.83
Overtime Wage Rate: $6.00 above the "Painters on Structural Steel" overtime rate.

Overtime Description

Supplemental Benefits shall be paid for each hour worked, up to forty (40) hours per week for the period of May 1st to November 15th or up to fifty (50) hours per week for the period of November 16th to April 30th.

Overtime
Time and one half the regular rate after a 7 hour day.
Time and one half the regular rate for Saturday.
Time and one half the regular rate for Sunday.

Overtime Holidays
Double time the regular rate for work on the following holiday(s).
New Year's Day
Memorial Day
Independence Day
Labor Day
Thanksgiving Day
Christmas Day

Paid Holidays
None

Shift Rates
Regular hourly rates plus a ten per cent (10%) differential

(Local #806)

PAPERHANGER

Paperhanger

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate per Hour: $45.40
Supplemental Benefit Rate per Hour: $34.74
Supplemental Note: Supplemental benefits are to be paid at the appropriate straight time and overtime rate.

Overtime
Time and one half the regular rate after a 7 hour day.
Time and one half the regular rate for Saturday.
Time and one half the regular rate for Sunday.

Overtime Holidays
Time and one half the regular rate for work on the following holiday(s).
New Year's Day
President's Day
Memorial Day
Independence Day
Labor Day
Thanksgiving Day
Day after Thanksgiving
Christmas Day

Paid Holidays
None

Shift Rates
Evening shift - 4:30 P.M. to 12:00 Midnight (regular rate of pay); any work performed before 7:00 A.M. shall be at time and one half the regular base rate of pay.

(District Council of Painters #9)

PAVER AND ROADBUILDER

Paver & Roadbuilder - Formsetter

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate per Hour: $46.85
Supplemental Benefit Rate per Hour: $44.86
Supplemental Note: For time and one half overtime - $48.74 For double overtime - $52.61

Paver & Roadbuilder - Laborer

Paving and road construction work, regardless of material used, including but not limited to preparation of job sites, removal of old surfaces, asphalt and/or concrete, by whatever method, including but not limited to milling; laying of concrete; laying of asphalt for temporary, patchwork, and utility paving (but not production paving); site preparation and incidental work for installation of rubberized materials and similar surfaces; installation and repair of temporary construction fencing; slurry/seal coating, paving stones, maintenance of safety surfaces; play equipment installation, and other related work.

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate per Hour: $42.98
Supplemental Benefit Rate per Hour: $44.86
Supplemental Note: For time and one half overtime - $48.74 For double overtime - $52.61

Production Paver & Roadbuilder - Screed Person

(Production paving is asphalt paving when using a paving machine or on a project where a paving machine is traditionally used)

Adjustment of paving machinery on production paving jobs.

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate per Hour: $47.45
Supplemental Benefit Rate per Hour: $44.86
Supplemental Note: For time and one half overtime - $48.74 For double overtime - $52.61

Production Paver & Roadbuilder - Raker

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate per Hour: $46.85
Supplemental Benefit Rate per Hour: $44.86
Supplemental Note: For time and one half overtime - $48.74 For double overtime - $52.61

Production Paver & Roadbuilder - Shoveler

General laborer (except removal of surfaces - see Paver and Roadbuilder-Laborer) including but not limited to tamper, AC paint and liquid tar work.

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate per Hour: $42.98
Supplemental Benefit Rate per Hour: $44.86
Supplemental Note: For time and one half overtime - $48.74 For double overtime - $52.61

Overtime Description
If an employee works New Year's Day or Christmas Day, they receive the single time rate plus 25%.

For Paid Holidays: Holiday pay for all holidays shall be prorated based two hours per day for each day worked in the holiday week, not to exceed 8 hours of holiday pay.

Overtime
Time and one half the regular rate after an 8 hour day.
Time and one half the regular rate for Saturday.
Double time the regular rate for Sunday.

Overtime Holidays
Double time the regular rate for work on the following holiday(s).
Memorial Day
Independence Day
Labor Day
Columbus Day
Thanksgiving Day

Paid Holidays
Memorial Day
Independence Day
Labor Day
Thanksgiving Day

Shift Rates
When two shifts are employed, the work period for each shift shall be a continuous eight (8) hours. When three shifts are employed, each shift will work seven and one half (7 ½) hours but will be paid for eight (8) hours since only one half (1/2) hour is allowed for meal time.
When two or more shifts are employed, single time will be paid for each shift.

Night Work - On night work, the first eight (8) hours of work will be paid for at the single time rate, except that production paving work shall be paid at 10% over the single time rate for the screed person, rakers and shovelers directly involved only. This differential is to be paid when there is only one shift and the shift works at night. All other workers will be exempt. Hours worked over eight (8) hours during said shift shall be paid for at the time and one-half rate.

(Local #1010)

PLASTERER

Plasterer

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate per Hour: $45.93
Supplemental Benefit Rate per Hour: $26.52

Overtime
Time and one half the regular rate after an 8 hour day.
Time and one half the regular rate for Saturday.
Double time the regular rate for Sunday.
Saturday may be used as a make-up day at straight time when a day is lost during that week to inclement weather.

Overtime Holidays
Double time the regular rate for work on the following holiday(s).
New Year's Day
President's Day
Memorial Day
Independence Day
Labor Day
Thanksgiving Day
Christmas Day

Paid Holidays
None

Shift Rates
When it is not possible to conduct work during regular working hours (between 6:30am and 4:30pm), a shift differential shall be paid at the regular hourly rate plus a twelve per cent (12%) per hour differential. Workers on shift work shall be allowed a paid one-half hour meal break.

(Local #262)

PLASTERER - TENDER

Plasterer - Tender

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate per Hour: $38.40
Supplemental Benefit Rate per Hour: $31.04

Overtime
Time and one half the regular rate after an 8 hour day.
Time and one half the regular rate for Saturday.
Double time the regular rate for Sunday.
Saturday may be used as a make-up day at straight time when a day is lost during that week to inclement weather.

Overtime Holidays
Double time the regular rate for work on the following holiday(s).
New Year's Day
Washington's Birthday
Memorial Day
Independence Day
Labor Day
Presidential Election Day
Thanksgiving Day
Christmas Day

Paid Holidays
None

Shift Rates
When work commences outside regular work hours, workers receive an hour additional (differential) wage and supplement payment. Eight hours pay for seven hours work or nine hours pay for eight hours work.

(Mason Tenders District Council)

PLUMBER

Plumber

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate per Hour: $69.00
Supplemental Benefit Rate per Hour: $37.20
Supplemental Note: Supplemental benefit contributions are to be made at the applicable overtime rates.

Plumber - Temporary Services

Temporary Services - When there are no Plumbers on the job site, there may be three shifts designed to cover the entire twenty-four hour period, including weekends if necessary, at the following rate straight time.

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate per Hour: $55.28
Supplemental Benefit Rate per Hour: $29.68

Overtime Description
Double time the regular rate after a 7 hour day - unless for new construction site work where the plumbing contract price is $1.5 million or less, the hours of labor can be 8 hours per day at the employers option. On Alteration jobs when other mechanical trades at the site are working an eighth hour at straight time, then the plumber shall also work an eighth hour at straight time.

Overtime
Double time the regular time rate for Saturday.
Double time the regular rate for Sunday.

Overtime Holidays
Double time the regular rate for work on the following holiday(s).
New Year's Day
President's Day
Memorial Day
Independence Day
Labor Day
Columbus Day
Veteran's Day
Thanksgiving Day
Day after Thanksgiving
Christmas Day

Shift Rates
Shift work, when directly specified in public agency or authority documents where plumbing contract is $8 million or less, will be permitted. 30% shift premium shall be paid for wages and fringe benefits for 4:00 pm and midnight shifts Monday to Friday. 50% shift premium shall be paid for wages and fringe benefits for 4:00 pm and midnight shift work performed on weekends. For shift work on holidays, double time wages and fringe benefits shall be paid.

(Plumbers Local #1)

PLUMBER (MECHNICAL EQUIPMENT AND SERVICE)
(Mechanical Equipment and Service work shall include any repair and/or replacement of the present plumbing system.)

Plumber

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate per Hour: $43.05
Supplemental Benefit Rate per Hour: $17.71

Overtime
Time and one half the regular rate after an 8 hour day.
Time and one half the regular rate for Saturday.
Time and one half the regular rate for Sunday.

Overtime Holidays
Time and one half the regular rate for work on the following holiday(s).
New Year's Day
President's Day
Memorial Day
Independence Day
Thanksgiving Day
Day after Thanksgiving
Christmas Day

Paid Holidays
None

(Plumbers Local # 1)

PLUMBER (RESIDENTIAL RATES FOR 1, 2 AND 3 FAMILY HOME CONSTRUCTION)

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate per Hour: $47.89
Supplemental Benefit Rate per Hour: $26.74

Overtime
Double time the regular rate after an 8 hour day.
Double time the regular time rate for Saturday.
Double time the regular rate for Sunday.

Overtime Holidays
Double time the regular rate for work on the following holiday(s).
New Year's Day
President's Day
Memorial Day
Independence Day
Labor Day
Columbus Day
Veteran's Day
Thanksgiving Day
Day after Thanksgiving
Christmas Day

Paid Holidays
None

Shift Rates
30% shift premium shall be paid for wages and fringe benefits for 4:00 pm and midnight shifts Monday to Friday. 50% shift premium shall be paid for wages and fringe benefits for 4:00 pm and midnight shift work performed on weekends. For shift work on holidays, double time wages and fringe benefits shall be paid.

(Plumbers Local #1)

PLUMBER: PUMP & TANK
Oil Trades (Installation and Maintenance)

Plumber - Pump & Tank

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate per Hour: $67.45
Supplemental Benefit Rate per Hour: $25.26

Overtime
Time and one half the regular rate after an 8 hour day.
Time and one half the regular rate for Saturday.
Time and one half the regular rate for Sunday.

Overtime Holidays
Time and one half the regular rate for work on the following holiday(s).
New Year's Day
President's Day
Memorial Day
Independence Day
Labor Day
Columbus Day
Veteran's Day
Thanksgiving Day
Day after Thanksgiving
Christmas Day

Paid Holidays
None

Shift Rates
All work outside the regular workday (8:00 A.M. to 3:30 P.M.) is to be paid at time and one half the regular hourly rate

(Plumbers Local #1)

POINTER, WATERPROOFER, CAULKER, SANDBLASTER, STEAMBLASTER
(Exterior Building Renovation)

Journeyperson

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate per Hour: $53.42
Supplemental Benefit Rate per Hour: $26.52

Overtime
Time and one half the regular rate after an 8 hour day.
Time and one half the regular rate for Saturday.
Time and one half the regular rate for Sunday.
Saturday may be used as a make-up day at straight time when a day is lost during that week to inclement weather.

Overtime Holidays
Time and one half the regular rate for work on the following holiday(s).
New Year's Day
Martin Luther King Jr. Day
President's Day
Memorial Day
Independence Day
Labor Day
Thanksgiving Day
Christmas Day

Paid Holidays
None

Shift Rates
All work outside the regular work day (an eight hour workday between the hours of 6:00 A.M. and 4:30 P.M.) is to be paid at time and one half the regular rate.

(Bricklayer District Council)

ROOFER

Roofer

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate per Hour: $43.50
Supplemental Benefit Rate per Hour: $33.81

Overtime
Time and one half the regular rate after an 8 hour day.
Time and one half the regular rate for Saturday.
Time and one half the regular rate for Sunday.

Overtime Holidays
Time and one half the regular rate for work on the following holiday(s).
New Year's Day
Memorial Day
Independence Day
Labor Day
Thanksgiving Day
Christmas Day

Paid Holidays
None

Shift Rates
Second shift - Regular hourly rate plus a 10% differential. Third shift - Regular hourly rate plus a 15% differential.

(Local #8)

SHEET METAL WORKER

Sheet Metal Worker

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate per Hour: $50.15
Supplemental Benefit Rate per Hour: $50.55
Supplemental Note: Supplemental benefit contributions are to be made at the applicable overtime rates.

Sheet Metal Worker - Fan Maintenance

(The temporary operation of fans or blowers in new or existing buildings for heating and/or ventilation, and/or air conditioning prior to the completion of the project.)

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate per Hour: $40.12
Supplemental Benefit Rate per Hour: $50.55

Sheet Metal Worker - Duct Cleaner

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate per Hour: $16.08
Supplemental Benefit Rate per Hour: $11.63

Overtime
Time and one half the regular rate after an 8 hour day.
Time and one half the regular rate for Saturday.
Double time the regular rate for Sunday.

Overtime Holidays
Double time the regular rate for work on the following holiday(s).
New Year's Day
Martin Luther King Jr. Day
President's Day
Memorial Day
Independence Day
Labor Day
Columbus Day
Veteran's Day
Thanksgiving Day
Day after Thanksgiving
Christmas Day

Paid Holidays
None

Shift Rates
Work that can only be performed outside regular working hours (eight hours of work between 7:30 A.M. and 3:30 P.M.) - First shift (work between 3:30 P.M. and 11:30 P.M.) - 10% differential above the established hourly rate. Second shift (work between 11:30 P.M. and 7:30 A.M.) - 15% differential above the established hourly rate.

For Fan Maintenance: On all full shifts of fan maintenance work the straight time hourly rate of pay will be paid for each shift, including nights, Saturdays, Sundays, and holidays.

(Local #28

SHEET METAL WORKER - SPECIALTY
(Decking & Siding)

Sheet Metal Specialty Worker

The first worker to perform this work must be paid at the rate of the Sheet Metal Worker. The second and third workers shall be paid the Specialty Worker Rate. The ratio of One Sheet Metal Worker, then Two Specialty Workers shall be utilized thereafter.

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate per Hour: $46.30
Supplemental Benefit Rate per Hour: $25.95
Supplemental Note: Supplemental benefit contributions are to be made at the applicable overtime rates.

Overtime
Time and one half the regular rate after an 8 hour day.
Time and one half the regular rate for Saturday.
Double time the regular rate for Sunday.

Overtime Holidays
Double time the regular rate for work on the following holiday(s).
New Year's Day
Martin Luther King Jr. Day
President's Day
Memorial Day
Independence Day
Labor Day
Columbus Day
Veteran's Day
Thanksgiving Day
Christmas Day

Paid Holidays
None

(Local #28)

SHIPYARD WORKER

Shipyard Mechanic - First Class

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate per Hour: $28.50
Supplemental Benefit Rate per Hour: $3.95

Shipyard Mechanic - Second Class

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate per Hour: $19.07
Supplemental Benefit Rate per Hour: $3.59

Shipyard Laborer - First Class

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate per Hour: $23.40
Supplemental Benefit Rate per Hour: $3.75

Shipyard Laborer - Second Class

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate per Hour: $17.38
Supplemental Benefit Rate per Hour: $3.52

Shipyard Dockhand - First Class

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate per Hour: $21.57
Supplemental Benefit Rate per Hour: $3.68

Shipyard Dockhand - Second Class

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate per Hour: $17.28
Supplemental Benefit Rate per Hour: $3.52

Overtime Description
Work performed on holiday is paid double time the regular hourly wage rate plus holiday pay.

Overtime
Time and one half the regular rate after an 8 hour day.
Time and one half the regular rate for Saturday.
Double time the regular rate for Sunday.
Time and one half the regular hourly rate after 40 hours in any work week.

Paid Holidays
New Year's Day
Martin Luther King Jr. Day
President's Day
Good Friday
Memorial Day
Independence Day
Labor Day
Thanksgiving Day
Day after Thanksgiving
Christmas Day

Based on Survey Data

SIGN ERECTOR
(Sheet Metal, Plastic, Electric, and Neon)

Sign Erector

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate per Hour: $49.35
Supplemental Benefit Rate per Hour: $54.63

Overtime
Time and one half the regular rate after a 7 hour day.
Time and one half the regular rate for Saturday.
Time and one half the regular rate for Sunday.
Time and one half the regular rate for work on the following holiday(s).

Paid Holidays
New Year's Day
President's Day
Memorial Day
Independence Day
Labor Day
Columbus Day
Election Day
Thanksgiving Day
Day after Thanksgiving
Christmas Day

Shift Rates
Time and one half the regular hourly rate is to be paid for all hours worked outside the regular workday either (7:00 A.M. through 2:30 P.M.) or (8:00 A.M. through 3:30 P.M.)

(Local #137)

STEAMFITTER

Steamfitter I

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate per Hour: $57.50
Supplemental Benefit Rate per Hour: $57.29
Supplemental Note: Overtime supplemental benefit rate: $113.84

Steamfitter -Temporary Services

The steamfitters shall not do any other work and shall not be permitted to work more than one shift in a twenty-four hour day. When steamfitters are present during the regular working day, no temporary services steamfitter will be required

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate per Hour: $43.70
Supplemental Benefit Rate per Hour: $46.54

Overtime
Double time the regular rate after a 7 hour day.
Double time the regular time rate for Saturday.
Double time the regular rate for Sunday.

Overtime Holidays
Double time the regular rate for work on the following holiday(s).
New Year's Day
President's Day
Memorial Day
Independence Day
Labor Day
Columbus Day
Veteran's Day
Thanksgiving Day
Day after Thanksgiving
Christmas Day

Paid Holidays
None

Shift Rates
Work performed between 3:30 P.M. and 7:00 A.M. and on Saturdays, Sundays and Holidays shall be at double time the regular hourly rate and paid at the overtime supplemental benefit rate above.

Steamfitter II

For heating, ventilation, air conditioning and mechanical public work contracts with a dollar value not to exceed $30,000,000 and for fire protection/sprinkler public work contracts not to exceed $3,000,000.

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate per Hour: $57.50
Supplemental Benefit Rate per Hour: $57.29
Supplemental Note: Overtime supplemental benefit rate: $113.84

Steamfitter -Temporary Services

The steamfitters shall not do any other work and shall not be permitted to work more than one shift in a twenty-four hour day. When steamfitters are present during the regular working day, no temporary services steamfitter will be required.

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate per Hour: $43.70
Supplemental Benefit Rate per Hour: $46.54

Overtime
Double time the regular rate after an 8 hour day.
Double time the regular time rate for Saturday.
Double time the regular rate for Sunday.

Overtime Holidays
Double time the regular rate for work on the following holiday(s).
New Year's Day
President's Day
Memorial Day
Independence Day
Labor Day
Columbus Day
Veteran's Day
Thanksgiving Day
Day after Thanksgiving
Christmas Day

Paid Holidays
None

Shift Rates
May be performed outside of the regular workday except Saturday, Sunday and Holidays. A shift shall consist of eight working hours. All work performed in excess of eight hours shall be paid at double time. No shift shall commence after 7:00 P.M. on Friday or 7:00 P.M. the day before holidays. All work performed after 12:01 A.M. Saturday or 12:01 A.M. the day before a Holiday will be paid at double time. When shift work is performed the wage rate for regular time worked is a 15% percent premium on wage and 15% percent premium on supplemental benefits.

On Transit Authority projects, where work is performed in the vicinity of tracks all shift work on weekends and holidays may be performed at the regular shift rates.

Local #638

STEAMFITTER - REFRIGERATION AND AIR CONDITIONER
(Maintenance and Installation Service Person)

Refrigeration and Air Conditioner Mechanic

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate per Hour: $42.35
Supplemental Benefit Rate per Hour: $17.46

Refrigeration and Air Conditioner Service Person V

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate per Hour: $34.80
Supplemental Benefit Rate per Hour: $15.59

Refrigeration and Air Conditioner Service Person IV

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate per Hour: $28.83
Supplemental Benefit Rate per Hour: $14.05

Refrigeration and Air Conditioner Service Person III

Filter changing and maintenance thereof, oil and greasing, tower and coil cleaning, scraping and painting, general housekeeping, taking of water samples.

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate per Hour: $24.74
Supplemental Benefit Rate per Hour: $12.91

Refrigeration and Air Conditioner Service Person II

Filter changing and maintenance thereof, oil and greasing, tower and coil cleaning, scraping and painting, general housekeeping, taking of water samples.

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate per Hour: $20.51
Supplemental Benefit Rate per Hour: $11.83

Refrigeration and Air Conditioner Service Person I

Filter changing and maintenance thereof, oil and greasing, tower and coil cleaning, scraping and painting, general housekeeping, taking of water samples.

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate per Hour: $15.01
Supplemental Benefit Rate per Hour: $10.60

Overtime

Time and one half the regular rate after an 8 hour day.
Time and one half the regular rate for Saturday.
Double time the regular rate for Sunday.

Overtime Holidays

Double time the regular rate for work on the following holiday(s).
New Year's Day
Independence Day
Labor Day
Veteran's Day
Thanksgiving Day
Christmas Day

Double time and one half the regular rate for work on the following holiday(s).
Martin Luther King Jr. Day
President's Day
Memorial Day
Columbus Day

Paid Holidays

New Year's Day
Martin Luther King Jr. Day
President's Day
Memorial Day
Independence Day
Labor Day
Columbus Day
Veteran's Day
Thanksgiving Day
Christmas Day

(Local #638B)

STONE MASON - SETTER

Stone Mason - Setter

(Assisted by Derrickperson and Rigger)

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate per Hour: $54.17
Supplemental Benefit Rate per Hour: $42.65

Overtime

Time and one half the regular rate after a 7 hour day.
Time and one half the regular rate for Saturday.
Double time the regular rate for Sunday.

Overtime Holidays

Double time the regular rate for work on the following holiday(s).
New Year's Day

Washington's Birthday
Good Friday
Memorial Day
Independence Day
Labor Day
Thanksgiving Day
Christmas Day

Paid Holidays

1/2 day on Christmas Eve if work is performed in the A.M.

Shift Rates

For all work outside the regular workday (8:00 A.M. to 3:30 P.M. Monday through Friday), the pay shall be straight time plus a ten percent (10%) differential.

(Bricklayers District Council)

TAPER

Drywall Taper

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate per Hour: $47.82
Supplemental Benefit Rate per Hour: $26.81

Overtime

Time and one half the regular rate after a 7 hour day.
Time and one half the regular rate for Saturday.
Time and one half the regular rate for Sunday.

Overtime Holidays

Time and one half the regular rate for work on the following holiday(s).
New Year's Day
Martin Luther King Jr. Day
President's Day
Good Friday
Memorial Day
Independence Day
Labor Day
Columbus Day
Thanksgiving Day
Christmas Day

Paid Holidays

Any worker who reports to work on Christmas Eve or New Year's Eve pursuant to his employer's instruction shall be entitled to three (3) hours afternoon pay without working.

(Local #1974)

TELECOMMUNICATION WORKER

(Install/maintain/repair telecommunications cables carrying data, video, and/or voice except for installation on building construction/alteration/renovation projects.)

Telecommunication Worker

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate per Hour: $44.75
Supplemental Benefit Rate per Hour: $23.15
Supplemental Note: The above rate applies for Manhattan, Bronx, Brooklyn, Queens. $22.84 for Staten Island only.

Overtime

Time and one half the regular rate after an 8 hour day.
Time and one half the regular rate for Saturday.
Time and one half the regular rate for Sunday.

Overtime Holidays

Time and one half the regular rate for work on the following holiday(s).
New Year's Day
Lincoln's Birthday
Washington's Birthday
Memorial Day
Independence Day
Labor Day
Columbus Day
Election Day
Veteran's Day
Thanksgiving Day
Christmas Day

Paid Holidays

New Year's Day
Lincoln's Birthday
Washington's Birthday
Memorial Day
Independence Day
Labor Day
Columbus Day
Election Day
Veteran's Day
Thanksgiving Day
Christmas Day

Employees have the option of observing either Martin Luther King's Birthday or the day after Thanksgiving instead of Lincoln's Birthday

Shift Rates

For any workday that starts before 8A.M. or ends after 6P.M. there is a 10% differential for the applicable worker's hourly rate.

Vacation

After 6 months.....one week.
After 12 months but less than 7 years.....two weeks.
After 7 or more but less than 15 years.....three weeks.
After 15 years or more but less than 25 years.....four weeks.

(C.W.A.)

TILE FINISHER

Tile Finisher

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate per Hour: $42.72
Supplemental Benefit Rate per Hour: $33.57

Overtime

Time and one half the regular rate after a 7 hour day.
Time and one half the regular rate for Saturday.
Double time the regular rate for Sunday.

Overtime Holidays

Double time the regular rate for work on the following holiday(s).
New Year's Day
President's Day
Good Friday
Memorial Day
Independence Day
Labor Day
Columbus Day
Veteran's Day
Thanksgiving Day
Day after Thanksgiving
Christmas Day

Paid Holidays

None

Shift Rates

Off shift work day (work performed outside the regular 8:00 A.M. to 3:30 P.M. workday): shift differential of one and one quarter (1¼) times the regular straight time rate of pay for the seven hours of actual off-shift work.

(Local #7)

TILE LAYER - SETTER

Tile Layer - Setter

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate per Hour: $54.84
Supplemental Benefit Rate per Hour: $38.32

Overtime
Time and one half the regular rate after a 7 hour day.
Time and one half the regular rate for Saturday.
Double time the regular rate for Sunday.

Overtime Holidays
Double time the regular rate for work on the following holiday(s).
New Year's Day
President's Day
Good Friday
Memorial Day
Independence Day
Labor Day
Columbus Day
Veteran's Day
Thanksgiving Day
Day after Thanksgiving
Christmas Day

Shift Rates
Off shift work day (work performed outside the regular 8:00 A.M. to 3:30 P.M. workday): shift differential of one and one quarter (1¼) times the regular straight time rate of pay for the seven hours of actual off-shift work.

(Local #7)

TIMBERPERSON

Timberperson

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate per Hour: $50.05
Supplemental Benefit Rate per Hour: $51.03

Overtime
Time and one half the regular rate after an 8 hour day.
Time and one half the regular rate for Saturday.
Double time the regular rate for Sunday.
Saturday may be used as a make-up day at straight time when a day is lost during that week to inclement weather.
Time and one half the regular hourly rate after 40 hours in any work week.

Overtime Holidays
Double time the regular rate for work on the following holiday(s).
New Year's Day
President's Day
Memorial Day
Independence Day
Labor Day
Columbus Day
Presidential Election Day
Thanksgiving Day
Christmas Day

Paid Holidays
None

Shift Rates
Off shift work commencing between 5:00 P.M. and 11:00 P.M. shall work eight and one half hours allowing for one half hour for lunch. The wage rate shall be 113% of the straight time hourly wage rate.

(Local #1536)

TUNNEL WORKER

Blasters, Mucking Machine Operators (Compressed Air Rates)

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate per Hour: $65.42
Supplemental Benefit Rate per Hour: $56.42

Tunnel Workers (Compressed Air Rates)

Includes shield driven liner plate portions or solidification portions work (8 hour shift) during excavation phase.

Effective Period: 7/1/2019 - 6/30/2020

Wage Rate per Hour: $63.21
Supplemental Benefit Rate per Hour: $54.60

Top Nipper (Compressed Air Rates)

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate per Hour: $62.02
Supplemental Benefit Rate per Hour: $53.57

Outside Lock Tender, Outside Gauge Tender,Muck Lock Tender (Compressed Air Rates)

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate per Hour: $60.84
Supplemental Benefit Rate per Hour: $52.63

Bottom Bell & Top Bell Signal Person: Shaft Person (Compressed Air Rates)

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate per Hour: $60.84
Supplemental Benefit Rate per Hour: $52.63

Changehouse Attendant: Powder Watchperson (Compressed Air Rates)

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate per Hour: $53.40
Supplemental Benefit Rate per Hour: $49.60

Blasters (Free Air Rates)

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate per Hour: $62.41
Supplemental Benefit Rate per Hour: $54.17

Tunnel Workers (Free Air Rates)

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate per Hour: $59.72
Supplemental Benefit Rate per Hour: $51.89

All Others (Free Air Rates)

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate per Hour: $55.18
Supplemental Benefit Rate per Hour: $48.03

Microtunneling (Free Air Rates)

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate per Hour: $47.78
Supplemental Benefit Rate per Hour: $41.51

Overtime Description

For work performed during excavation and primary concrete tunnel lining phases - Double time the regular rate after an 8 hour day and Saturday, Sunday and on the following holiday(s) listed below.
For Repair-Maintenance Work on Existing Equipment and Facilities - Time and one half the regular rate after a 7 hour day, Saturday, Sunday and double time the regular rate for work on the following holiday(s) listed below.
For Small-Bore Micro Tunneling Machines - Time and one-half the regular rate shall be paid for all overtime.
For work not listed above - Time and one half the regular rate after an 8 hour day and Saturday and double time the regular rate on Sunday and on the following holiday(s) listed below.

Paid Holidays

New Year's Day
Lincoln's Birthday
President's Day
Memorial Day
Independence Day
Labor Day
Columbus Day
Election Day
Veteran's Day
Thanksgiving Day
Christmas Day

(Local #147)

UTILITY LOCATOR

(Locate & mark underground utilities for street excavation.)

Utility Locator (Year 7 and above)

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate per Hour: $31.56
Supplemental Benefit Rate per Hour: $1.93

Utility Locator (Year 5 - 6)

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate per Hour: $22.85
Supplemental Benefit Rate per Hour: $1.93

Utility Locator (Year 4)

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate per Hour: $21.54
Supplemental Benefit Rate per Hour: $1.93

Utility Locator (Year 3)

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate per Hour: $20.30
Supplemental Benefit Rate per Hour: $1.93

Utility Locator (Year 2)

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate per Hour: $19.13
Supplemental Benefit Rate per Hour: $1.93

Utility Locator (Year 1)

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate per Hour: $18.04
Supplemental Benefit Rate per Hour: $1.93

Utility Locator (Up to 1 year)

Effective Period: 7/1/2019 - 6/30/2020
Wage Rate per Hour: $17.00
Supplemental Benefit Rate per Hour: $1.93
Supplemental Note: No benefits for the first 90 days of employment.

Overtime
Time and one half the regular rate for work on the following Paid Holiday(s).
Time and one half the regular hourly rate after 40 hours in any work week.

Paid Holidays
New Year's Day
Memorial Day
Independence Day
Thanksgiving Day
Christmas Day

Shift Rates
10% shift differential to employees working any shift starting between noon and 5 AM.

Vacation
For up to 1 year ..... 0 hours
For year 1 - 2 ..... 48 hours per year
For year 3 - 9 ..... 96 hours per year
For year 10 or more ..... 144 hours per year

Sick Days:
For up to 1 year employee receives 40 hours paid sick leave.
For year 1 employee earns 2 hours of paid sick leave for every 100 overtime hours worked.
For year 2 - 9 years employee earns 4 hours of paid sick leave for every 100 overtime hours worked.
For year 10 or more employee earns 6 hours of paid sick leave for every 100 overtime hours worked.

(C.W.A.)

WELDER

TO BE PAID AT THE RATE OF THE JOURNEYPERSON IN THE TRADE PERFORMING THE WORK.

Department of Design and Construction

Issue Date: July 1, 2019

DDC STANDARD GENERAL CONDITIONS

FOR SINGLE CONTRACT PROJECTS

Department of Design and Construction

Issue Date: July 1, 2019

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DIVISION 01 – DDC STANDARD GENERAL CONDITIONS
SINGLE CONTRACT PROJECTS
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SECTION 01 10 00
SUMMARY

PART 1 – GENERAL

1.1 RELATED DOCUMENTS:

A. The following documents apply to all required work for the Project: (1) the Contract Drawings, (2) the Specifications, (3) the General Conditions, (4) the Addendum, and (5) the Contract [City of New York Standard Construction Contract].

B. Addendum to the General Conditions: These General Conditions include and are supplemented by the Addendum to the General Conditions (the "Addendum"). The Addendum includes the following: (1) schedules referred to in these General Conditions (Schedule A through F), (2) information regarding the applicability of various articles, and (3) amended articles, if any.

1.2 SUMMARY:

A. This section includes the following:

1. Scope and Intent
2. Provisions Referenced in the Contract
3. Performance of Work During Non-Regular Work Hours (Pursuant to a Change Order)
4. Interruption of Services at Existing Facilities

1.3 DEFINITIONS:

A. Refer to Article 2 of the Contract for definition of terms, words and expressions used in the General Conditions not otherwise defined herein.

B. Design Consultant: "Design Consultant" shall mean the entity responsible for providing design services for the Project, including without limitation, preparing the construction documents (drawings and specifications) and providing services in connection with such documents during construction. The entity serving as the "Design Consultant" may be a corporation, firm, partnership, joint venture, individual or combination thereof. Such entity may be either an employee(s) of the City or an entity engaged by the City to provide such services.

1.4 SCOPE AND INTENT:

A. Description of Project: Refer to the Addendum for a description of the project.

REFER TO THE ADDENDUM FOR THE APPLICABILITY OF SUB-SECTION 1.4 B

B. LEED: The City of New York will seek U.S. Green Building Council (USGBC) LEED (Leadership in Energy and Environmental Design) certification for this Project as specified in Section 01 81 13.03 "SUSTAINABLE DESIGN REQUIREMENTS FOR LEED v3 BUILDINGS"; or Section 01 81 13.04 "SUSTAINABLE DESIGN REQUIREMENTS FOR LEED v4 BUILDINGS", and the Addendum to the General Conditions.

REFER TO THE ADDENDUM FOR THE APPLICABILITY OF SUB-SECTION 1.4 C

C. COMMISSIONING: The project will be commissioned by an independent third party under separate contract with the City of New York. Commissioning shall be in accordance with ASHRAE and USGBC LEED-NC procedures, as described in Section 01 91 13, GENERAL COMMISSIONING REQUIREMENTS FOR MEP SYSTEMS, and/ or Section 01 91 15, GENERAL COMMISSIONING REQUIREMENTS FOR BUILDING ENCLOSURE and the Addendum to the General Conditions. The Contractor shall cooperate with the commissioning agent and provide whatever assistance is required.

D. PROGRESS SCHEDULE: Refer to Section 01 32 00 CONSTRUCTION PROGRESS DOCUMENTATION for requirements of the project.

E. COMPLETION OF WORK: Work to be done under the Contract is comprised of the furnishing of all labor, materials, equipment and other appurtenances, and obtaining all regulatory agency approvals necessary and required to complete the construction work in accordance with the Contract.

F. OMISSION OF DETAILS: All work called for in the Specifications applicable to the Contract but not shown on the Contract Drawings in their present form, or vice versa, is required, and shall be performed by the Contractor as though it were originally delineated or described. The cost of such work shall be deemed included in the total Contract Price.

G. WORK NOT IN SPECIFICATIONS OR CONTRACT DRAWINGS: Work not particularly specified in the Specifications nor detailed on the Contract Drawings but involved in carrying out their intent or in the complete and proper execution of the work, is required, and shall be performed by the Contractor. The cost of such work shall be deemed included in the total Contract Price.

H. SILENCE OF THE SPECIFICATIONS: The apparent silence of the Specifications as to any detail, or the apparent omission from them of a detailed description concerning any work to be done and materials to be furnished, shall be regarded as meaning that only the best practice is to prevail and that only the best material and workmanship is to be used and interpretation of the Specifications shall be made upon that basis.

I. CONFLICT BETWEEN CONTRACT DRAWINGS AND SPECIFICATIONS: Should any conflict occur in or between the Drawings and Specifications, the Contractor shall be deemed to have estimated the most expensive way of doing the work unless the Contractor shall have asked for and obtained a decision in writing from the Commissioner before the submission of the bid as to what shall govern.

1.5 CONTRACT DRAWINGS AND SPECIFICATIONS:

A. SCHEDULE C - The Contract Drawings are listed in Schedule C, which is set forth in the Addendum. Such drawings referred to in the Contract, and in the applicable Specifications for the Contract, bear the general title:

City of New York
Department of Design and Construction
Division of Public Buildings

B. DOCUMENTS FURNISHED TO THE CONTRACTOR - After the award of the Contract, the Contractor will be furnished with five (5) complete sets of paper prints of all Contract Drawings mentioned in Paragraph A above, as well as a copy of the Specifications.

C. ADDITIONAL COPIES of Drawings and Specifications, when requested, will be furnished to the Contractor if available.

D. SUPPLEMENTARY DRAWINGS - When, in the opinion of the Commissioner, it becomes necessary to more fully explain the work to be done, or to illustrate the work further, or to show any changes which may be required, drawings known as Supplementary Drawings will be prepared by the Commissioner.

E. COMPENSATION - Where Supplementary Drawings entail extra work, compensation therefore to the Contractor shall be subject to the terms of the Contract. The Supplementary Drawings shall be binding upon the Contractor with the same force as the Contract Drawings.

F. SUPPLEMENTARY DRAWING PRINTS - Three (3) copies of prints of these Supplementary Drawings will be furnished to the Contractor.

G. COPIES TO SUBCONTRACTORS - The Contractor shall furnish each of its subcontractors and material suppliers such copies of Contract Drawings, Supplementary Drawings, or copies of the Specifications as may be required for its work.

1.6 COORDINATION:

A. COORDINATION AND COOPERATION - The Contractor shall consult and study the requirements of the Contract Drawings and Specifications for all required work, including all work to be performed by trade subcontractors, so that the Contractor may become acquainted with the work of the project as a whole in order to achieve the proper coordination and cooperation necessary for the efficient and timely performance of the work.

B. CONTRACTOR TO CHECK DRAWINGS: - The Contractor shall verify all dimensions, quantities and details shown on the Contract Drawings, Schedules, or other data received from the Commissioner, and shall notify the Commissioner of all errors, omissions, conflicts and discrepancies found therein. Notice of such errors shall be given before the Contractor proceeds with any work. Figures shall be used in preference to scale dimensions and large-scale drawings in preference to small-scale drawings.

1.7 SHOP DRAWINGS AND RECORD DRAWINGS:

A. Refer to Division I Section 01 33 00 – SUBMITTAL PROCEDURES and Section 01 78 39 – PROJECT RECORD DRAWINGS for requirements applicable to shop drawings and record drawings.

1.8 TEMPORARY FACILITIES, SERVICES AND CONTROLS:

A. Refer to Division I Section 01 50 00 – TEMPORARY FACILITIES SERVICES AND CONTROLS for the responsibilities of the Contractor.

1.9 DUST CONTROL:

A. The Contractor shall prepare, execute and manage a "Dust Control Plan" for the prevention of the emission of dust from construction related activities in compliance with 15 RCNY 13-01 et. seq.

1.10 PROVISIONS REFERENCED IN THE CONTRACT:

A. SCHEDULE A - Various Articles of the Contract refer to requirements set forth in Schedule A of the General Conditions. Schedule A, which is included in the Addendum, sets forth (1) the referenced Articles of the Contract, and (2) the specific requirements applicable to the Contract.

B. EXTENSION OF TIME - Applications for Extensions of Time, as indicated in Article 13 of the Contract, shall be made in accordance with the Rules of the Procurement Policy Board.

C. PARTIAL PAYMENTS FOR MATERIALS IN ADVANCE OF THEIR INCORPORATION IN THE WORK PURSUANT TO ARTICLE 42 OF THE CONTRACT – In order to better insure the availability of materials, fixtures and equipment when needed for the work, the Commissioner may authorize partial payment for certain materials, fixtures and equipment, prior to their incorporation in the work, but only in

strict accordance with, and subject to, all the terms and conditions set forth in the Specifications, unless an alternate method of payment is elsewhere provided in the Specifications for specified materials, fixtures or equipment.

1. The Contractor shall submit to the Commissioner a written request, in quadruplicate, for payment for materials purchased or to be purchased for which the Contractor needs to be paid prior to their actual incorporation in the work. The request shall be accompanied by a schedule of the types and quantities of materials, and shall state whether such materials are to be stored on or off the site.

2. Where the materials are to be stored off the site, they shall be stored at a place other than the Contractor's premises (except with the written consent of the Commissioner) and under the conditions prescribed or approved by the Commissioner. The Contractor shall set apart and separately store at the place or places of storage all materials and shall clearly mark same "PROPERTY OF THE CITY OF NEW YORK", and further, shall not at any time move any of said materials to another off-site place of storage without the prior written consent of the Commissioner. Materials may be removed from their place of storage off the site for incorporation in the work upon approval of the Resident Engineer.

3. Where the materials are to be stored at the site, they shall be stored at such locations as shall be designated by the Resident Engineer and only in such quantities as, in the opinion of the Resident Engineer, will not interfere with the proper performance of the work by the Contractor or by other Contractors then engaged in performing work on the site. Such materials shall not be removed from their place of storage on the site except for incorporation in the work, without the approval of the Resident Engineer.

4. INSURANCE

   a. STORAGE OFF-SITE – Where the materials are stored off the site and until such time as they are incorporated in the work, the Contractor shall fully insure such materials against any and all risks of destruction, damage or loss including but not limited to fire, theft, and any other casualty or happening. The policy of insurance shall be payable to the City of New York. It shall be in such terms and amounts as shall be approved by the Commissioner and shall be placed with a company duly licensed to do business in the State of New York. The Contractor shall deliver the original and one (1) copy of such policy or policies marked "Fully Paid" to the Commissioner.

   b. STORAGE ON THE SITE – Where the materials are stored at the site, the Contractor shall furnish satisfactory evidence to the Commissioner that they are properly insured against loss, by endorsements or otherwise, under the policy or policies of insurance obtained by the Contractor to cover losses to materials owned or installed by the Contractor. The policy of insurance shall cover fire and extended coverage against windstorm, hail, explosion and riot attending a strike, civil commotion, aircraft, vehicles and smoke.

5. All costs, charges and expenses arising out of the storage of such materials, shall be paid by the Contractor and the City hereby reserves the right to retain out of any partial or final payment made under the Contract an amount sufficient to cover such costs, charges and expenses with the understanding that the City shall have and may exercise any and all other remedies at law for the recovery of such cost, charges and expenses. There shall be no increase in the Contract price for such costs, charges and expenses and the Contractor shall not make any claim or demand for compensation therefore.

6. The Contractor shall pay any and all costs of handling and delivery of materials, to the place of storage and from the place of storage to the site of the work; and the City shall have the right to retain from any partial or final payment an amount sufficient to cover the cost of such handling and delivery.

7. In the event that the whole or any part of these materials are lost, damaged or destroyed in advance of their satisfactory incorporation in the work, the Contractor, at the Contractor's own cost, shall replace such lost, damaged or destroyed materials of the same character and quality. The City will reimburse the Contractor for the cost of the replaced materials to the extent, and only to the extent, of the funds actually received by the City under the policies of insurance hereinbefore referred to. Until such time as the materials are replaced, the City will deduct from the value of the stored materials or from any other money due under the Contract, the amount paid to the Contractor for such lost, damaged or destroyed materials.

8. Should any of the materials paid for the City hereunder be subsequently rejected or incorporated in the work in a manner or by a method not in accordance with the Contract Documents, the Contractor shall remove and replace, at Contractor's own cost, such defective or improperly incorporated material with materials complying with the Contract Documents. Until such materials are replaced, the City will deduct from the value of the stored materials or from any other money due the Contractor, the amount paid by the City for such rejected or improperly incorporated materials.

9. Payments for the cost of materials made hereunder shall not be deemed to be an acceptance of such materials as being in accordance with the Contract Documents, and the Contractor always retains and must comply with the Contractor's duty to deliver to the site and properly incorporate in the work only materials which comply with the Contract Documents.

10. The Contractor shall retain any and all risks in connection with the damage, destruction or loss of the materials paid for hereunder to the time of delivery of the same to the site of the work and their proper incorporation in the work in accordance with the Contract Documents.

11. The Contractor shall comply with all laws and the regulations of any governmental body or agency pertaining to the priority purchase, allocation and use of the materials.

12. When requesting payment for such materials, the Contractor shall submit with the partial estimate duly authenticated documents of title, such as bills of sale, invoices or warehouse receipts, all in quadruplicate. The executed bills of sale shall transfer title to the materials from the Contractor to the City. (In the event that the invoices state that the material has been purchased by a subcontractor, bills of sale in quadruplicate will also be required transferring title to the materials from subcontractor to the Contractor).

13. Where the Contractor, with the approval of the Commissioner, has purchased unusually large quantities of materials in order to assure their availability for the work, the Commissioner, at the Commissioner's option, may waive the requirements of Paragraph 12 provided the Contractor furnishes evidence in the form of an affidavit from the Contractor in quadruplicate, and such other proof as the Commissioner may require, that the Contractor is the sole owner of such materials and has purchased them free and clear of all liens and other encumbrances. In such event, the Contractor shall pay for such materials and submit proof thereof, in the same manner as provided in Paragraph 12 hereof, within seven (7) days after receipt of payment therefore from the Comptroller. Failure on the part of the Contractor to submit satisfactory evidence that all such materials have been paid for in full, shall preclude the Contractor from payments under the Contract.

14. The Contractor shall include in each succeeding partial estimate requisition a summary of materials stored which shall set forth the quantity and value of materials in storage, on or off the site, at the end of each preceding estimate period; the amount removed for incorporation in the work; the quantity and value of materials delivered during the current period and the total value of materials on hand for which payment thereof will be included in the current payment estimate.

15. Upon proof to the satisfaction of the Commissioner of the actual cost of such materials and upon submission of proper proof of title as required under Paragraph 12 or Paragraph 13 hereof, payment will be made therefore to the extent of 85%, provided however, that the cost so verified,

established and approved shall not exceed the estimated cost of such materials included in the approved detailed breakdown estimate submitted in accordance with Article 41 of the Contract; if it does, the City will pay only 85% approved estimated cost.

16. Upon the incorporation in the work of any such materials, which have been paid for in advance of such incorporation in accordance with the foregoing provisions, payment will be made for such materials incorporated in the work pursuant to Article 42 of the Contract, less any sums paid pursuant to Paragraph 15 herein.

D. MOBILIZATION PAYMENT – A line item for mobilization shall be allowed on the Contractor's Detailed Bid Breakdown submitted in accordance with Article 41 of the Contract. The Mobilization Payment is intended to include the cost of required bonds, insurance coverage and/or any other expenses required for the initiation of the Contract Work. All costs for mobilization shall be deemed included in the total Contract Price. The Detailed Bid Breakdown shall reflect, and the Mobilization Payment shall be made, in accordance with the following schedule:

Contract Amount		Percent		Mobilization
Less than - $ 50,000	x 0	=	0	
$ 50,000 - $ 100,000	x	=	$ 6,000	
$ 100,001 - $ 500,000	x 6	=	$ 6,000 (min)	- $ 30,000 (max)
$ 500,000 - $ 2,500,000	x 5	=	$ 30,000 (min)	- $ 125,000 (max)
Over - $ 2,500,000	x 4	=	$ 125,000 (min)	- $ 300,000 (max)

The Contractor may requisition for one-half (1/2) of the Mobilization Payment upon satisfactory completion of the following:

1. Installation of any required field office(s).
2. Submission of all required insurance certificates and bonds.
3. Approval by the Department of Design and Construction of the coordinated progress schedule for the project and the Contractor's Shop Drawing schedule.

The remaining balance of the Mobilization Payment may be requisitioned only after 10 percent (10%) of the Contract price, exclusive of the total amount of Mobilization Payments made or to be made hereunder, shall have been approved for payment.

E. ULTRA LOW SULFUR DIESEL FUEL AND BEST AVAILABLE TECHNOLOGY REPORTING: The Contractor shall submit reports to the Commissioner regarding the use of Ultra Low Sulfur Diesel Fuel in Non-Road Vehicles, and the implementation of Best Available Technology (BAT), as set forth in Article 5.4 of the Contract. Such reports shall be submitted in accordance with the schedule, format, directions and procedures established by the Commissioner.

1.11 PERFORMANCE OF WORK DURING NON-REGULAR WORK HOURS:

A. NON-REGULAR WORK HOURS: The Commissioner may issue a change order in accordance with Article 25 of the Contract which (1) directs the Contractor to perform the Work, or specific components thereof, during other than regular work hours (i.e., evenings, weekends and holidays), and (2) provides

compensation to the Contractor for costs in connection with the performance of Work during other than regular work hours. The Commissioner may issue a change order if a delay has occurred and such delay is not the fault of the Contractor, or if the work is of such an important nature that delay in completing such work would result in serious disadvantage to the public.

B. PROCEDURE: The Contractor shall (1) obtain whatever permits may be required for performance of the work during other than regular business hours, and (2) pay all necessary fees in connection with such permits. In addition, if directed by the Commissioner, the Contractor shall make immediate application to the Commissioner of the Department of Labor, State of New York, for dispensation in accordance with Subdivision 2 of Section 220 of the Labor Law.

1.12 INTERRUPTION OF SERVICES AT EXISTING FACILITIES:

A. EVENING AND WEEKEND WORK - Where performance of the Work requires the temporary shutdown(s) of services, such shutdown(s) shall be made at night or on weekends or at such times that will cause no interference with the established routines and operations of the facility in question.

1 Where weekend or evening work is required due to unavoidable service shutdowns, such work shall be performed at no extra cost to the City. Components of the Work that must be performed during other than regular work hours are indicated in the Drawings and/or the Specifications.

B. INTERRUPTION OF EXISTING FACILITIES:

1 The Contractor shall not interrupt any of the services of the facility nor interfere with such services in any way without the permission of the Commissioner. Such interruption or interferences shall be made as brief as possible, and only at such time stated.

2 Under no circumstances shall the Contractor, its subcontractors, or its workers, be permitted to use any part of the project as a shop, without the permission of the Commissioner.

3 Unnecessary noise shall be avoided at all times and necessary noise shall be reduced to a minimum.

4 Toilet facilities, water and electricity must be operational at all times (i.e. 24/7). No services of the facility can be interrupted in any way without the permission of the Commissioner. Careful coordination of all work with the Resident Engineer must be done to maintain the operational level of the project personnel at the facility.

5 The Contractor shall schedule the work to avoid noise interference that will affect the normal functions of the facility. In particular, construction operations producing noises that are objectionable to the functions of the facility must be scheduled at times of day or night, day of the week, or weekend, which will not interfere with personnel at the facility. Any additional cost resulting from this scheduling shall be borne by the Contractor.

6 The Contractor shall arrange to work continuously, including evening and weekend hours, if required, to assure that services will be shut down only during the time actually required to make the necessary connections to the existing facility.

7 The Contractor shall give ample written notice in advance to the Commissioner and personnel at the facility of any required shutdown.

PART II – PRODUCTS (Not Used)

PART III – EXECUTION (Not Used)

END OF SECTION 01 10 00

SECTION 01 31 00
PROJECT MANAGEMENT AND COORDINATION

PART 1 – GENERAL

1.1 RELATED DOCUMENTS:

A. The following documents apply to all required work for the Project: (1) the Contract Drawings, (2) the Specifications, (3) the General Conditions, (4) the Addendum, and (5) the Contract [City of New York Standard Construction Contract].

B. LEED: Refer to the Addendum to identify whether this project is designed to comply with a Certification Level according to the U.S. Green Building Council's Leadership in Energy & Environmental Design (LEED) Rating System, as specified in Section 01 81 13.03, "SUSTAINABLE DESIGN REQUIREMENTS FOR LEED v3 BUILDINGS", or Section 01 81 13.04 SUSTAINABLE DESIGN REQUIREMENTS FOR LEED v4 BUILDINGS.

C. COMMISSIONING: Refer to the Addendum to identify whether this project will be commissioned by an independent third party under separate contract with the City of New York. Commissioning shall be in accordance with ASHRAE and USGBC LEED-NC procedures, as described in Section 01 91 13, GENERAL COMMISSIONING REQUIREMENTS FOR MEP SYSTEMS, and/ or Section 01 91 15 GENERAL COMMISSIONING REQUIREMENTS FOR BUILDING ENCLOSURE COMMISSIONING. The Contractor shall cooperate with the commissioning agent and provide whatever assistance is required.

1.2 SUMMARY:

A. This Section includes administrative provisions for coordinating construction operations on the Project including without limitation the following.

1. Coordination Drawings.
2. Administrative and supervisory personnel.
3. Project meetings.
4. Requests for Interpretation (RFIs).

B. This section includes the following:

1. Definitions
2. Coordination
3. Submittals
4. Administrative and Supervisory Personnel
5. Project Meetings
6. Requests for Interpretation (RFI's)
7. Correspondence
8. Contractor's Daily Reports
9. Alternate and Substitute Equipment

C. RELATED SECTIONS: include without limitation the following:

1. Section 01 10 00 SUMMARY
2. Section 01 32 00 CONSTRUCTION PROGRESS DOCUMENTATION
3. Section 01 33 00 SUBMITTALS
4. Section 01 35 26 SAFETY REQUIREMENTS
5. Section 01 73 00 EXECUTION REQUIREMENTS

6. Section 01 74 19 CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL
7. Section 01 77 00 CLOSEOUT PROCEDURES

1.3 DEFINITIONS:

A. Refer to Article 2 of the Contract for definition of terms, words and expressions used in the General Conditions not otherwise defined herein.

B. Design Consultant: "Design Consultant" shall mean the entity responsible for providing design services for the Project, including without limitation, preparing the construction documents (drawings and specifications) and providing services in connection with such documents during construction. The entity serving as the "Design Consultant" may be a corporation, firm, partnership, joint venture, individual or combination thereof. Such entity may be either an employee(s) of the City or an entity engaged by the City to provide such services.

1.4 COORDINATION:

A. Coordination: The Contractor shall coordinate its construction operations, including those of its subcontractors, with other entities to ensure the efficient and orderly installation of each part of the Work. The Contractor shall coordinate the various operations required by different Sections of the Specifications that depend on each other for proper installation, connection, and operation.

1. Schedule construction operations in sequence in order to obtain the best results where installation of one part of the Work depends on installation of other components, before or after its own installation.
2. Coordinate installation of different components to ensure maximum accessibility for required maintenance, service, and repair.
3. Make adequate provisions to accommodate items scheduled for later installation.
4. Where availability of space is limited, coordinate installation of different components to ensure maximum performance and accessibility for required maintenance, service, and repair of all components, including mechanical and electrical.

B. The Contractor shall prepare memoranda for distribution to its subcontractors and other involved entities, outlining special procedures required for coordination. Such memoranda shall include required notices, reports, and meeting minutes as applicable.

C. Administrative Procedures: The Contractor shall coordinate scheduling and timing of required administrative procedures with other construction activities and activities of its subcontractors to avoid conflicts and to ensure orderly progress of the Work. Such administrative activities include without limitation the following:

1. Preparation of Contractor's Construction Schedule.
2. Installation and removal of temporary facilities and controls.
3. Delivery and processing of submittals.
4. Progress meetings.
5. Pre-installation conferences.
6. Startup and adjustment of systems.
7. Project closeout activities.

D. Conservation: The Contractor shall coordinate construction activities to ensure that operations are carried out with consideration given to conservation of energy, water, and materials.

E. Salvaged Items, Material and/or Equipment: The Specifications may identify certain items, materials or equipment which must be salvaged by the Contractor and handled or disposed of as directed. The Contractor shall comply with all directions in the Specifications regarding the salvaging and handling of identified items, material or equipment.

1.5 SUBMITTALS:

A. Submit shop drawings, product data, samples etc. in compliance with Section 01 33 00, SUBMITTAL PROCEDURES.

B. Coordination Drawings: The Contractor shall prepare applicable Coordination Drawings in compliance with the requirements for Coordination Drawings in Section 01 33 00, SUBMITTAL PROCEDURES.

C. Safety Plan in compliance with Section 01 35 26, SAFETY REQUIREMENTS PROCEDURES.

D. Waste Management Plan in compliance with Section 01 74 19, CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL

E. Key Personnel Names: Within 15 days after the Notice to Proceed, the Contractor shall submit a list of key personnel assignments of the Contractor and its subcontractors, including superintendent and other personnel in attendance at Project site. Identify individuals and their duties and responsibilities; list addresses and telephone numbers, including home and office telephone numbers. Provide names, addresses, and telephone numbers of individuals assigned as standbys in case of the absence of individuals assigned to Project.

1. Post copies of list in Project meeting room, in temporary field office, and by each temporary telephone. Keep list current at all times.

2. In addition to Project superintendent, provide other administrative and supervisory personnel as required for proper performance of the Work. Include special personnel required for coordinating all operations by its subcontractors.

1.6 PROJECT MEETINGS:

A. General: The Resident Engineer will hold regularly scheduled construction progress meetings at the site, at which time the Contractor and appropriate subcontractors shall have their representatives present to discuss all details relative to the execution of the work. The Resident Engineer shall preside over these meetings.

1. Agenda: Prior to each meeting, the Resident Engineer will consult with the Contractor and will prepare an agenda of items to be discussed. In general, after informal discussion of any item on the agenda, the Resident Engineer will summarize the discussion in a brief written statement, and the Contractor will then dictate a brief statement for the record.

2. Coordination: In addition to construction progress meetings called by the Resident Engineer, the Contractor shall hold regularly scheduled meetings for the purpose of coordinating; expediting and scheduling the work in accordance with the master coordinated Job Progress Chart. The Contractor and its subcontractors, material suppliers or vendors whose presence is necessary, are required to attend. These meetings may, at the discretion of the Contractor, be held at the same place and immediately following the project meetings held by the Resident Engineer. Minutes of these meetings shall be recorded, typed and printed by the Contractor and distributed to all parties concerned.

B. PRECONSTRUCTION KICK-OFF MEETING:

1. The Resident Engineer will schedule a preconstruction kick-off meeting either at DDC's main office or at the Project site to review responsibilities and personnel assignments and clarify the

role of each participant. Unless otherwise directed the Design Consultant will record and distribute meeting minutes.

2. Attendees: Authorized representative of the Client Agency; Design Consultant; the Contractor and its superintendents, subcontractor(s) and their superintendent(s); LEED sub-consultant and Commissioning Authority /Agent (CxA) as applicable and other concerned parties. All participants at the meeting shall be familiar with the Project and authorized to conclude matters relating to the Contract Work.
3. Agenda: Includes without limitation the following as applicable:
   a. Establishing construction schedule
   b. Schedule for regular construction meetings
   c. Phasing
   d. Critical work sequencing and long-lead items
   e. Designation of key personnel and their duties
   f. Reviewing Application for Payment and Change Order Procedures
   g. Procedures for Requests for Information (RFIs.)
   h. Review Permits and Approval requirements
   i. Review all recent Administrative Code reporting requirements relating to the project, (i.e. LL 77, LL86 etc.)
   j. Procedures for testing and inspecting
   k. Reviewing special conditions at the Project site
   l. Distribution of the Contract Documents
   m. Submittal procedures
   n. Safety Procedures
   o. LEED requirements
   p. Commissioning Requirements
   q. Preparation of Record Documents
   r. Historic Treatment requirements
   s. Use of the premises
   t. Work restrictions
   u. Client Agency occupancy requirements
   v. Responsibility for temporary facilities, services and controls
   w. Construction Waste Management and Disposal
   x. Indoor Air Quality Management Plan
   y. Dust Mitigation Plan
   z. Office, work, and storage areas
   aa. Equipment deliveries and priorities
   bb. Security
   cc. Progress cleaning
   dd. Working hours

C. CONSTRUCTION PROGRESS MEETINGS:

1. The Resident Engineer will schedule and conduct construction progress meetings at bi-weekly intervals or as otherwise determined. All participants at the meeting shall be familiar with the Project and authorized to conclude matters relating to the Work. Unless otherwise directed the Design Consultant will record and distribute meeting minutes.
2. Attendees:
   a. Design Consultant and applicable sub-consultants
   b. Client Agency Representative
   c. Representatives from the Contractor, sub-contractor(s), suppliers or other entities involved in the current progress, planning, coordination or future activities of the Work
   d. Other appropriate DDC personnel, DDC consultants and concerned parties
3. Agenda: Includes without limitation the following:
   a. Review the Construction Schedule and progress of the Work. Determine if the Work is on time, ahead of schedule or behind schedule. Determine actions to be taken to maintain or accelerate the schedule
   b. Review and approve prior meeting minutes and follow up open issues
   c. Coordinate work between each subcontractor
   d. Sequence of Operations
   e. Status of submittals, deliveries and off-site fabrication
   f. Status of inspections and approvals by governing agencies
   g. Temporary facilities and controls
   h. Review Site Safety
   i. Quality and work standards
   j. Field observations
   k. Status of correction of deficient items
   l. RFI's
   m. Pending changes
   n. Status of outstanding Payments and Change Orders
   o. LEED requirements including Construction Waste Management, Indoor Air Quality Plan, Dust Mitigation and Commissioning
   p. Status of Administrative Code reporting requirements related to the project

1.7 REQUESTS FOR INFORMATION (RFI):

A. Procedure: Immediately on discovery of the need for information or interpretation of the Contract Documents, and if not possible to request interpretation at Project meeting, the Contractor shall prepare and submit an RFI in the form specified by the Resident Engineer.

1. RFI shall originate with the Contractor. RFIs submitted by entities other than Contractor will be returned with no response.
2. Coordinate and submit RFI in a prompt manner to the Resident Engineer so as to avoid delays in Contractor's work or work of its subcontractors.
3. RFI Log: The Contractor shall prepare, maintain, and submit a tabular log of RFIs organized by the RFI number monthly to the Resident Engineer.

4. On receipt of responses and action to the RFI, the Contractor shall update the RFI log and immediately distribute the RFI response to affected parties. Review response(s) and notify the Resident Engineer immediately if the Contractor disagrees with response(s).

1.8 CORRESPONDENCE:

A. Copies of all correspondence to DDC shall be sent directly to the Resident Engineer at the job site.

1.9 CONTRACTOR'S DAILY REPORTS:

A. The Contractor shall prepare and submit Daily Construction Progress Reports as outlined in Section 01 32 00, CONSTRUCTION PROGRESS DOCUMENTATION.

PART II – PRODUCTS (Not Used)

PART III – EXECUTION (Not Used)

END OF SECTION 01 31 00

SECTION 01 32 00
CONSTRUCTION PROGRESS DOCUMENTATION

PART 1 – GENERAL

1.1 RELATED DOCUMENTS:

A. The following documents apply to all required work for the Project: (1) the Contract Drawings, (2) the Specifications, (3) the General Conditions, (4) the Addendum, and (5) the Contract [City of New York Standard Construction Contract].

1.2 SUMMARY

A. This Section includes administrative and procedural requirements for establishing an effective base line schedule for the project and documenting the progress of construction during performance of the Work by developing, revising as necessary, various documents including but not limited to the following:

1. Baseline Construction Schedule.
2. Composite Schedule for entire project
3. Recovery Composite Schedule
4. Revised and/or updated Composite Schedule
5. Submittals Schedule.
6. Daily construction reports.
7. Material location reports.
8. Field condition reports.
9. Special reports.

B. RELATED SECTIONS: include without limitation the following:

1. Section 01 10 00 SUMMARY
2. Section 01 32 22 PHOTOGRAPHIC DOCUMENTATION
3. Section 01 33 00 SUBMITTAL PROCEDURES
4. Section 01 40 00 QUALITY REQUIREMENTS

1.3 DEFINITIONS:

A. Refer to Article 2 of the Contract for definition of terms, words and expressions used in the General Conditions not otherwise defined herein.

B. Design Consultant: "Design Consultant" shall mean the entity responsible for providing design services for the Project, including without limitation, preparing the construction documents (drawings and specifications) and providing services in connection with such documents during construction. The entity serving as the "Design Consultant" may be a corporation, firm, partnership, joint venture, individual or combination thereof. Such entity may be either an employee(s) of the City or an entity engaged by the City to provide such services.

C. Baseline Construction Schedule:
1. A horizontal bar chart type schedule (Microsoft Project OR similar program) listing all the activities and their duration for entire contract duration OR construction period, including logical ties and interrelations between the activities necessary for the timely and successful completion of the project. Critical path activities shall be clearly marked. The Baseline construction schedule is a preliminary schedule that must be reviewed and approved by the Resident Engineer.

D. Composite Schedule:
1. A composite horizontal bar chart type schedule (Microsoft Project OR similar program) listing all activities to be performed by the Contractor and its subcontractors, the duration of each activity including logical ties and interrelations between activities, and the sequence of each of necessary activities for the timely and successful completion of the project within the stipulated contract duration. Critical path activities shall be clearly marked. The Composite schedule must be signed and submitted by the Contractor within thirty (30) calendar days after the date established for commencement of the Contract, unless otherwise directed. The Composite Schedule must be reviewed and approved by the Resident Engineer.

E. Recovery Composite Schedule: A Recovery Composite Schedule is not required unless the City issues an Acceleration Change Order.

1. A Composite Schedule outlining and incorporating extraordinary efforts required to recover lost time with the aim of achieving completion of the project within the stipulated contract duration, plus authorized time extensions. In such case special attention must be given to keep the delays as minimum as possible and must establish the nature of efforts such as extended hours of work, weekend work, accelerated fabrication, required action(s) or effort(s) by the Contractor, its subcontractors, consultants, clients, end users and/or other concerned parties.

2. Such schedule must be prepared and submitted within Five (5) calendar days of request by the Resident Engineer. The Recovery Composite Schedule must be reviewed and approved by the Resident Engineer.

F. Revised and/or Updated Composite Schedule:

1. A Baseline construction schedule OR Composite Schedule OR Recovery Composite Schedule for the project that shows the actual duration of all the completed activities, including duration of and the reasons for delays, if any has occurred, AND revisions to all remaining activities of the Contractor and its subcontractors, including changes, if any, to logical ties, interrelations and the sequence of each of the outlined activities. Any such revisions should be shown on the row just below the approved schedule of the respective activity so that revisions can be compared.

2. The Revised and/or updated Composite Schedule must be reviewed and approved by the Resident Engineer.

G. Activity: A discrete part of a project that can be identified for planning, scheduling, monitoring, and controlling the construction project. Activities included in a construction schedule consume time and resources.

H. Event: The starting or ending point of an activity.

I. Fragment: A part of the activity that breaks down activities into smaller activities for greater detail.

J. Milestone: A key or critical point in time for reference or measurement.

K. Network Diagram: A graphic diagram of a network schedule, showing activities and activity relationships.

PART II – PRODUCTS

2.1 BASELINE CONSTRUCTION SCHEDULE:

A. The Contractor shall prepare a Baseline horizontal bar-chart-type construction schedule for the project. Submit the Baseline Construction Schedule to the Resident Engineer within (15) fifteen calendar days after the date established for commencement of the Contract, unless directed otherwise. The Baseline Schedule must be reviewed and approved by the Resident Engineer.

1. Provide a separate time bar for each significant construction activity. Coordinate each activity on the schedule with other construction activities for proper interrelationship & sequence.
2. Duration: The duration of each activity on the schedule besides installation must clearly show required duration of filing for permits, inspections, testing, approvals, shop drawings and materials submittals and approvals, fabrication, delivery, phasing for each construction activity.
3. Schedule shall be time-scaled in not more than weekly increments, with the dates of the first day (Monday) of each week indicated.
4. Completion of all the project activities shall be indicated in advance of the date established for completion of the Contract, allowing time for required inspection and punch list work.
5. Clearly show time bar for all the tasks, to be completed before start of physical work of scheduled activities, including but not limited to obtaining required permit, subcontractor approval, submission and approval of shop drawings, field verification, time for fabrication and delivery, testing of materials and/or samples, preparation and approval of mock-up sample, curing, pre-testing of soil, pre-testing of equipment - including start up, testing & adjusting, filing for inspection by regulatory agencies, training, final use, etc. required to maintain orderly progress of the activity. A special consideration must be given to those activities requiring early approvals because of long lead-time for manufacture or fabrication.
6. Phasing: Arrange all activities in proper sequence to reflect requirements for phased completion, work by other entities, work by the City, City furnished items, coordination with existing work, limitations arising due to continued occupancies, non-interruptible services, partial completion for occupancy, site restrictions, provisions for future work, seasonal variations, environmental control, and similar conditions of the project.
7. Arrange all activities and/or show interrelationship and logical sequence of all activities, determine and mark all critical path activities including any phasing reflecting actual project condition.
8. Keep at least two blank horizontal bars between all activities for recording actual progress and submitting Revised Schedule as defined in Sub-Section 1.3 G
9. If necessary a new revised schedule shall be prepared in the same manner as outlined above.

2.2 COMPOSITE SCHEDULE FOR THE PROJECT:

A. The Contractor shall prepare a Composite Schedule based on the approved Baseline Schedule. Such schedule shall indicate graphically and chronologically the start and completion of each and every activity, including all the pre-activity and post activity tasks. Keep at least two blank horizontal bars between all activities for recording actual progress and/or revisions.

1. If necessary the Contractor shall meet with each subcontractor and with the Resident Engineer to review and make warranted adjustments and finalize the Composite Schedule. Once the schedule is finalized, the Contractor shall sign and date a reproducible form of the Composite Schedule. The Composite Schedule must be finalized and signed by the Contractor within (30) thirty calendar days

after the date established for commencement of the Contract, unless directed otherwise. The Composite Schedule must be reviewed and approved by the Resident Engineer.

2.3 RECOVERY COMPOSITE SCHEDULE:

A. A Recovery Composite Schedule is not required unless the City issues an Acceleration Change Order. A Recovery Composite Schedule outlining and incorporating extraordinary efforts required to recover lost time with the aim of achieving completion of the project within the stipulated contract duration, plus authorized time extensions, must be developed and submitted within (5) five calendar days of the request by the Resident Engineer. Such Recovery Composite Schedule shall include all information as defined in Article 1.3 F and shall be prepared in the same manner as outlined in Sub-Sections 2.1 and 2.2. The Recovery Composite Schedule must be reviewed and approved by the Resident Engineer.

2.4 REVISED AND/OR UPDATED COMPOSITE SCHEDULE:

A. The Contractor shall revise and/or update the approved Composite Schedule as directed. The Revised schedule shall be prepared in the same manner as outlined above in Sub-Sections 2.1 and 2.2.

B. The Contractor shall mark actual progress, delays, work stoppage etc. in the row just below the approved schedule for the respective activity so that revisions can be compared.

C. Such schedule also shall indicate graphically and chronologically any revisions to the start and completion of the remaining activities including revisions to all the pre-activity and post activity tasks for all subcontractors.

D. If necessary, the Contractor shall meet with each subcontractor and with the Resident Engineer to review and make warranted adjustments and finalize the Revised Composite Schedule. Once the schedule is finalized, the Contractor shall sign and date a reproducible form of the Schedule. Such schedule must be prepared and submitted by the Contractor within Five (5) calendar days of request by the Resident Engineer. The Revised Composite Schedule must be reviewed and approved by the Resident Engineer.

2.5 SUBMITTALS SCHEDULE:

A. Preparation: The Contractor shall submit a schedule of submittals, arranged in chronological order by dates required by the construction schedule. Include time required for review, re-submittal, ordering, manufacturing, fabrication, and delivery when establishing dates.

B. SCHEDULE F: Schedule F sets forth all submittal requirements for shop drawings and material samples. Schedule F is included in the Addendum. At the kick-off meeting, the Contractor must review this Schedule with the Resident Engineer and the Design Consultant. Within 10 days after the kick-off meeting, the Contractor must complete information on Schedule F concerning the submission date, the required delivery date and the fabrication time. For all required submittals of shop drawings and material samples, the Schedule F provided by the Contractor must indicate a submission date which is at least 20 business days prior to the date of the manufacture of the item or materials to be installed. In addition, if so directed by the Commissioner, the Schedule F provided by the Contractor must indicate a submission date for shop drawings and/or material samples of specified items or materials which is within 60 business days after the kick-off meeting. In the event of any conflict between the Specifications and Schedule F, Schedule F shall take precedence; provided, however, in the event of an omission from Schedule F (i.e., Schedule F omits either a reference to or information concerning a submittal requirement which is set forth in the Specifications), such omission from Schedule F shall have no effect and the Contractor's submittal obligation, as set forth in the Specifications, shall remain in full force and effect.

C. Review: The Resident Engineer will review the Schedule F submitted by Contractor. Upon acceptance, the Resident Engineer will date and sign the schedule as approved and transmit it to the Consultant, Contractor and others within DDC as he/she deems appropriate.

2.6 REPORTS:

A. Daily Construction Reports: The Contractor shall submit to the Resident Engineer written Daily Construction Reports at the end of each work day, recording basic information such as the date, day, weather conditions, and contract days passed, remaining contract duration/days and the following information concerning the Project.

Information: The reports shall be prepared by the Contractor's Superintendent and shall bear the Contractor's Superintendents signature. Each report shall contain the following information:

1. List name of Contractor, subcontractors, their work force in each category, and details of activities performed.
2. The type of materials and/or major equipment being installed by the Contractor and/or by each subcontractor.
3. The major construction equipment being used by the Contractor and/or subcontractors.
4. Material and Equipment deliveries.
5. High and low temperatures and general weather conditions.
6. Accidents.
7. Meetings and significant decisions.
8. Unusual events.
9. Stoppages, delays, shortages, and losses.
10. Meter readings and similar recordings
11. Emergency procedures.
12. Orders and/or requests of authorities having jurisdiction.
13. Approved Change Orders received and implemented.
14. Field Orders and Directives received and implemented.
15. Services connected and disconnected.
16. Equipment or system tests and startups.
17. Partial Completions and occupancies.
18. Substantial Completions authorized.

NOTE: If there is NO ACTIVITY at site, a daily report indicating so and the reason for no activity at the site must be submitted.

B. Material Location Reports: The contractor shall submit a Material Location Report at weekly OR monthly intervals as determined and established by the Resident Engineer. Such report shall include a comprehensive list of materials delivered to and stored at Project site. List shall be cumulative, showing materials previously reported plus items recently delivered. Include with list a statement of progress on and delivery dates for materials or items of equipment fabricated or stored away from Project site.

C. Field Condition Reports: Immediately on discovery of a difference between field conditions and the Contract Documents, prepare and submit a detailed report. Submit a Request For Information (RFI) form with a detailed description of the differing conditions, together with recommendations for changing the Contract Documents.

2.7 SPECIAL REPORTS:

A. Accident report, incident report, special condition report for the conditions out of control of any party involved with the project effecting project progress, explaining impact on the project schedule and cost if any.

PART III – EXECUTION (Not Used)

END OF SECTION 01 32 00

SECTION 01 32 33
PHOTOGRAPHIC DOCUMENTATION

REFER TO THE ADDENDUM FOR THE APPLICABILITY OF SECTION 01 32 33

PART 1 – GENERAL

1.1 RELATED DOCUMENTS:

A. The following documents apply to all required work for the Project: (1) the Contract Drawings, (2) the Specifications, (3) the General Conditions, (4) the Addendum, and (5) the Contract [City of New York Standard Construction Contract].

1.2 SUMMARY:

A. This Section includes the following:
1. Photographic Media
2. Construction Photographs
3. Pre-construction Photographs
4. Periodic Construction Progress Photographs
5. Special Photographs
6. DVD Recordings
7. Final Completion Construction Photographs

B. RELATED SECTIONS: include without limitation the following:

1.	Section 01 10 00	SUMMARY
2.	Section 01 33 00	SUBMITTAL PROCEDURES
3.	Section 01 35 91	HISTORIC TREATMENT PROCEDURES
4.	Section 01 78 39	CONTRACT RECORD DOCUMENTS
5.	Section 01 81 19	INDOOR AIR QUALITY REQUIREMENTS FOR LEED BUILDINGS

C. PHOTOGRAPHER - The Contractor shall employ and pay for the services of a professional photographer who shall take photographs showing the progress of the work for all Contracts.

1.3 DEFINITIONS:

A. Refer to Article 2 of the Contract for definition of terms, words and expressions used in the General Conditions not otherwise defined herein.

B. Design Consultant: "Design Consultant" shall mean the entity responsible for providing design services for the Project, including without limitation, preparing the construction documents (drawings and specifications) and providing services in connection with such documents during construction. The entity serving as the "Design Consultant" may be a corporation, firm, partnership, joint venture, individual or combination thereof. Such entity may be either an employee(s) of the City or an entity engaged by the City to provide such services.

1.4 SUBMITTALS:

A. Qualification Data: For photographer.

B. Key Plan: With each Progress Photograph Submittal include a key plan of Project site and building with notation of vantage points marked for location and direction of each image. Indicate location, elevation or story of construction. Include same label information as corresponding set of photographs.

C. Construction Progress Photograph Prints: Take Progress Photographs bi-weekly and submit four color prints of each photographic view for each trade to the Resident Engineer. Such photographs shall be included in each monthly progress report or as otherwise directed by the Resident Engineer.

D. Construction Photograph Negatives: Submit a complete set of photographic negatives in individually protected negative sleeves with each submittal of prints. Identify negatives with label matching photographic prints.

E. Digital Images: If Digital Media is used, submit a complete set of digital color image electronic files on USB drive or other electronic media requested by the Commissioner with each submittal of prints. Identify electronic media with date photographs were taken. Submit images that have same aspect ratio as the sensor, un-cropped.

1.5 QUALITY ASSURANCE:

A. Photographer Qualifications: An individual who has been regularly engaged as a professional photographer of construction projects for not less than three years.

1.6 COORDINATION:

A. The Contractor and its subcontractor(s) shall cooperate with the photographer and provide auxiliary services requested, including access to Project site and use of temporary facilities, including temporary lighting required to produce clear, well-lit photographs without obscuring shadows.

1.7 COPYRIGHT:

A. The Contractor shall include the provisions set forth below in the agreement between the Contractor and the Photographer who will provide the construction photographs described in this section. The Contractor shall submit to the Resident Engineer a copy of its agreement with the Photographer.

B. Any photographs, images and/or other materials produced pursuant to this Agreement, and any and all drafts and/or other preliminary materials in any format related to such items produced pursuant to this Agreement, shall upon their creation become the exclusive property of the City.

C. Any photographs, images and/or other materials provided pursuant to this Agreement ("Copyrightable Materials") shall be considered "work-made-for-hire" within the meaning and purview of Section 101 of the United States Copyright Act, 17 U.S.C. § 101, and the City shall be the copyright owner thereof and of all aspects, elements and components thereof in which copyright protection might exist. To the extent that the Copyrightable Materials do not qualify as "work-made-for-hire," the Photographer hereby irrevocably transfers, assigns and conveys exclusive copyright ownership in and to the Copyrightable Materials to the City, free and clear of any liens, claims, or other encumbrances. The Photographer shall retain no copyright or intellectual property interest in the Copyrightable Materials. The Copyrightable Materials shall be used by the Photographer for no purpose other than in the performance of this Agreement without the prior written permission of the City. The Department may grant the Photographer a license to use the Copyrightable Materials on such terms as determined by the Department and set forth in the license.

D. The Photographer acknowledges that the City may, in its sole discretion, register copyright in the Copyrightable Materials with the United States Copyright Office or any other government agency authorized to grant copyright registrations. The Photographer shall fully cooperate in this effort, and agrees to provide any and all documentation necessary to accomplish this.

E. The Photographer represents and warrants that the Copyrightable Materials: (i) are wholly original material not published elsewhere (except for material that is in the public domain); (ii) do not violate any copyright Law; (iii) do not constitute defamation or invasion of the right of privacy or publicity; and (iv) are not an infringement, of any kind, of the rights of any third party. To the extent that the Copyrightable Materials incorporate any non-original material, the Photographer has obtained all necessary permissions and clearances, in writing, for the use of such non-original material under this Agreement, copies of which shall be provided to the City.

PART II – PRODUCTS

2.1 PHOTOGRAPHIC MEDIA:

A. Photographic Film: Medium format, 2-1/4 by 2-1/4 inches (60 by 60 mm).

B. Digital Images:

1. Construction Progress Images: Color images in JPEG format with minimum sensor size of 1.3 megapixels.

2. Presentation Quality Images: Provide Color images in uncompressed TIFF format, produced by a digital camera with minimum sensor size of 4.0 megapixels, and at an image resolution of not less than 1024 by 768 with 8"x10" original capture at 300 dpi or greater.

C. Prints:

1. Format: 8-by-10-inch (203-by-254-mm) smooth-surface matte color prints on single-weight commercial-grade stock paper, with 1inch wide margins and punched for standard 3-ring binder.

2. Identification: On the front of each photograph affix a label in the margin with Project name and date photograph was taken. On the back of each print, provide an applied label or rubber-stamped impression with the following information:
   a. Project Contract I.D. Number.
   b. Project Contract Name.
   c. Name of Contractor. (and Subcontractor Trade Represented)
   d. Subject of Image Taken.
   e. Date and time photograph was taken if not date stamped by camera.
   f. Description of vantage point, indicating location, direction and other pertinent information.
   g. Unique sequential identifier.
   h. Name and address of photographer.

PART III – EXECUTION

3.1 CONSTRUCTION PHOTOGRAPHS:

A. General: Take photographs using the maximum range of depth of field, and that are in focus, to clearly show the Work. Photographs with blurry or out-of-focus areas will not be accepted.

1. Maintain key plan with each set of construction photographs that identifies each photographic location and direction of view.

B. Film Images:

1. Date Stamp: Unless otherwise indicated, date and time stamp each photograph as it is being taken so stamp is integral to photograph.

2. Field Office Prints: Retain one set of prints of progress photographs in the field office at Project site, available at all times for reference. Identify photographs same as for those submitted to Commissioner.

C. Digital Images: Submit digital images exactly as originally recorded in the digital camera, without alteration, manipulation, editing, or modifications using image-editing software.

1. Date and Time: Include date and time in filename for each image.

2. Field Office Images: Maintain one set of images on USB drive or other electronic media requested by the Commissioner in the field office at Project site, available at all times for reference. Identify images same as for those submitted to Commissioner.

3.2 PRE-CONSTRUCTION & PRE-DEMOLITION PHOTOGRAPHS:

A. Before commencement of Contract work at the site, take color photographs of Project site and surrounding properties, including existing structures or items to remain during construction, from different vantage points, as directed by the Resident Engineer.

1. Flag applicable excavation areas and construction limits before taking construction photographs.
2. Take photographs of minimum eight (8) views to show existing conditions adjacent to property before starting the Work.
3. Take applicable photographs of minimum eight (8) views of existing buildings either on or adjoining property to accurately record physical conditions at start of construction.
4. Take additional photographs as required or directed by the Resident Engineer to record settlement or cracking of adjacent structures, pavements, and improvements.

B. Demolition Operations: Take photographs as directed by the Resident Engineer of minimum of eight (8) views each before commencement of demolition operations, at mid-point of operations and at completion of operations.

C. Pre-Demolition Photographs: Take archival quality color photographs, to include all exterior building facades, of all structures at the Project site designated to be fully demolished or removed in compliance with NYC Building Code requirements. Submit four (4) complete sets of pre-demolition photographs, in the format specified herein, to the Resident Engineer for submission to the Department of Buildings.

3.3 PERIODIC CONSTRUCTION PROGRESS PHOTOGRAPHS:

A. Take photographs of minimum eight (8) views bi-weekly as directed by the Resident Engineer of construction progress for each contract trade. Select vantage points to show status of construction and progress since last photographs were taken.

3.4 SPECIAL PHOTOGRAPHS:

A. The photographer shall take special photographs of subject matter or events as specified in other sections of the Project Specifications from vantage points specified or as otherwise directed by the Resident Engineer.

B. Historical Elements: As required in Section 01 35 91, HISTORIC TREATMENT PROCEDURES, for Contract work at designated landmark structures or sites the photographer, as specified and required by individual sections of the Contract documents or at the direction of the Commissioner, shall take images of existing elements scheduled to be removed for replacement, repair or replication in quantities as directed, including post-construction photographs of completed work as directed by the Commissioner.

1. Take Presentation Quality Photographs of designated landmark structures as directed by the Commissioner for submission to the New York City Landmarks Preservation Commission. Provide a minimum of four color photographic prints of each view as directed.

3.5 VIDEO RECORDING:

A. When Video Recording of Demonstration and Orientation sessions is required, the Contractor shall provide the services of a Videographer as indicated in Section 01 79 00, DEMONSTRATION AND OWNER'S PRE-ACCEPTANCE ORIENTATION.

3.6 FINAL COMPLETION CONSTRUCTION PHOTOGRAPHS:

A. Take color photographs of minimum eight (8) unobstructed views of the completed project or project and site, as directed by the Commissioner and after all scaffolding, hoists, shanties, field offices or other temporary work has been removed and final cleaning is done after date of Substantial Completion for submission as Project Record Documents. Submit four (4) sets of each view of Presentation Quality photographic prints including negatives and/or digital images electronic file.

END OF SECTION 01 32 33

(No Text on This Page)

SECTION 01 33 00
SUBMITTAL PROCEDURES

PART 1 – GENERAL:

1.1 RELATED DOCUMENTS:

A. The following documents apply to all required work for the Project: (1) the Contract Drawings, (2) the Specifications, (3) the General Conditions, (4) the Addendum, and (5) the Contract [City of New York Standard Construction Contract].

1.2 SUMMARY:

A. This Section includes administrative and procedural requirements for submitting Shop Drawings, Coordination Drawings, Catalogue Cuts, Material Samples and other submittals required by the Contract Documents.

B. Review of submittals does not relieve the Contractor of responsibility for any Contractor's errors or omissions in such submittals, nor from responsibility for complying with the requirements of the Contract.

C. Responsibility of the Contractor: The approval of Shop Drawings will be general and shall not relieve the Contractor of responsibility for the accuracy of such Shop Drawings, nor for the proper fitting and construction of the work, nor of the furnishing of materials or work required by the Contract and not indicated on the Shop Drawings. Approval of Shop Drawings shall not be construed as approving departures from the Contract Drawings, Supplementary Drawings or Specifications.

D. This Section includes the following:
1. Definitions
2. Submission Procedures
3. Coordination Drawings
4. LEED Submittals
5. Ultra Low Sulfur Diesel Fuel Reporting
6. Construction Photographs and Recordings
7. As-Built Documents

1.3 RELATED SECTIONS: Include without limitation the following:

A.	Section 01 10 00	SUMMARY
B.	Section 01 31 00	PROJECT MANAGEMENT AND COORDINATION
C.	Section 01 32 00	CONSTRUCTION PROGRESS DOCUMENTATION
D.	Section 01 32 33	PHOTOGRAPHIC DOCUMENTATION
E.	Section 01 77 00	CLOSEOUT PROCEDURES
F.	Section 01 78 39	CONTRACT RECORD DOCUMENTS
G.	Section 01 81 13.03	SUSTAINABLE DESIGN REQUIREMENTS FOR LEED v3 BUILDINGS
H.	Section 01 81 13.04	SUSTAINABLE DESIGN REQUIREMENTS FOR LEED v4 BUILDINGS

1.4 DEFINITIONS:

A. Refer to Article 2 of the Contract for definition of terms, words and expressions used in the General Conditions not otherwise defined herein.

B. Design Consultant: "Design Consultant" shall mean the entity responsible for providing design services for the Project, including without limitation, preparing the construction documents (drawings and

specifications) and providing services in connection with such documents during construction. The entity serving as the "Design Consultant" may be a corporation, firm, partnership, joint venture, individual or combination thereof. Such entity may be either an employee(s) of the City or an entity engaged by the City to provide such services.

C. Submittals: Written and graphic information that requires responsive actions and includes without limitation all shop drawings, product data, letters of certification, tests and other information required for quality control and as required by the Contract Documents.

D. Informational Submittals: Written information that does not require responsive action. Submittals may be rejected for non-compliance with the Contract.

E. Shop Drawings: Include drawings, diagrams, illustrations, schedules, performance charts, brochures, and other data, except for coordination drawings, specifically prepared for the project by the Contractor or any subcontractor, manufacturer, supplier or distributor, which illustrates how specific portions of the work shall be fabricated and/or installed.

F. Coordination Drawings: As required in Section 01 31 00 PROJECT MANAGEMENT AND COORDINATION.

G. Product Data and Quality Assurance Submittals: Includes manufacturer's standard catalogs, pamphlets and other printed materials including without limitation the following:

1. Catalogue and Product specifications
2. Installation instructions
3. Color charts
4. Catalog cuts
5. Rough-in diagrams and templates
6. Wiring diagrams
7. Performance curves
8. Operational range diagrams
9. Mill reports
10. Design data and calculations
11. Certification of compliance or conformance
12. Manufacturer's instructions and field reports

1.5 COORDINATION DRAWINGS:

A. The Contractor shall provide reproducible Coordination Drawing(s) of the reflective ceiling showing the integration of all applicable contract work, including general construction work as well as trade work (Plumbing, HVAC, and Electrical) to be performed by subcontractors. The Coordination Drawing(s) shall include, without limitation, the following information:
1. General Construction work showing the reflective ceiling plan including starting points, ceiling and beam soffits elevations, ceiling heights, roof openings, etc.
2. HVAC Contract work showing ductwork, heating and sprinkler piping, location of grilles, registers etc. and access doors in hung ceilings. Locations shall be fixed by elevations and dimensions from column centerlines and/or walls.
3. Plumbing Contract work including piping, valves, cleanouts etc., indicating locations and elevations and shall indicate the necessary access doors.
4. Electrical Contract work indicating fixtures, large conduit runs, clearances, pull boxes, junction boxes, sound system speakers, etc.

B. The Contractor shall issue the completed Coordination Drawing(s) to the Resident Engineer for his/her review. The Resident Engineer may call as many meetings as necessary with the Contractor, including attendance by applicable subcontractors, and may call on the services of the Design Consulting where necessary, to resolve any conflicts that become apparent.

C. Upon resolution of any conflicts, the Contractor shall provide a final Coordination Drawing(s) which will become the Master Coordination Drawing(s). The Master Coordination Drawing(s) shall be signed and dated by the Contractor to indicate acceptance of the arrangement of the work.

D. A reproducible copy of the Master Coordination Drawing(s) shall be provided by the Contractor to each of the appropriate subcontractor(s), the Resident Engineer and the Design Consultant for information.

E. Shop Drawings shall not be submitted prior to acceptance of the final coordinated drawings and shall be prepared in accordance with the Master Coordination Drawing(s). No work will be permitted without accepted Shop Drawings. It is therefore essential that this procedure be instituted as quickly as possible.

1.6 SUBMITTAL PROCEDURES:

A. Refer to Section 01 35 03 GENERAL MECHANICAL REQUIREMENTS and Section 01 35 06 GENERAL ELECTRICAL REQUIREMENTS for additional submittal requirements involving electrical and mechanical work or equipment of any nature called for the project.

B. Coordination: Coordinate preparation and processing of submittals with performance of construction activities.

1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activities, with the Submittal Schedule specified in Section 01 32 00 CONSTRUCTION PROGRESS DOCUMENTATION.
2. Coordinate transmittal of different types of submittals for related parts of the Work so processing will not be delayed because of need to review submittals concurrently for coordination.
3. The Commissioner reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.

C. Submittals Schedule: The Submittals Schedule is set forth in Schedule F, which is included in the Addendum.

D. Identification: Place a permanent label or title block on each submittal for identification.

1. Indicate name of firm or entity that prepared each submittal on label or title block.
2. Provide a space approximately 6 by 8 inches on label or beside title block to record Contractor's review and approval markings and action taken by Design Consultant.
3. Include the following minimum information on label for processing and recording action taken:
   a. Project name, DDC Project Number and Contract Number
   b. Date
   c. Name and address of Design Consultant
   d. Name and address of Contractor
   e. Name and address of subcontractor
   f. Name and address of supplier
   g. Name of manufacturer
   h. Submittal number or other unique identifier, including revision identifier
   i. Number and title of appropriate Specification Section
   j. Drawing number and detail references, as appropriate
   k. Location(s) where product is to be installed, as appropriate
   l. Other necessary identification

E. Transmittal:

1. Package each submittal individually and appropriately for transmittal and handling. Transmit each submittal using a transmittal form in triplicate. Transmittals received from sources other than the Contractor will be returned without review. Re-submission of the same drawings or product data shall bear the original number of the prior submission and the original titles.

2. Transmittal Form: Provide locations on form for the following information:

   a. Project name, DDC Project number and Contract Number
   b. Date
   c. Destination (To:)
   d. Source (From:)
   e. Names of Contractor, subcontractor, manufacturer, and supplier
   f. Category and type of submittal
   g. Submittal purpose and description
   h. Specification Section number and title
   i. Drawing number and detail references, as appropriate
   j. Transmittal number, numbered consecutively
   k. Submittal and transmittal distribution record
   l. Remarks
   m. Signature of transmitter

F. Shop Drawings:

1. Procedures for Preparing, Forwarding, Checking and Returning all Shop Drawings shall be, generally, as follows:

   a. The Contractor shall make available to its subcontractors the necessary Contract Documents and shall instruct such subcontractor to determine dimensions and conditions in the field, particularly with reference to coordination between the trade subcontractors. The Contractor shall direct its subcontractors to prepare Shop Drawings for submission to the Design Consultant in accordance with the requirements of these General Conditions. The Contractor shall also direct its subcontractors to "Ring Up" corrections made on all re-submissions for approval, so as to be readily seen, and that the symbol "sub" be used to identify the source of the correction or information that has been added.

      The Contractor shall:

      1. Review and be responsible to the Commissioner, for information shown on its subcontractor's Shop and Installation drawings and manufacturers' data, and also for conformity to Contract Documents.
      2. "Ring Up" corrections made on all submissions for approval, so as to be readily seen, and that the symbol "GC", "PL", "HVAC" or "EL" be used to indicate that the correction and/or information added was made by the Contractor and/or its subcontractor(s).
      3. Clearly designate which entity is to perform the work when the term, "work by others" or other similar phrases are indicated on the Contract Drawings before submission to the Design Consultant.
      4. Stamp submissions "Recommended for Acceptance", date and forward to the Design Consultant.

2. The Contractor shall promptly prepare and submit project specific layout detail and Shop Drawings of such parts of the work as are indicated in the Specifications, Schedule F of the Addendum or as required. These Shop Drawings shall be made in accordance with the Contract Drawings, Specifications and Supplementary Drawings, if any. The Shop Drawings shall be accurate and distinct and give all the dimensions required for the fabrication, erection and installation of the work.

3. Size of Drawings: The Shop Drawings, unless otherwise directed, shall be on sheets of the same size as the Contract Drawings, drawn accurately and of sufficient scale to be legible, with a one half

(1/2) inch marginal space on each side and a two (2) inch marginal space for binding on the left side.

4. Scope of Drawings: Shop Drawings shall be numbered consecutively and shall accurately and distinctly represent all aspects of the work, including without limitation the following:

   a. All working and erection dimensions
   b. Arrangements and sectional views
   c. Necessary details, including performance characteristics, and complete information for making necessary connections with other work
   d. Kinds of materials including thickness and finishes
   e. Identification of products
   f. Fabrication and installation drawings
   g. Roughing-in and setting diagrams
   h. Wiring diagrams showing field-installed wiring, including power, signal, and control wiring
   i. Shop work manufacturing instructions
   j. Templates and patterns
   k. Schedules
   l. Design calculations
   m. Compliance with specified standards
   n. Notation of coordination requirements
   o. Notation of dimensions established by field measurement
   p. Relationship to adjoining construction clearly indicated
   q. Seal and signature of professional engineer if specified
   r. Wiring Diagrams: Differentiate between manufacturer-installed and field-installed wiring
   s. All other information necessary for the work and/or required by the Commissioner

5. Titles and Reference: Shop Drawings shall be dated and contain:
   a. Name of the Project, DDC Project Number and Contract Number
   b. The descriptive names of equipment, or materials covered by the Contract Drawings and the classified item number or numbers, if any, under which it is, or they are required
   c. The locations or points and sequence at which materials, or equipment, are to be installed in the work
   d. Cross references to the section number, detail number and paragraph number of the Contract Specifications
   e. Cross references to the sheet number, detail number, etc., of the Contract Drawings

6. Field Measurements: In addition to the above requirements, the Shop Drawings shall be signed by the Contractor and, if applicable, the subcontractor responsible for preparation of the Shop Drawings. Each Shop Drawing shall be stamped with the following wording:

   FIELD MEASUREMENTS: The Contractor certifies that it has verified and supplemented the Contract Drawings by taking all required field measurements, which said measurements correctly reflect all field conditions and that this Shop Drawing incorporates said measurements.

7. Contractor's Statement with Submittal: Any Submittal by the Contractor for acceptance, including without limitation, all dimensional drawings of equipment, blueprints, catalogues, models, samples and other data relative to the equipment, the materials, the work or any part thereof, must be accompanied by a statement that the Submittal has been examined by the Contractor and that everything shown in the Submittal is in accordance with the requirements of the Contract Drawings and Specifications. If there is any discrepancy between what is shown in the Submittal and the requirements of the Contract Drawings and Specifications, the Contractor shall, in its statement, list and clearly describe each such discrepancy.

Acceptance will be given based upon the Contractor's representation that what is shown in the Submittal is in accordance with the requirements of the Contract Drawings and Specifications. If the Contractor's statement indicates any discrepancy between what is shown in the Submittal and the requirements of the Contract Drawings and Specifications, such change is subject to review and prior written acceptance by the Design Consultant. In addition, such change may require a change order in accordance with Article 25 of the Contract. In the event any such change is approved, any additional expense or increased cost in connection with the change is the sole responsibility of the Contractor.

8. Submission of Shop Drawings:

   a. Initial Submission: The Contractor shall submit seven (7) copies of each Shop Drawing to the Design Consultant for his/her review and acceptance. The Design Consultant will transmit Shop Drawings to appropriate sub-consultants for review and acceptance, including Commissioning Authority/Agent as applicable. A satisfactory Shop Drawing will be stamped "No Exceptions Taken", be dated and distributed by the Design Consultant as follows:
      1) Two (2) copies thereof will be returned to the Contractor by letter
      2) Three (3) copies of the approved Shop Drawing and copy of the transmittal letter to the Contractor will be forwarded to DDC
      3) One copy will be retained by the Design Consultant
      4) One copy will be forwarded / retained by sub-consultant(s) as appropriate

      Should the Shop Drawing(s) be "Rejected" or noted "Revise and Resubmit" by the Design Consultant, the Design Consultant will return the Shop Drawings to the Contractor with the necessary corrections and changes to be made as indicated thereon.

   b. Revisions: The Contractor must make such corrections and changes and again submit seven (7) copies of each shop drawing to the Design Consultant. The Contractor shall revise and resubmit the Shop Drawing as required by the Design Consultant until the Shop Drawings are stamped "No Exceptions Taken". However, Shop Drawings which have been stamped "Make Corrections Noted" shall be considered an "Acceptable" Shop Drawing and NEED NOT be resubmitted.

   c. Commencement of Work: No work or fabrication called for by the Shop Drawings shall be done until the acceptance of the said drawings by the Design Consultant is given. In addition to the foregoing Shop Drawing transmissions, a copy of any Shop Drawing prepared by any of the Contractor's subcontractors which Shop Drawing indicated work related to, adjacent to, impinging upon, or affecting work to be done by other subcontractors shall be transmitted to the subcontractors so affected. [These accepted Shop Drawings shall be distributed to the affected subcontractors when required with a copy of the transmittal to the Resident Engineer.]

   d. Variations: If the Shop Drawings show variations from the Contract requirements because of standard shop practice or other reasons, the Contractor shall make specific mention of such variations in its letter of submittal. Acceptance of the Shop Drawings shall constitute acceptance of the subject matter thereof only and not of any structural apparatus shown or indicated.

G. Product Data:

1. General: Except as otherwise prescribed herein, the submission, review and acceptance of Product Data and Catalogue cuts shall conform to the procedures specified in Sub-Section 1.6 F, Shop Drawings.

2. If information must be specially prepared for submittal because standard printed data are not suitable for use, submit as Shop Drawings, not as Product Data.

3. Mark each copy of each submittal to show which products and options are applicable.

4. Include the following information, as applicable:

   a. Manufacturer's written recommendations.
   b. Manufacturer's product specifications.
   c. Manufacturer's installation instructions.
   d. Standard color charts.
   e. Manufacturer's catalog cuts.
   f. Wiring diagrams showing factory-installed wiring.
   g. Printed performance curves.
   h. Operational range diagrams.
   i. Mill reports.
   j. Standard product operation and maintenance manuals.
   k. Compliance with specified referenced standards.
   l. Testing by recognized testing agency.
   m. Application of testing agency labels and seals.
   n. Notation of coordination requirements.

5. Submit Product Data before or concurrent with Samples.

6. Submission of Product Data:

   a. Initial Submission: The Contractor shall submit seven (7) sets of Product Data to the Design Consultant for his/her review and acceptance. The Design Consultant will transmit Product Data to appropriate sub-consultants for review and acceptance, including Commissioning Authority/Agent as applicable. A satisfactory catalogue cut will be stamped "No Exception Taken", be dated and distributed as follows:

      1) Two (2) copies thereof will be returned to the Contractor by letter

      2) Three (3) copies of the Product Data and copy of the transmittal letter to the Contractor will be forwarded to DDC

      3) One copy will be retained by the Design Consultant

      4) One copy will be forwarded / retained by sub-consultant(s) as appropriate

      Should the Product Data be "Rejected" or noted "Revise and Resubmit" by the Design Consultant, the Design Consultant will return one (1) set of such Product Data to the Contractor with the necessary corrections and changes to be made indicated and one (1) set to DDC.

7. Revisions: The Contractor must make such corrections and changes and again submit seven (7) copies of each Product Data for the review of the Design Consultant. The Contractor shall revise and resubmit the Product Data as required by the Design Consultant until the submission is stamped "No Exceptions Taken" by the Design Consultant. However, Product Data which has been stamped "Make Corrections Noted" shall be considered an "Accepted" Product Data and NEED NOT be resubmitted.

H. Samples of Materials:

1. For samples of materials involving electrical work of any nature, refer to Section 00 35 06 - General Electrical Requirements.

2. Samples shall be in triplicate, of sufficient size to show the quality, type, range of color, finish and texture of the material.

3. Each of the samples shall be labeled as follows:

   a. Name of the Project, DDC Project Number and Contract Number
   b. Name and quality of the material

c. Date
d. Name of Contractor, subcontractor, manufacturer and supplier
e. Related Specification or Contract Drawing reference to the samples submitted

4. A letter of transmittal, in triplicate, from the Contractor requesting acceptance must accompany all such samples.

5. Transportation charges to the Design Consultant's office must be prepaid on all samples forwarded.

6. Samples for testing purposes shall be as required in the Specifications.

7. Samples on Display: When samples are specified to be equal to approved product, they shall be carefully examined by the Contractor and by those whom the Contractor expects to employ for the furnishing of such materials.

8. Timely Submissions Log/Schedule: Samples shall be submitted in accordance with approved Shop Drawing log so as to permit proper consideration without delaying any operation under the project. Materials should not be ordered until acceptance is received, in writing, from the Design Consultant. All materials shall be furnished equal in every respect to the accepted samples.

9. The Acceptance of any samples will be given as promptly as possible, and shall be only for the characteristic color, texture, strength, or other feature of the material named in such approval, and no other. When this approval is issued by the Design Consultant, it is done with the distinct understanding that the materials to be furnished will fully and completely comply with the Specifications, the determination of which may be made at some later date by a laboratory test or by other procedure. Use of materials will be permitted only so long as the quality remains equal to the approved samples and complies in every respect with the Specifications, and the colors and textures of the samples on file in the office of the Design Consultant, for the project.

10. Acceptability of test Data: The Commissioner will be the final judge as to acceptability of laboratory test data and performance in service of materials submitted.

11. Valuable Samples: Valuable samples, such as hardware, plumbing and electrical fixtures, etc., not destroyed by inspection or test, will be returned to the Contractor and may be incorporated into the work after all questions of acceptability have been settled, providing suitable permanent records are made as to the location of the samples, their properties, etc.

12. Equivalent Quality: Any material, article and/or equipment which is designated in the Drawings and/or Specifications by a number in the catalogue of any manufacturer or by a manufacturer's grade or trade name is designated for the purpose of describing the material, article and/or equipment and fixing the standard of performance and/or function, as well as the quality and/or finish. Any material, article and/or equipment which is other than what is specified in the Drawings and/or Specifications will only be accepted if the Commissioner makes a written determination that such material, article and/or equipment is equivalent to that which is specified in the Drawings and/or Specifications.

13. The submission of any material, article and/or equipment as the equal of any material, article and/or equipment set forth in the Drawings and/or Specifications as a standard shall be accompanied by any and all information essential for determining whether such proposed material, article and/or equipment is equivalent to that which is specified. Such information shall include, without limitation, illustrations, drawings, descriptions, catalogues, records of tests, samples, as well as information regarding the finish, durability and satisfactory use of such proposed material, article and/or equipment under similar operating conditions.

REFER TO THE ADDENDUM FOR THE APPLICABILITY OF SUB-SECTION 1.7

1.7 LEED SUBMITTALS:

A. Comply with submittal requirements specified in Section 01 74 19, CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL; Section 01 81 13.03, SUSTAINABLE DESIGN REQUIREMENTS FOR LEED v3 BUILDINGS; or Section 01 81 13.04 SUSTAINABLE DESIGN REQUIREMENTS FOR LEED v4 BUILDINGS, as applicable; Section 01 81 13.13, VOLATILE ORGANIC COMPOUND (VOC) LIMITS FOR ADHESIVES, SEALANTS, PAINTS AND COATINGS FOR LEED v3 BUILDINGS; Section 01 81 19, INDOOR AIR QUALITY REQUIREMENTS FOR LEED BUILDINGS and Section 01 91 13, GENERAL COMMISSIONING REQUIREMENTS FOR MEP SYSTEMS, and/or section 01 91 15 BUILDING ENCLOSURE COMMISSIONING REQUIREMENTS.

B. LEED Building submittal information shall be assembled into one package per each applicable specification section, separate from all other non-LEED submittals. Each submittal package shall have a separate transmittal and identification as described in Sub-Section 1.5 herein.

C. Number of Copies: Submit FOUR (4) copies of LEED submittals, in accordance with procedure described in Article 1.5 herein, unless otherwise indicated.

D. Material Safety Data Sheets (MSDSs) for LEED Certification: Submit information necessary to show compliance with LEED certification requirements, which will be the limit of the Design Consultant's review for LEED compliance.

1. Designated LEED submittals that include non-LEED MSDS data will not be reviewed. The entire submittal will be returned for re-submission.

E. Product Cut Sheets and/or Shop Drawings for LEED Certification: Provide product cut sheets and/or shop drawings with the Contractor's or sub-contractor's stamp, confirming that the submitted products are the products installed in the Project. For detailed requirements refer to Sub-Section 1.6 of Section 01 81 13.03 SUSTAINABLE DESIGN REQUIREMENTS FOR LEED v3 PROJECTS, or Section 01 81 13.04 SUSTAINABLE DESIGN REQUIREMENTS FOR LEED v4 BUILDINGS.

1. Provide the quantity, length, area, volume, weight, and/or cost of each product submitted as required to satisfy LEED documentation requirements. Refer to Sub-Section 1.6 of Section 01 81 13.03 SUSTAINABLE DESIGN REQUIREMENTS FOR LEED v3 PROJECTS.

1.8 ULTRA LOW SULFUR DIESEL FUEL AND BEST AVAILABLE TECHNOLOGY REPORTING:

A. In accordance with Section 01 10 00 Summary, Sub-Section 1.5 E, the Contractor shall submit reports to the Commissioner regarding the use of Ultra Low Sulfur Diesel Fuel and Best Available Technology (BAT) in Non road Vehicles. Submission of such reports shall be in accordance with the schedule, format, directions and procedures established by the Commissioner.

1.9 CONSTRUCTION PHOTOGRAPHS AND VIDEO RECORDINGS:

A. Submit construction progress photographs and Video recordings in accordance with requirements of Section 01 32 33, PHOTOGRAPHIC DOCUMENTATION

1.10 AS-BUILT DOCUMENTS:

A. Submit all as-built documents in accordance with Section 01 78 39 CONTRACT RECORD DOCUMENTS.

PART II – PRODUCTS (Not Used)

PART III – EXECUTION (Not Used)

END OF SECTION 01 33 00

SECTION 01 35 03
GENERAL MECHANICAL REQUIREMENTS

REFER TO THE ADDENDUM FOR APPLICABILITY OF THIS SECTION 01 35 03

PART 1 GENERAL

1.1 RELATED DOCUMENTS:

A. The following documents apply to all required work for the Project: (1) the Contract Drawings, (2) the Specifications, (3) the General Conditions, (4) the Addendum, and (5) the Contract [City of New York Standard Construction Contract].

1.2 SUMMARY:

A. The General Mechanical Requirements contained herein shall be followed by the Contractor, as well as its subcontractor for HVAC work. This Section sets forth the General Requirements applicable to mechanical work for the Project. Such requirements are intended to be read in conjunction with the Specifications and Contract Drawings for the Project. In the event of any conflict between the requirements set forth in this Section and the requirements of the Specifications and/or the Contract Drawings, whichever requirement is the most stringent, as determined by the Commissioner, shall take precedence.

1.3 RELATED SECTIONS: Include without limitation the following:

A. Section 01 10 00 SUMMARY
B. Section 01 33 00 SUBMITTAL PROCEDURES
C. Section 01 35 06 GENERAL ELECTRICAL REQUIREMENTS
D. Section 01 42 00 REFERENCES
E. Section 01 77 00 CLOSEOUT PROCEDURES
F. Section 01 78 39 CONTRACT RECORD DOCUMENTS

1.4 DEFINITIONS:

A. CONCEALED PIPING AND DUCTS -: shall mean piping and ducts hidden from sight in masonry or other construction, in floor fill, trenches, partitions, hung ceilings, furred spaces, pipe shafts and in service tunnels not used for passage. Where piping and ducts run in areas that have hung ceilings, such piping and ducts shall be installed in the hung ceilings. For work on existing piping any insulation on such existing piping is to be tested for asbestos and abated, if found to be positive by a certified asbestos contractor. Such testing and abatement shall occur prior to the performance of any work on these pipes.

1.5 SUBMITTALS:

A. INTENT OF MECHANICAL CONTRACT DRAWINGS – Mechanical Contract Drawings are in part diagrammatic and show the general arrangement of the equipment, ducts and piping included in the Contract and the approximate size and location of the equipment.

B. The Contractor shall follow these Contract Drawings in laying out the work and verify the spaces in which it will be installed. The Contractors shall submit, as directed, Mechanical Shop Drawings, roughing drawings, manufacturer's Shop Drawings, field drawings, cuts, bulletins, etc., of all materials, equipment and methods of installation shown or specified in accordance with Section 01 33 00 SUBMITTAL PROCEDURES.

1. Submit sheet metal shop standards. Submit manufacturer's product data including gauges, materials, types of joints, scaling materials and installations for metal ductwork materials and products.

2. Submit scaled layout drawing (3/8"=1') of metal ductwork and fittings including, but not limited to, duct sizes, locations, elevations, slopes of horizontal runs, wall and floor penetrations and connections. Show modifications of indicated requirements made to conform to local shop practice and how those modifications ensure that free area, materials and rigidity are not reduced. Layouts should include all the room plans, mechanical equipment rooms and penthouses. Method of attachment of duct hangers to building construction all with the support details. Coordinate shop drawings with related trades prior to submission.

3. Indicate duct fittings, particulars such as gauges, sizes, welds and configuration prior to start of work for low-pressure systems.

4. Submit maintenance data and parts lists for metal ductwork materials and products. Include this data, product data and shop drawings in maintenance manual.

1.6 ACCESSIBILITY:

A. All work shall be installed by the Contractor so as to be readily accessible for inspection, operation, maintenance and repair. Minor deviations from the arrangement indicated on the Contract Drawings may be made to accomplish this, but they shall not be made without approval by the Commissioner.

1.7 CHANGES IN PIPING, DUCTS, AND EQUIPMENT:

A. Wherever field conditions are such that for proper execution of the work, reasonable changes in location of piping, ducts and equipment are necessary and required, the Contractor shall make such changes as directed and approved, without extra cost to the City.

1.8 CLEANING OF PIPING, DUCTS, AND EQUIPMENT:

A. Piping, ducts and equipment shall be thoroughly cleaned by the Contractor of all dirt, cuttings and other foreign substances. Should any pipe, duct or other part of the several systems be obstructed by any foreign matter, the Contractor will be required to pay for disconnecting, cleaning and reconnecting wherever necessary for the purpose of locating and removing obstructions. The Contractor shall pay for repairs to other work damaged in the course of removing obstructions. For work on existing piping, ducts and equipment the Contractor shall pay special attention during this task so as not to disturb the insulation on such piping, ducts or equipment.

1.9 STANDARDIZATION OF SIMILAR EQUIPMENT:

A. Unless otherwise particularly specified, all equipment of the same kind, type or classification, and used for identical purposes, shall be the product of one (1) manufacturer.

1.10 SUPPORTING STRUCTURES DESIGNED BY THE CONTRACTOR:

A. Unless otherwise specified, supporting structures for equipment to be furnished by the Contractor shall be designed by an Engineer licensed in New York State retained by the Contractor. Supporting structures shall be built by the Contractor of sufficient strength to safely withstand all stresses to which they may be subjected, within permissible deflections, and shall meet the following standards:

1. Structural Steel - ASTM Standard Specifications, AISC and New York City Construction Codes.
2. Concrete for supports for equipment shall conform to the Specifications for concrete herein, but in no case shall be less than the requirements of the New York City Construction Codes for average concrete.
3. Steel reinforcement for concrete shall be of intermediate grade and shall meet the requirements of the Standard Specifications for Billet Steel-Concrete Reinforcement Bars, ASTM.
4. Drawings and calculations shall be submitted for review and acceptance in accordance with Section 01 33 00 SUBMITTAL PROCEDURES.

1.11 ELIMINATION OF NOISE:

A. All systems and/or equipment provided under the Contract shall operate without objectionable noise or vibration.

B. Should operation of any one or more of the several systems produce noise or vibration which is, in the opinion of the Commissioner, objectionable, the Contractor shall at its own expense make changes in piping, equipment, etc. and do all work necessary to eliminate objectionable noise or vibration.

C. Should noise or vibration found objectionable by the Commissioner be transmitted by any pipe or portions of the structure from systems and/or equipment installed under the Contract, the Contractor shall at its own expense install such insulators and make such changes in or additions to the installations as may be necessary to prevent transmission of this noise or vibration.

1.12 PRELIMINARY FIELD TEST:

A. As soon as conditions permit, the Contractor shall furnish all necessary labor and materials for, and shall make, preliminary field tests of the equipment to ascertain compliance with the requirements of the Contract. If the preliminary field tests disclose equipment that does not comply with the Contract, the Contractor shall, prior to the acceptance test, make all changes, adjustments and replacements required.

1.13 INSTRUCTIONS ON OPERATION:

A. At the time the equipment is placed in permanent operation by the City, the Contractor shall make all adjustments and tests required by the Commissioner to prove that such equipment is in proper and satisfactory operating condition. The Contractor shall instruct the City's operating personnel on the proper maintenance and operation of the equipment for the period of time called for in the Specifications.

1.14 CERTIFICATES:

A. On completion of the work, the Contractor shall obtain certificates of inspection, approval, acceptance and of compliance with all laws from all agencies and/or entities having jurisdiction over the work and shall deliver these certificates to the Commissioner in accordance with Section 01 77 00 CLOSEOUT PROCEDURES. The work shall not be deemed substantially complete until the certificates have been delivered. See General Comments regarding problems with specifying items required for substantial completion.

PART II – PRODUCTS (Not Used)

PART III – EXECUTION (Not Used)

END OF SECTION 01 35 03

(No Text on This Page)

SECTION 01 35 06
GENERAL ELECTRICAL REQUIREMENTS

PART 1 – GENERAL

1.1 RELATED DOCUMENTS:

A. The following documents apply to all required work for the Project: (1) the Contract Drawings, (2) the Specifications, (3) the General Conditions, (4) the Addendum, and (5) the Contract [City of New York Standard Construction Contract].

1.2 SUMMARY:

A. This Section sets forth the General Requirements applicable to electrical work for the Project. Such requirements are intended to be read in conjunction with the Specifications and Contract Drawings for the Project. In the event of any conflict between the requirements set forth in this Section and the requirements of the Project Specifications and/or the Contract Drawings, whichever requirement is the most stringent, as determined by the Commissioner, shall take precedence.

B. This Section includes the following:

1. Procedure for Electrical Approval
2. Submittals
3. Electrical Installation Procedures
4. Electrical Conduit System Including Boxes (Pull, Junction and Outlet)
5. Electrical Wiring Devices
6. Electrical Conductors and Terminations
7. Circuit Protective Devices
8. Distribution Centers
9. Motors
10. Motor Control Equipment
11. Schedule of Electrical Equipment

1.3 RELATED SECTIONS: Include without limitation the following:

A.	Section 01 10 00	SUMMARY
B.	Section 01 33 00	SUBMITTAL PROCEDURES
C.	Section 01 35 03	GENERAL MECHANICAL REQUIREMENTS
D.	Section 01 42 00	REFERENCES
E.	Section 01 77 00	CLOSEOUT PROCEDURES
F.	Section 01 78 39	CONTRACT RECORD DOCUMENTS

1.4 DEFINITIONS:

A. WIRING: means both wire and raceway (rigid steel, heavy wall conduit unless specifically indicated otherwise).

B. POWER WIRING: means wiring from a panel board or other specified source to a starter (if required) then to a disconnect (if required), then to the final point of usage such as a motor, unit or device.

C. CONTROL and/or INTERLOCK WIRING: means that wiring that signals the device to operate or shut down in response to a signal from a remote control device such as a temperature, smoke, pressure, float, etc. device (starters and disconnect switches are not included in this definition) regardless of the voltage required for the controlling device.

D. RIGID STEEL CONDUIT: shall mean rigid steel, heavy wall conduit that is hot dipped galvanized inside and outside. The conduit shall meet the requirements of the latest edition, as amended, of the "Standard for Rigid Steel Conduit" of the Underwriters' Laboratories, Inc. Unless otherwise specified in the Specifications or indicated on the Contract Drawings, rigid steel conduit shall be used for all exposed work, for all underground conduits in contact with earth and for fire alarms systems, as required by the New York City Construction Codes.

E. ELECTRICAL METALLIC TUBING (EMT): shall mean industry standard thin wall conduit of galvanized steel only. All elbows, bends, couplings and similar fittings which are installed as a part of the conduit system shall be compatible for use with electric metallic tubing. Couplings and terminating fittings shall be of the pressure type as approved by the Commissioner. Set screw fittings will not be acceptable. EMT shall meet the requirements of the latest edition, as amended, of the "Standard for Electrical Metallic Tubing of the Underwriters Laboratories Inc." EMT may only be used where specifically indicated. In no case will EMT be permitted in spaces other than hung ceilings and dry wall partitions.

F. FLEXIBLE METALLIC CONDUIT (FMC): Shall mean a conduit made through the coiling of a self-interlocking ribbed strip of aluminum or steel, forming a hollow tube through which wires can be pulled. For final connections to motors and motorized equipment, not more than a 4' - 0" length of flexible conduit may be used. For watertight installations, this conduit shall be of a watertight type, attached with watertight glands or fittings for final connections from outlet box to recessed lighting fixtures and in locations only where specifically permitted by the Specifications or Contract Drawings.

1.5 PROCEDURE FOR ELECTRICAL APPROVAL:

This Sub-Section sets forth General Electrical information, as well as required approvals for all electrical work required for the Project, including ancillary electrical work which may be included in the work of other trade subcontractors.

A. ELECTRIC SERVICE: The electric service supply is subject to commercial and operating variation of the utility company. Proper provision shall be made to have all apparatus operate normally under these conditions.

B. ACCEPTANCE: Acceptance and approval of the work will be contingent upon the inspection and test of the installation by the City regulatory agency.

C. TESTS: The Contractor shall notify the Commissioner when the Contractor has completed the work and is ready to have it inspected and tested. Upon completion of the work tests shall be made as required by the Commissioner of all electrical materials, electrical and associated mechanical equipment, and of appliances installed hereunder. The Contractor shall furnish all labor and material for such tests. Should the tests show that any of the material, appliances or workmanship is not first class or not in compliance with the Contract, the Contractor on written notice shall remove and promptly replace them with other materials in conformity with the Contract.

D. CERTIFICATE OF THE BUREAU OF ELECTRICAL CONTROL, OF THE DEPARTMENT OF BUILDINGS (B.E.C.): The Contractor must file prior to requesting a substantial completion inspection a Certificate of Inspection issued by B.E.C. On completion of the work the Contractor shall obtain certificates of inspection, approval, acceptance and compliance from all agencies and/or entities having jurisdiction over the work and shall deliver these certificates to the Commissioner in accordance with Section 01 77 00 CLOSEOUT PROCEDURES.

E. RESPONSIBILITY FOR CARE AND PROTECTION OF EQUIPMENT:

1. The Contractor furnishing any equipment shall be responsible for the equipment until it has been finally inspected, tested and accepted, in accordance with the requirements of the Contract.

2. After delivery and before and after installation, the Contractor shall protect all equipment against theft, injury or damage from all causes. The Contractor shall carefully store all equipment received for work, which is not immediately installed. If any equipment has been subject to possible injury by water, it shall be thoroughly dried out and put through a special dielectric test as directed by the Commissioner, at the expense of the Contractor or replaced by the Contractor without additional cost to the City.

F. UNIFORMITY OF EQUIPMENT: Any two (2) or more pieces of equipment, apparatus or materials of the same kind, type or classification which are intended to be used for identical types of service, shall be made by the same manufacturer.

1.6 SUBMITTALS:

A. CONTRACTOR'S ELECTRICAL DRAWINGS AND SAMPLES FOR APPROVAL:

1. The Contractor shall submit to the Commissioner for approval, in accordance with Section 01 33 00 SUBMITTAL PROCEDURES, complete dimensional drawings of all equipment, wiring diagrams, motor test data, details of control, installation layouts showing all details and locations and including all schedules, and descriptions and supplementary data to comprise complete working drawings and instructions for the performance of the work. A description of the operation of the equipment and controls shall be included. A letter, in triplicate, shall accompany each submittal.

2. The Contractor shall submit in accordance with Section 01 33 00 SUBMITTAL PROCEDURES, duplicate samples of such materials and appliances as may be requested by the Commissioner for approval. These samples shall be properly tagged for identification and submitted for examination and test. After the samples are approved, one (1) sample will be returned to the Contractor and the other sample will be filed in the office of the Commissioner's representative for inspection use. After the Contract is completed, the second set of samples will be returned to the Contractor.

B. TIMELINESS: All material shall be submitted in accordance with the submittal schedule in sufficient time for the progress of construction. Failure to promptly submit acceptable samples and dimensional drawings of equipment will not be accepted as grounds for an extension of time. The Commissioner may decline to consider submittals unless all related items are submitted at the same time.

C. CONTRACTOR'S STATEMENT WITH SUBMITTALS: Contractor shall submit statement in accordance with Section 01 33 00, SUBMITTAL PROCEDURES.

D. BULLETINS AND INSTRUCTIONS: The Contractor shall furnish and deliver to the Commissioner in accordance with Section 01 78 39, CONTRACT RECORD DOCUMENTS and Section 01 77 00, CLOSEOUT PROCEDURES, after acceptance of the work, four (4) complete sets of instructions, technical bulletins and any other printed matter (diagrams, prints, or drawings) required to provide complete information for the proper operation, maintenance and repair of the equipment and the ordering of spare parts.

PART II – PRODUCTS (Not Used)

PART III – EXECUTION

3.1 ELECTRICAL INSTALLATION PROCEDURES:

This Sub-Section sets forth the General Installation Procedure that shall apply to all electrical work and electrical equipment appearing in the Contract.

(Refer to Sub-Section 1.4 DEFINITIONS for terms used in this section)

A. INTENT OF CONTRACT DOCUMENTS: The Drawings and Specifications are to be interpreted as a means of conveying the scope and intent of the work without giving every minor electrical detail. It is intended, nevertheless, that the Contractor shall provide whatever labor and materials are found necessary, within the scope of the Contract, for the successful operation of the installation. Specific details of individual installations are to be finally decided upon when the Contractor submits Working or Shop Drawings for approval to DDC. Whenever there are two (2) or more methods to complete project work within the Contract scope, the Commissioner reserves the right to choose that method which, in the Commissioner's opinion, will afford the most satisfactory performance, lasting qualities, and accessibility for repairs, even though this selection is the most costly.

B. SCHEMATIC PLANS – APPROXIMATE LOCATIONS: Conduits and wiring are shown on the plans for diagrammatic purposes only. Therefore, conduit layouts may not necessarily give the actual physical route of the conduits. The Contractor who installs a conduit system will also be required, as part of the work, to furnish and install all hangers and pull-boxes, including any special pull-boxes found necessary to overcome interferences, and to facilitate the pulling of electrical cables. Similarly, the locations of equipment, appliances, outlets and other items shown on Contract Drawings are only approximate and are to be definitively established when equipment Shop Drawings are submitted and approved by DDC during construction.

C. SLEEVES: required for conduits passing through walls or floors, shall be furnished and set by the Contractor installing the conduits. Sleeves in waterproofed floors shall be provided with flashing extending 12 inches in all directions from sleeve and secured to waterproofing. Flashing shall be turned down into space between pipe and sleeve and caulked watertight. Flashing shall be 20 oz. cold rolled copper. Sleeves shall be supplied with welded flanges similar to those supplied by the subcontractor for Plumbing Work and shall extend one (1) inch above finished floor.

D. COORDINATION: The Contractor shall keep in close touch with the construction progress and obtain the necessary information for the accurate placement of its work in ample time before project construction operations obstruct its work. The Contractor is to consult all other Contract Drawings, as well as approved equipment Shop Drawings on file in the Resident Engineer's Field Office. This will aid in avoiding interferences, omissions and errors in the electrical installation.

E. RESTORATION: If drilling or cutting is done on finished surfaces of equipment or the structure, any marring of the surface shall be repaired or replaced by the Contractor. The Contractor shall be held responsible for corrective restoration due to its cutting or drilling, and for any damage to the project or its contents caused by the Contractor or the Contractor's workers. If any piercing of waterproofing occurs because of the installation of the work, the Contractor shall restore the waterproofing, at its own expense, to the satisfaction of the Commissioner.

F. ELECTRICAL WORK AT SITE: The Contractor furnishing equipment consisting of a number of related electrical devices or appliances, mounted in a single enclosure, or on a common base, shall furnish this unit complete with internal wiring, connections, terminal boxes with copper connectors and/or lugs and ample electrical leads, ready for connection and operation. The cost of any wiring, re-wiring or other work

required to be done on this unit in the field, shall be borne by the Contractor without additional cost to the City.

G. COOPERATION AMONG SUBCONTRACTORS: Whenever an electrically operated unit or system involves the combined work of several subcontractors for its installation and successful operation, the Contractor shall require each subcontractor to exercise the utmost diligence in cooperating with others to produce a complete, harmonious installation.

REFER TO THE ADDENDUM FOR THE APPLICABILITY OF SUB-SECTION 3.2

3.2 ELECTRICAL CONDUIT SYSTEM INCLUDING BOXES (PULL, JUNCTION AND OUTLET):

This Sub-Section sets forth the requirements applying to the installation of electrical conduits, boxes or fittings. Rigid steel conduit shall be used throughout, unless otherwise directed by the Commissioner. Where the word 'conduit', without a modifier such as, rigid steel, EMT, etc., is specified to be used, it shall be interpreted to mean, rigid steel, heavy wall, threaded conduit.

(Refer to Sub-Section 1.4 DEFINITIONS for terms used in this section)

A. INSTALLATIONS AND APPLICATIONS:

1. Unless otherwise specified or indicated on the Contract Drawings, conduit runs shall be installed concealed in finished spaces.
2. CONDUIT SIZES: The sizes of conduit shall be as indicated on the Contract Drawings. Wherever conduit sizes are not indicated, the conduit shall meet the requirements of the New York City Electrical Code to accommodate the conductors to be installed therein.
3. Conduits shall be reamed smooth after cutting. No running threads will be permitted. Universal type couplings shall be used where required. Conduit joints shall be screwed up to butt. Empty conduits after installation shall have all open ends temporarily plugged to prevent the entrance of water or other foreign matter.
4. Conduits being installed in concrete or masonry shall be securely held in place during pouring and construction operations. A group of conduits terminating together shall be held in place by a template.
5. UNDERGROUND STEEL CONDUITS: Unless otherwise specified, all underground steel conduits in contact with earth shall be encased by the Contractor who installs them, in a covering of not less than two (2) inches of an approved concrete mixture. Concrete mix shall be one (1) part cement to four and one-half (4 ½) parts of fine and coarse aggregate.
6. EXCAVATION RESTORATION PERMITS: When installing underground conduits, duct banks or manholes the Contractor shall perform the work of cutting pavement, excavation shoring, keeping trenches or holes pumped dry, backfilling, restoration of surfaces to original condition and removal of excess earth and rubbish from premises. During the work, the Contractor shall provide adequate crossovers, protective barriers, lamps, flags, etc., to safeguard traffic and the public. When the work is in a public highway or street, the Contractor shall secure and pay for all necessary permits and inspection fees and pay the cost of repaving.
7. EXPOSED CONDUIT SUPPORTS: Exposed conduit shall be supported by Galvanized hangers with necessary inserts, beam clamps of approved design or attached to walls or ceilings by

expansion bolts. Exposed conduits shall be supported or fastened at intervals not more than five (5) feet.

8. Exposed conduit shall be installed parallel or at right angles to ceiling, walls and partitions. Where direction changes of exposed conduit cannot be made with neat bends, such as required around beams or columns, conduit type fitting shall be used.

9. The conduit shall be installed with an approved expansion joint:

   a. Wherever the conduit crosses a building expansion joint the Contractor will be held responsible for determining where the building expansion joints are located.

   b. Every 200 feet, when in straight runs of 200 feet or longer.

10. Conduit may only enter and leave a floating slab in the vertical direction, and then only in an approved manner. Horizontal entries into floating slabs are not permitted.

11. Conduit installed in pipe shafts shall be properly supported to carry the total weight of the raceway system complete with cable. In addition at least one (1) horizontal brace per 10 ft. section shall be provided to assure stability of the raceway system.

12. BUSHINGS AND LOCKNUTS: Approved bushings and locknuts shall be used wherever conduits enter outlet boxes, switch boxes, pull boxes, panel board cabinets, etc.

13. CONDUIT BENDS: shall be made without kinking conduit or appreciably reducing the internal diameter. All bends in conduit of two (2) inch in diameter or larger shall be made with an hydraulic or power pipe bender. The radius of the inner edge of any bend shall not be less than six (6) times the internal diameter of the conduit where rubber covered conductors are to be installed, and not less than 10 times the internal diameter of the conduit where lead covered conductors are to be used. Long gradual sweeps will be required, rather than sharp bends, when changes of direction are necessary.

14. EMPTY CONDUITS

   a. TESTS: All conduits and ducts required to be installed and left empty shall be tested for clear bore and correct installation by the Contractor using a ball mandrel and a brush and snake before the installation will be accepted. The ball shall be turned to approximately 85% of the internal diameter of the raceway to be tested. Two (2) short wire brushes shall be included in the mandrel assembly. Snaking of conduits, ducts, etc., shall be performed by the Contractor in the presence of the Resident Engineer. Any conduits or ducts which reject the mandrel shall be cleared at once with the Contractor bearing all costs, such as chopping concrete, to replace the defective conduit and restore the surface to its original condition.

   b. TAGS: Numbers or letters shall be assigned to the various conduit runs, and as they test clear they shall be identified by a fiber tag not less than 1-¼ inch width, attached by means of a nylon cord. All conduit terminations in panel, splice or pull boxes as well as those out of the floor or ceiling shall be tagged.

   c. TEST RECORDS: As the conduit runs clear, a record shall be kept under the heading of "Empty Conduit Tested, Left Clear, Tagged and Capped" showing conduit designation, diameter, location, date tested and by whom. When complete, this record shall be signed by the Resident Engineer and submitted in triplicate for approval. This record shall be entered on the Contract Record Drawings under Section 01 78 39, CONTRACT RECORD DOCUMENTS.

   d. CAPPING: All empty conduit and duct openings, after test, shall be capped or plugged by the Contractor as directed.

   e. DRAG LINES: A drag line shall be left in all empty conduit.

B. BOXES:

1. The Contractor shall furnish and erect all pull boxes indicated on the plans or where required. Sides, top and bottom of pull boxes shall be Galvanized coated and shall be built of No. 12 USSG steel reinforced at corners by substantial angle irons and riveted or welded to plates. Bottom or side of pull boxes shall be removable and held in place by corrosion resistant machine screws. Pull boxes in damp locations shall have threaded hubs and gaskets and be NEMA 4X. All pull boxes shall be suspended from ceiling or walls in the most substantial manner.

2. In centering outlets, the Contractor is cautioned to allow for overhead pipes, ducts and other obstructions, and for variations in arrangement and thickness of fireproofing, soundproofing and plastering. Precaution should be exercised regarding the location of window and door trims, paneling, etc. Mistakes resulting from failure to exercise precaution must be corrected by the Contractor at no additional cost to the City. Outlets in hung ceilings shall be supported from the black iron or structure.

3. The exact location of all outlets in finished rooms shall be as directed. When the interior finish has been applied, the Contractor shall make any necessary adjustment of its work to properly center the outlets. All outlet boxes for local switches near doors shall be located at the strike side of doors as finally hung, whether so indicated on the drawings or not.

4. Exposed wall outlet boxes shall be erected neatly and tight against the walls and securely anchored to same.

5. All wall outlets of each type shall be set accurately at the same level on each floor, except where otherwise specified or directed. Where special conditions occur, outlets shall be located as directed.

6. MOUNTING HEIGHTS: The following heights are standard heights and are subject to correction due to coordination with Contract Drawings. All such changes must be approved by the Resident Engineer. Heights given are from finished floor to center line of outlet or device on wall or partition, unless otherwise indicated.

a.	General Convenience Outlets (mount vertical)	1'-6"
b.	Clock Outlets	8'-6"or 1'-6" below ceiling
c.	Wall Lighting Switches	4'-0"
d.	Motor Controllers	5'-0"
e.	Motor Push-button	4'-2"
f.	Telephone Outlets	As Directed
g.	Fire Alarm Bells	8'-6"or 1'-6" below ceiling
h.	Fire Alarm Stations	4'-0"
i.	Intercom Outlet	1'-6"
j.	Cooking and Refrigerator Unit	As Directed

7. Outlet boxes shall be of approved design and construction; of form and dimensions suited and adapted to its specific location; the kind of fixture to be used and the number and arrangements of conduits, etc., connecting therewith. All ferrous outlet boxes shall meet the requirements for zinc coating as specified under Electrical Conduit Systems.

8. There shall be knockouts opened only for the insertion of conduit. Any outlet boxes with more openings than are necessary for conduit insertion shall be sealed by the Contractor without additional charge.

9. All outlet boxes and junction boxes for exposed work shall be galvanized cast iron or cast aluminum with threaded openings. Outlet boxes for exposed inside work in damp locations shall be galvanized cast iron or cast aluminum with threaded hubs and neoprene gaskets.

10. Junction boxes shall not be less than 4 11/16" square and shall be equipped with zinc coated plates. Where plates are exposed they shall be finished to match the room decor.

11. FIXTURE SUPPORTS: Outlet boxes supporting lighting fixtures shall be equipped with fixture studs held by approved galvanized stove bolts or integral with the box. Cast iron or malleable boxes shall have four (4) tapped holes for mounting required cover or fixtures.

12. Outlet boxes exposed to the weather or indicated W.P. shall be cast iron or cast aluminum and the covers made watertight with neoprene gaskets. The boxes shall have external lugs for mounting. Drilling of the body of the fitting for mounting will not be permitted. The cover screws shall be appropriate in size, non-corrodible and not less than four (4) in number for each box opening.

REFER TO THE ADDENDUM FOR THE APPLICABILITY OF SUB-SECTION 3.3

3.3 ELECTRICAL WIRING DEVICES:

A. WALL SWITCHES shall be of the best specification grade, quiet type, and shall have a rating of 20 Amperes at 277 volts, as manufactured by Bryant, Hubbell or approved equal. The mechanism shall be equipped with arc snuffers. They shall be of the tumbler type, single pole. Switches of the 3-way type shall have a similar rating.

B. RECEPTACLES:

1. CONVENIENCE OUTLETS: shall be of the best specification grade, duplex, two-pole, 3-wire, 20 Amperes at 125 volts. It shall have a grounding pole that shall be grounded to the conduit system. Receptacles shall be capable of both back and side wiring and shall have only one (1) grounding screw. Receptacles shall be Hubbell Cat. #5262 or approved equal.

2. HEAVY DUTY RECEPTACLE OUTLETS: shall have the Ampere rating and the number of poles specified on the Contract Drawings and shall be Hubbell, Russell-Stoll, Bryant, AH & H or approved equal. Each outlet shall have a grounding pole, which shall be grounded to the conduit system.

3. FLOOR RECEPTACLES: shall be Russell & Stoll #3040 or approved equal, to fit into floor box previously specified.

4. NAMEPLATES: are required for all receptacles other than 120V.

C. CLOCK HANGERS: Clock outlets for surface type clocks shall be equipped with a supporting hook and recessed faceplate to conceal the electrical cord.

D. WATERTIGHT DEVICES: For installations exposed to weather or in damp locations, the devices shall be in a gasketed, cast iron enclosure.

E. PLATES:

1. Every convenience outlet and switch outlet shall be covered by means of a stainless steel No. 302 - 0.4" antimagnetic plate with an approved finish, unless provided otherwise in the detailed Specifications.

2. Where two (2) or three (3) switches are grouped together, a single faceplate shall be used. Where more than three (3) switches are located at one (1) point, the faceplates may be made up in multiple units.

REFER TO THE ADDENDUM FOR THE APPLICABILITY OF SUB-SECTION 3.4

3.4 ELECTRICAL CONDUCTORS AND TERMINATIONS:

A. CONDUCTORS FOR LIGHT AND POWER - All wire and cable shall be of annealed copper of 98% conductivity. Aluminum wire or cable will not be permitted. The insulation shall be flame retardant, moisture and heat resistant, thermoplastic, type THW or THWN rated for 600 volts at 75 degrees C. for both wet and dry locations. Wires No. 8 or larger shall be stranded. Wires and cables shall also be subject to the requirements of the NYCEC. Cables for incoming service or wire in conduits contiguous with the earth or in concrete or other damp or wet locations shall be synthetic rubber insulated with neoprene jacket, heat and moisture resistant and shall be equal to UL Type USE and rated for 600 volts at 75 degrees C. for both wet and dry locations.

B. FIXTURE WIRE: Lighting fixtures shall be wired with No. 14 gauge wire designated as AWM and rated at 105 degrees C.

C. OTHER TYPES: Cables and wires for interior communication systems are described in applicable detailed Specifications.

D. MINIMUM SIZE: Conductors smaller than No. 12 AWG shall not be used for light or power.

E. COLOR CODE: Wires shall have a phase color code, and multiple conductor cables shall be color coded.

F. CABLE DATA: The Contractor shall submit for approval the following information for each size and type of cable to be furnished.

1. Manufacture of Cable - Location of Plant.
2. Minimum insulation resistance at standard test temperature.
3. Days required for delivery to site of work after order to proceed with manufacture.

G. ORIGINAL REELS: Cable and wire shall be delivered to the site of the work on original sealed factory reels.

H. WIRE INSTALLATION:

1. INSTALL WIRES AFTER PLASTERING - Feeder and branch circuits wiring shall not be installed in conduit before the rough plastering work is completed. No conductors shall be pulled into floor conduits before floor is poured.
2. CONDUIT SECURED IN PLACE - No conductor shall be pulled into any conduit run before all joints are made up tightly and the entire run rigidly secured in place.
3. WIRE ENDS - All wires shall be left with sufficiently long ends for proper connection and stowing.
4. PULLING COMPOUNDS - When required to ease the pulling-in of wires into conduit, only approved compounds as recommended by cable manufacturers shall be used.
5. PRESSURE CONNECTORS - for wires shall be of the cast copper or forged copper pressure plate type. Connectors shall be O.Z., Burndy, National Electric Products or approved equal.
6. Splices and feeder taps in the gutters of panel boxes shall be made by means of pressure plate type connectors encased in composition covers as manufactured by O.Z., Burndy, National Electric Products or approved equal.
7. Splices in branch wiring for sound systems and fire systems, shall be first made mechanically secure, then soldered and taped.
8. In lieu of soldered splices (except for sound and Fire Systems, which must have soldered splices) the following alternates are acceptable for operating temperatures up to 105 degrees C., for

fluorescent fixtures and for the splicing of branch circuit wiring up to No. 8 AWG wire:

a. Mechanical splices made with mechanical connectors as manufactured by the Minnesota Manufacturing Company "Scotchlock" or approved equal. Mechanical connectors requiring a special tool (pressure connectors, insulators and locking rings) by Buchanan or approved equal. The tool used for connector application shall be as approved by the connector manufacturer.

b. For wire and cable No. 6 AWG and larger for branch circuit wiring the seamless tubular connector will only be accepted. Application of this connector shall be with a tool recommended by the connector manufacturer.

9. TAGS: All feeders and risers shall be tagged at both ends, and in all pull and junction boxes and gutter spaces through which they pass. Such tags shall be of fiber and have the feeder designation and size stamped thereon.

10. BRANCH CIRCUIT WIRING:

a. The Contractor installing branch circuit wiring shall test the work for correct connections and leave all loop splices in the fixture outlet boxes properly spliced and taped. The Contractor shall provide wire ends long enough for convenient connection to device.

b. NEUTRALS: No common neutrals shall be used except for lighting branch circuits. Each neutral wire shall be terminated separately on a neutral busbar in the panelboard. No common neutrals will be permitted for convenience receptacle branch circuits.

I. TERMINATIONS

1. LUGS: All lugs for all devices and all cable terminations shall be copper. AL/CU rated lugs will not be permitted. The only exception to this requirement is when the particular device is not manufactured with copper lugs by any manufacturer. Lugs for No. 6 AWG cable and larger shall be cast copper or forged copper pressure plate type. Lugs for 1/0 and larger shall be fastened with two (2) bolts.

2. All lugs shall be of the proper size to accept the cable connected to them. Any subcontractor furnishing a device containing lugs is to coordinate with the Contractor to ensure that the device terminations are adequate for the wire or cable (whose size may be larger than expected due to voltage drop considerations) connected to the device.

REFER TO THE ADDENDUM FOR THE APPLICABILITY OF SUB-SECTION 3.5

3.5 CIRCUIT PROTECTIVE DEVICES:

This Section sets forth the circuit protective devices such as circuit breakers and safety switches, used in connection with Motor Control Equipment, Distribution Centers, Panel boards and Service Entrance.

A. CIRCUIT BREAKERS:

1. CIRCUIT BREAKERS: shall be operable in any position and shall be of the quick-make, quick-break type on manual operation. The handle shall be trip free, preventing contacts from being held in closed position against abnormal overloads or short circuits. Positive visual indication of automatic tripped position of breaker shall be provided, in addition to the "On" and "Off" indication. All circuit breakers shall be of the bolted type.

2. TRIP RATING: Circuit breakers shall be provided with the required number of trip elements, calibrated at 40 degrees C., ambient temperature, in accordance with wire sizes or motor currents as shown on Contract Drawings or indicated in the Specifications.

3. POLE BARRIER: Multipole pole breakers shall be designed to break all poles simultaneously.

They shall be provided with barriers between poles and arc suppressing devices.

4. ELEMENTS: Multipole circuit breakers shall have frames of not less than a 100 Ampere rating. Multipole circuit breakers for 480 volts AC operation shall have an NEMA interrupting rating of 18,000 Amperes, unless a higher rating is specified in the Specific Requirements or indicated on the Contract Drawings.

5. For circuit breakers with frame size up to and including 225 Amperes, the breakers may be provided with non-interchangeable trip elements. For frame ratings above 225 Amperes, the breakers shall be provided with interchangeable trip elements, which can be replaced readily.

6. Single pole circuit breakers for branch circuits shall have a frame size of no less than 100 Amperes, and shall be rated at 125 volt A.C. with a NEMA interrupting rating of 10,000 Amperes, unless a higher rating is specified in the Specifications or indicated on the Contract Drawings.

7. INVERSE TIME ACTION: The circuit breakers shall be dual element type, one (1) element with time limit characteristics, so that tripping will be prevented on momentary overloads, but will occur before dangerous values are reached and the other with instantaneous trip action. Inverse time delay action shall be effective between a minimum tripping point of 125% of rating of breaker and an instantaneous tripping point between 600% and 700% of rated current.

8. CONSTANCY OF CALIBRATION: The tripping elements shall insure constant calibration and be capable of withstanding excessive short circuit conditions without injury.

9. CONTACTS: shall be non-welding under operating conditions and of the silver to silver type.

10. TEMPERATURE RISE: Current carrying parts, except thermal elements, shall not rise in temperature in excess of 30 degrees C. while carrying rated current at rated frequency.

11. NUMBERING: Each circuit breaker shall be distinctly numbered when installed in a group with other breakers. The calibration of trip element shall be indicated on each breaker.

B. SAFETY SWITCHES:

NEMA TYPE HD: When safety switches are permitted to be used for service entrance, motor disconnecting means or to control other types of electrical equipment, they shall be of the type HD of a rating not less than 30 Amperes. Enclosures shall be provided with means for locking. For ratings above 60 Amperes terminals shall have double studs.

REFER TO THE ADDENDUM FOR THE APPLICABILITY OF SUB-SECTION 3.6

3.6 DISTRIBUTION CENTERS:

This Section sets forth the construction and installation procedure for Switchboards, Panel boards and Cabinets.

A. PANELBOARDS-GENERAL TYPE: The panel boards shall be of the automatic circuit breaker type with individual breakers for each circuit, removable without disturbing the other units. Circuit breakers shall be in accordance with the requirements outlined under "Circuit Protective Devices."

B. NUMBER AND RATING OF CIRCUIT BREAKERS: The Contract Drawings show a layout of each panel, giving the number, frame, size and trip setting of circuit breakers and number of branch circuits and spare breakers. Each branch circuit shall be distinctly numbered.

C. BUS-BAR CONSTRUCTION AND SUPPORT: Panel Boards shall be of the dead front type and shall have bus bars and branch circuits designed to suit the system and voltage. Current carrying parts, exclusive of circuit breakers shall be copper and based on a maximum density of 1,000 Amperes per square inch. Bus bars for the main switchboard shall be designed for the frame rating of the Service Breaker. Bus bars shall run up the center of the panel, unless otherwise indicated, and shall have

connected thereto the various branch circuits. Unless otherwise specified, bus bars for each panel board shall be equipped with main lugs only and capacity as required on Contract Drawings. Where main protection is required, automatic circuit breakers shall be used. A neutral bus of at least the same capacity as a live bus bar shall be provided for the connection of all neutral conductors. Each terminal shall be identified. All current carrying parts, exclusive of circuit breakers, shall be of copper with a minimum number of joints. The bus bar structure shall be a self-supporting unit, firmly fastened to a ½ inch plastic board, extending the full length and width of assembly which shall serve to insulate the bus structure from the back of panel box. Other methods affording equally effective bus structure support and insulation will be given consideration. An insulating barrier shall separate neutral bus from other parts of panel.

D. CIRCUIT BREAKER ASSEMBLY: The entire circuit breaker and bus bar assembly shall be mounted on an adjustable metal base or pan and secured to the back of panel box. The panel shall have edges flanged for rigidity.

E. PANEL MOUNTING: The panel shall be centered in the panel box to line up with door openings and set level and plumb so that no live parts are exposed with the door open.

F. PANEL CABINET:

1. PANEL CABINET INSTALLATION: When installed surface mounted in panel closets they shall be mounted on Kindorf channel.

2. Where cabinets cannot be set entirely flush due to shallow walls or partitions or where cabinet is extra deep, the protruding sides of cabinet shall be trimmed with a metal or hardwood return molding of approved design and fastened to cabinet so as to conceal the intersection between the wall and cabinet.

G. NAMEPLATES: Nameplates where required, shall be made of engraved Lamicoid sheet, or approved equal. Letters and numbers shall be engraved white on a black background (except for Firehouse projects which shall have white letters on a red background). The Contractor shall submit an engraved sample for approval as to design and style of lettering before proceeding with the manufacture of the nameplate. Nameplates shall be of suitable size and shall also be provided at the top of the switchboard or section thereof and on the trim at the top of all lighting and power panels. Similar nameplates shall also be provided for each distribution circuit breaker giving the breaker number, the number of the feeder, and the name of the equipment fed.

H. SHOP DRAWINGS: showing all details of boxes, panels, etc., shall be submitted for approval.

I. DIRECTORIES: A directory shall be fastened with brass screws and consist of a noncorrosive metal frame with dimensions not less than five (5) inches x eight (8) inches and a transparent window of Plasticile, Plexiglass, Lucite, Polycarbonate or approved equal that is not less than 1/16 inch thick over cardboard or heavy paper. The directory shall be typewritten and show the number of each circuit, the name of circuit and lighting or equipment supplied. The size of riser feeder shall be as indicated on directory. The dimensions of directory shall be submitted for approval for each size of panel.

J. CONSTRUCTION

1. FINISH: Panel boxes, doors and trim for installation in dry locations, shall be zinc coated after fabrication by the hot-dip galvanizing or electroplate process on inside and outside surfaces. In damp locations, panel boards shall be enclosed and gasketed NEMA 3R type. Panel boards located outdoors or exposed to the weather shall be NEMA 3X type.

2. PAINTING: Panel boxes, doors and trim shall receive a coat of approved priming paint and a second coat of approved paint in the field after installation. Paint shall be applied to the inside and outside of boxes and on both sides of trim. Panel trims and doors shall receive a third or finishing coat on the outside after installation. Approval as to texture and color must be obtained before the final coat is applied.

REFER TO THE ADDENDUM FOR THE APPLICABILITY OF SUB-SECTION 3.7

3.7 MOTORS:

This Section sets forth the general design, construction and performance requirements, which shall apply to all motors furnished in the Contract.

A. MOTOR DESIGN: All motors shall be designed to comply with the New York State Energy Conservation Construction Code and the New York City Energy Conservation Code. In the event of any conflict or inconsistency between such codes, the New York City Energy Conservation Code shall prevail. Motors shall have standard NEMA frames and shall have nameplate ratings adequate to meet the specified conditions of operation. Motor performance under variable conditions of voltage and frequency shall be within the limits set in NEMA standards, unless modified in the Specifications. Motors shall be expressly designed for the hazard duty load, voltage and frequency as specified in the Contract. All motor windings shall be copper. All motors intended to operate on a 208 volt system shall be designed and rated for 200 volts.

B. STANDARDS OF COMPARISON: In the absence of specific motor specifications, in general, the best standard products of the leading motor manufacturers shall be considered as a standard for comparison. The requirements of the NEMA standards for motors and generators shall be deemed to contain the minimum requirements of performance and design.

C. OBJECTIONABLE NOISES: Objectionable noises will not be tolerated and exceptionally quiet motors may be required for certain specified locations. Noise control tests as per the New York City Construction Codes may be performed as directed by the Commissioner. Such motors shall bear a nameplate lettered "Quiet Motor." Springs and slip rings shall be of approved non-ferrous material.

D. BEARINGS:

1. Bearings, unless specified otherwise, shall be of the ball or roller type. Motors one (1) horsepower and larger that are equipped with ball roller bearings shall also have lubrication of the pressure-relief greasing type. The Contractor furnishing four (4) or more such motors shall also furnish, as part of the Contract, a pressure grease gun of rugged design, of approximately 10 ounce capacity, complete with necessary adapters. The Contractor shall also provide 10 pounds of approved gun grease.

2. For any particular unit where sleeve bearings are deemed desirable, permission for their use may be granted by the Commissioner. Motors one (1) horsepower and larger that are equipped with sleeve type bearings shall in addition to having protected accessible fittings for oiling be provided with visible means for determining normal oil level. Lubrication shall be positive, automatic and continuous.

E. MOTOR TERMINALS AND BOXES: Each motor shall be furnished with flexible leads of sufficient length to extend for a distance of not less than three (3) inches beyond the face of the conduit terminal box. This box shall be furnished of ample size to make and house motor connections. These requirements shall be met irrespective of any other standards or practices. Size of cable terminals and conduit terminal box holes shall be subject to approval. For motors five (5) horsepower. or larger, each terminal shall come with two (2) cast or forged copper pressure type connectors with bolts, nuts and washers. For motors of smaller ratings, connectors of other acceptable types may be furnished. For installations exposed to the weather or moist locations, terminal boxes shall be of cast iron with threaded hubs and gasketed covers. Cover screws shall be of non-corrosive material.

F. MOTOR TEMPERATURE RISES: The motor nameplate temperature rises for the various types of motor enclosures shall be as listed below:

1.	Open Frame	40 degrees C.
2.	Totally enclosed and enclosed fan cooled	55 degrees C.

3. Explosion proof and submersible — 55 degrees C.
4. Partially enclosed and drip proof — 40 degrees C.

The temperature of the various parts of a motor shall meet the requirements of NEMA standards for the size and type of the motors. Tests for heating shall be made by loading the motor to its rated horsepower and keeping it so loaded for the rated time interval or until the temperature becomes constant.

G. SPECIAL CODE INSTALLATIONS: Electrical installations covered by special publications of NBFU and by special City rulings and regulations shall comply in design and safety features with such applicable codes, regulations and rulings, and shall be furnished and installed complete with all accessories and safety devices as therein specified.

H. MOTORS ON LIGHTING PANELS: The largest A.C. motor permitted on branch circuits of lighting panels shall not exceed 1/4 horsepower.

I. MOTORS RATED: ½ horsepower and larger shall be polyphase.

REFER TO THE ADDENDUM FOR THE APPLICABILITY OF SUB-SECTION 3.8

3.8 MOTOR CONTROL EQUIPMENT:

This Section sets forth the requirements for motor controllers and associated devices. Such requirements are applicable to all motor control equipment furnished or installed.

A. MANUFACTURER: All control equipment furnished under the Contract shall be the product of a single manufacturer. Exceptions to this rule may be granted in the case of controllers for fractional horsepower motors driving special equipment, the various units of which have been engineered to obtain specific performance.

B. CONTROL ITEMS REQUIRED: The Contractor furnishing motors shall also furnish therewith complete disconnecting, starting and control equipment as required by the detailed Specifications, the various code authorities and for the successful operation of the driven equipment. These items include circuit breaker, magnetic starter with overload protection and low voltage release or protection, push button stations, pilot lights and alarms, float, pressure, temperature and limit switches, load transfer switches, devices for manual operation and speed controllers, etc. The Contractor shall furnish as many of these items as are required for the successful operation of the driven unit.

1. Where a motor is to be located out of sight of the controller, the Contractor shall furnish an approved disconnecting means to be mounted near motor.

C. TYPES OF STARTERS:

1. SQUIRREL CAGE: A.C. motors of the squirrel cage type, rated from one (1) to 30 horsepower, shall have magnetic across the line starters; motors rated above 30 horsepower shall be furnished with reduced voltage (autotransformer type) starter or part winding start with time delay to reduce inrush current. Size of starters shall be based on 200V operation.

2. SLIP RING: A.C. Motors of the slip-ring type shall be furnished with primary across the line starters interlocked with secondary starting and regulating equipment. The interlocking feature shall prevent starting of the motor when the secondary controller is off the initial starting point.

3. MAGNETIC: For fractional horsepower motors, magnetic type starters are not required unless the particular method of controlling the driven equipment makes them necessary. Where individual single phase fractional horsepower motors or the sum of fractional horsepower motors controlled by an automatic device are ½ horsepower or more, magnetic starters and circuit breakers shall be used. Single phase A.C. motors smaller than ½ horsepower or three-phase A.C. motors smaller than one (1) horsepower where manual control is specified may be furnished with starters of toggle

switch or push button type with inbuilt thermal protection. No additional disconnecting means is required to be furnished with this type of starter. This type of starter may also be used in series with automatic control devices such as thermostats, float and pressure switches, provided the individual motor or the sum of fractional horsepower motors is less than ½ horsepower. Means for manual operation shall be provided.

D. DISCONNECTING BREAKER: All motor starters, unless otherwise specified, shall be provided with a disconnecting means in the form of a circuit breaker of the type specified under Article 3.5 CIRCUIT PROTECTIVE DEVICES. This disconnecting means shall be contained in the same housing with the starter and shall be operable from outside. Means shall be provided for locking the handle of the circuit breaker in the "OFF" position if it is desired to take the equipment out of service and prevent unauthorized starting.

E. CONTROL CABINET: DRY LOCATIONS - All starters shall be furnished with general purpose, NEMA Type 1, sheet metal enclosures with hinged covers and baked enamel finish.

F. CONTROL CABINET – WATERTIGHT: In wet locations, cast iron watertight enclosures with threaded hubs, galvanized and gasketed hinged covers shall be provided.

G. 1. PANELS: Motor control devices and appliances shall be mounted on approved insulating slabs with all wiring and connections made on the back of the slabs.

2. WIRING AND TERMINALS: Wiring connections for currents of 100 Amperes or less may be made with copper wire or cable with special flameproof insulating coverings. Such wires shall be installed in a neat workmanlike manner, flat against the slab, and held in place by clips. Connections shall be made with pressure connectors for No. 8 AWG and larger wires, and with grommets for small stranded wires. Except for incoming and outgoing main leads, all connections shall terminate on approved connector blocks, which may be installed on the face of the slab. For small, across the line starters, the above requirements may be modified if satisfactory connections are provided.

3. COPPER BUS: For currents exceeding 100 Amperes, copper bus shall be used in place of wires. The bus shall be constructed of copper rods, tubing or flat strap, bent and shaped properly and securely attached to the slab in a neat and workmanlike manner. The cross section of copper shall provide sufficient areas to keep current density at not more than 1,000 Amperes per square inch.

H. COOPERATION: The Contractor's subcontractor(s) who furnish electrically operated equipment shall give to the Contractor and the Contractor's electrical subcontractor full information relative to sizes and locations of apparatus furnished by them which require electrical connections.

I. SPARE PARTS:

1. FURNISH: The Contractor shall furnish the following spare parts pertaining to equipment furnished by each subcontractor.

One (1) set of contact fingers and springs and thermal elements for each three (3) (or fraction) of each size of magnetic contactor starter.

One (1) holding coil for each three (3) (or fraction) of each size of magnetic contactor starter.

2. WRAPPER MARKING: All parts shall be delivered to the Resident Engineer neatly wrapped and boxed and plainly tagged and marked for identification and reordering.

END OF SECTION 01 35 06

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SECTION 01 35 26
SAFETY REQUIREMENTS PROCEDURES

PART 1 – GENERAL

1.1 RELATED DOCUMENTS:

A. The following documents apply to all required work for the Project: (1) the Contract Drawings, (2) the Specifications, (3) the General Conditions, (4) the Addendum, and (5) the Contract [City of New York Standard Construction Contract].

B. The Contractor shall comply with the requirements of "*The City of New York Department of Design and Construction Safety Requirements*". This document is included in the Information for Bidders.

1.2 SUMMARY:

A. This Section includes administrative and general procedural requirements for Safety and Health Requirements, including:

1. Definitions
2. Required Safety Meeting
3. Compliance with Regulations
4. Submittals
5. Personnel Protective Equipment
6. Hazardous and / or Contaminated Materials
7. Emergency Suspension of Work
8. Protection of Personnel
9. Environmental Protection

1.3 DEFINITIONS:

A. Refer to Article 2 of the Contract for definition of terms, words and expressions used in the General Conditions not otherwise defined herein.

B. Design Consultant: "Design Consultant" shall mean the entity responsible for providing design services for the Project, including without limitation, preparing the construction documents (drawings and specifications) and providing services in connection with such documents during construction. The entity serving as the "Design Consultant" may be a corporation, firm, partnership, joint venture, individual or combination thereof. Such entity may be either an employee(s) of the City or an entity engaged by the City to provide such services.

1.4 REQUIRED SAFETY MEETINGS:

A. Prior to commencing construction, the Resident Engineer will schedule and hold a preconstruction kick-off meeting either at DDC's main office or at the Project site with representatives of the Contractor, including the principal on-site project representative and one or more safety representatives, Commissioner's designated representatives and other concerned parties for the purpose of reviewing the Contract Safety requirements. The Contractor's safety requirements shall be reviewed, and implementation of safety provisions pertinent to the Work shall be discussed.

B. The Contractor is responsible for conducting weekly documented jobsite safety meetings, given to all jobsite personnel including all subcontractors on the project, with the purpose of discussing safety topics and job specific requirements at the DDC worksite.

1.5 COMPLIANCE WITH REGULATIONS:

A. The Work, including contact with or handling of hazardous materials, disturbance or dismantling of structures containing hazardous materials, and disposal of hazardous materials, shall comply with the applicable requirement for CFR Parts 1910 and 1926, and 40 CFR, Parts 61, 261, 761 and 763.

B. Work involving disturbance or dismantling of asbestos or asbestos containing materials, demolition of structures containing asbestos and removal of asbestos, shall comply with 40 CFR Part 61, Subparts A and M, and 40 CFR Part 763, as applicable.

C. Work shall additionally comply with all applicable federal, state and local safety and health regulations.

D. In case of a conflict between applicable regulations, the more stringent requirements shall apply.

E. All workers working on the DDC project site are required by NYC Local Law 41 to complete the OSHA 10 –hour training course.

1.6 SUBMITTALS:

A. The Contractor shall submit, to the Resident Engineer, copies of the Safety Program, Site Safety Plan and other required documentation in accordance with the "*New York City Department of Design and Construction Safety Requirements.*"

B. Permits: If hazardous materials are disposed of off-site submit copies of shipping manifests and permits from applicable federal, state or local authorities and disposal facilities, and submit certificates that the material has been disposed of in accordance with regulations to the Resident Engineer.

C. Accident Reporting: Submit a copy of each accident report to the Resident Engineer in accordance with the "*New York City Department of Design and Construction Safety Requirements.*"

D. All Asbestos and Lead project regulatory notifications are to be submitted to DDC's Office of Environmental and Geotechnical Services (OEGS) through the Resident Engineer.

E. Request for Subcontractor Approval: Any subcontractor performing environmental work shall submit required documentation for approval to perform such work as required by DDC's OEGS.

PART II – PRODUCTS

2.1 PERSONNEL PROTECTIVE EQUIPMENT:

A. Special facilities, devices, equipment and similar items used by the Contractor in execution of the Work shall comply with 29 CFR Part 1910, subpart I, Part 1926, subpart E and other applicable regulations.

2.2 HAZARDOUS AND / OR CONTAMINATED MATERIALS:

A. The Contractor shall bring to the attention of the Commissioner, any material encountered during execution of the Work that the Contractor suspects to be hazardous and / or contaminated.

B. The Commissioner shall determine whether the Contractor shall perform tests to determine if the material is hazardous and / or contaminated. A change to the Contract price may be provided, subject to the applicable provisions of the Contract.

C. If the material is found to be hazardous, the Commissioner may direct the Contractor to remediate the hazard and a change to the Contract price may be provided, subject to the applicable provisions of the Contract.

PART III – EXECUTION

3.1 EMERGENCY SUSPENSION OF WORK:

A. When the Contractor is notified by the Commissioner of noncompliance with the safety provisions of the Contract, the Contractor shall immediately, unless otherwise instructed, correct the unsafe condition, at no additional cost to the City.

B. If the Contractor fails to comply promptly, all or part of the Work may be stopped by notice from the Commissioner.

C. When, in the opinion of the Commissioner, the Contractor has taken satisfactory corrective action, the Commissioner shall provide written notice to the Contractor that work may resume.

D. The Contractor shall not be allowed any extension of time or compensation for damages in connection with a work stoppage for an unsafe condition.

3.2 PROTECTION OF PERSONNEL:

A. The Contractor shall take all necessary precautions to prevent injury to the public, occupants, or damage to property of others. The public and occupants includes all persons not employed by the Contractor or a subcontractor.

B. Whenever practical, the work area shall be fenced, barricaded or otherwise blocked off from the Public or occupants to prevent unauthorized entry into the work area, in compliance with the requirements of Section 01 50 00, TEMPORARY FACILITIES, SERVICES AND CONTROLS, and including, without limitation, the following:

1. Provide traffic barricades and traffic control signage where construction activities occur in vehicular areas.
2. Corridors, aisles, stairways, doors and exit ways shall not be obstructed or used in a manner to encroach upon routes of ingress or egress utilized by the public or occupants, or to present an unsafe condition to the public or occupants.
3. Store, position and use equipment, tools, materials, scraps and trash in a manner that does not present a hazard to the public or occupant by accidental shifting, ignition or other hazardous activity.
4. Store and transport refuse and debris in a manner to prevent unsafe and unhealthy conditions for the public and occupants. Cover refuse containers, and remove refuse on a frequent regular basis acceptable to the Resident Engineer. Use tarpaulins or other means to prevent loose transported materials from dropping from trucks or other vehicles.

3.3 ENVIRONMENTAL PROTECTION:

A. Dispose of solid, liquid and gaseous contaminants in accordance with local codes, laws, ordinances and regulations.

B. Comply with applicable federal, state and local noise control laws, ordinances and regulations, including but not limited to 29 CFR 1910.95, 29 CFR 1926.52 and NYC Administrative Code Chapter 28 of Title 15.

END OF SECTION 01 35 26

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SECTION 01 35 91
HISTORIC TREATMENT PROCEDURES

REFER TO THE ADDENDUM FOR APPLICABILITY OF THIS SECTION 01 35 91

PART 1 – GENERAL

1.1 RELATED DOCUMENTS:

A. The following documents apply to all required work for the Project: (1) the Contract Drawings, (2) the Specifications, (3) the General Conditions, (4) the Addendum, and (5) the Contract [City of New York Standard Construction Contract].

1.2 SUMMARY:

A. This Section includes administrative and procedural requirements for the treatment of Landmark Structures and Landmark Quality Structures, as identified in the Addendum. Specific requirements are indicated in other sections of the Specifications.

B. This Section includes, without limitation, the following:

1. Storage and protection of existing historic materials
2. Temporary protection of historic materials during construction
3. General Protection
4. Protection during use of heat-generating equipment
5. Photographic Documentation
6. NYC Landmarks Preservation Commission Final Approval signoffs

1.3 RELATED SECTIONS: include without limitation the following:

A.	Section 01 10 00	SUMMARY
B.	Section 01 32 33	PHOTOGRAPHIC DOCUMENTATION
C.	Section 01 33 00	SUBMITTAL PROCEDURES
D.	Section 01 77 00	CLOSEOUT PROCEDURES
E.	Section 01 78 39	CONTRACT RECORD DOCUMENTS

1.4 DEFINITIONS:

A. Refer to Article 2 of the Contract for definition of terms, words and expressions used in the General Conditions not otherwise defined herein.

B. Design Consultant: "Design Consultant" shall mean the entity responsible for providing design services for the Project, including without limitation, preparing the construction documents (drawings and specifications) and providing services in connection with such documents during construction. The entity serving as the "Design Consultant" may be a corporation, firm, partnership, joint venture, individual or combination thereof. Such entity may be either an employee(s) of the City or an entity engaged by the City to provide such services.

C. Landmark Structure or Site: Any building or site which has been designated as a landmark, or any building or site within a landmark district, as designated by the New York City Preservation Commission or the New York State Historic Preservation Office.

D. Landmark Quality Structure: Any building which has been determined by the City to be of landmark quality and/or historical significance.

E. Preservation: To apply measures necessary to sustain the existing form, integrity, and materials of a historic property. Work may include preliminary measures to protect and stabilize the property.

F. Rehabilitation: To make possible a compatible use for a property through repair, alterations, and additions while preserving those portions or features that convey its historical, cultural, or architectural values.

G. Restoration: To accurately depict the form, features, and character of a property as it appeared at a particular period of time by means of the removal of features from other periods in its history and the reconstruction of missing features from the restoration period.

H. Reconstruction: To reproduce in the exact form and detail a building, structure, or artifact as it appeared at a specific period in time.

I. Stabilize: To apply measures designed to reestablish a weather-resistant enclosure and the structural reinforcement of an item or portion of the building while maintaining the essential form as it exists at present.

J. Protect and Maintain: To remove deteriorating corrosion, reapply protective coatings, and install protective measures such as temporary guards; to provide the least degree of intervention.

K. Repair: To stabilize, consolidate, or conserve; to retain existing materials and features while employing as little new material as possible. Repair includes patching, piecing-in, splicing, consolidating, or otherwise reinforcing or upgrading materials. Within restoration, repair also includes limited replacement in kind, rehabilitation, and reconstruction, with compatible substitute materials for deteriorated or missing parts of features when there are surviving prototypes.

L. Replace: To duplicate and replace entire features with new material in kind. Replacement includes the following conditions:
   1. Duplication: Includes replacing elements damaged beyond repair or missing. Original material is indicated as the pattern for creating new duplicated elements.
   2. Replacement with New Materials: Includes replacement with new material when original material is not available as patterns for creating new duplicated elements.
   3. Replacement with Substitute Materials: Includes replacement with compatible substitute materials. Substitute materials are not allowed, unless otherwise indicated.

M. Remove: To detach items from existing construction and legally dispose of them off-site, unless indicated to be removed and salvaged or removed and reinstalled.

N. Remove and Salvage: To detach items from existing construction and deliver them to the City ready for reuse.

O. Remove and Reinstall: To detach items from existing construction, repair and clean them for reuse, and reinstall them where indicated.

P. Existing to Remain or Retain: Existing items of construction that are not to be removed and that are not otherwise indicated to be removed and salvaged, or removed and reinstalled.

Q. Material in Kind: Material that matches existing materials, as much as possible, in species, cut, color, grain, and finish.

1.5 SUBMITTALS:

A. Historic Treatment Program: Submit a written plan for each phase or process, including protection of surrounding materials during operations. Describe in detail materials, methods, and equipment to be used for each phase of work.

B. Alternative Methods and Materials: If alternative methods and materials to those indicated are proposed for any phase of work, submit for Commissioner's approval a written description including evidence of successful use on other comparable projects, and program of testing to demonstrate effectiveness for use on this Project.

C. Qualification Data: For historic treatment specialists as specified and required by individual sections of the project specifications.

D. Photographs for Designated Landmark Structures: Submit photographs in accordance with Section 01 32 33, PHOTOGRAPHIC DOCUMENTATION and as described in this section.

E. Record Documents: Include modifications to manufacturer's written instructions and procedures, as documented in the historic treatment preconstruction conference and as the Work progresses.

1.6 QUALITY ASSURANCE:

A. Special Experience Requirements: Special Experience Requirements may apply to the firm that will provide Historic Treatment Services. If applicable, such Special Experience Requirements are set forth in the Bid Booklet.

B. Historic Treatment Preconstruction Conference: The Resident Engineer will schedule and hold a preconstruction meeting at the site in accordance with Section 01 31 00, PROJECT MANAGEMENT AND COORDINATION.

1. Review manufacturer's written instructions for precautions and effects of products and procedures on building materials, components, and vegetation.

a. Record procedures established as a result of the review and distribute to affected parties.

1.7 STORAGE AND PROTECTION OF HISTORIC MATERIALS:

A. Removed and Salvaged Historic Materials: As specified and required by individual sections of the project specifications.

B. Removed and Reinstalled Historic Materials: As specified and required by individual sections of the project specifications.

C. Existing Historic Materials to Remain: Protect construction indicated to remain against damage and soiling during historic treatment. When permitted by the Commissioner, items may be removed to a suitable, protected storage location during historic treatment and reinstalled in their original locations after historic treatment operations are complete.

D. Storage and Protection: When removed from their existing location, store historic materials, at a location acceptable to the Commissioner, within a weather tight enclosure where they are protected from wetting by rain, snow, or ground water, and temperature variations. Secure stored materials to protect from theft.

1. Identify removed items with an inconspicuous mark indicating their original location.

PART II – PRODUCTS (Not Used)

PART III – EXECUTION

3.1 PROTECTION, GENERAL:

A. Comply with manufacturer's written instructions for precautions and effects of products and procedures on adjacent building materials, components, and vegetation.

B. Ensure that supervisory personnel are present when work begins and during its progress.

C. Temporary Protection of Historic Materials during Construction:

1. Protect existing materials during installation of temporary protections and construction. Do not deface or remove existing materials.
2. Attachments of temporary protection to existing construction shall be approved by the Commissioner prior to installation.

D. Protect landscape work adjacent to or within work areas as follows:

1. Provide barriers to protect tree trunks.
2. Bind spreading shrubs.
3. Use coverings that allow plants to breathe and remove coverings at the end of each day. Do not cover plant material with a waterproof membrane for more than 8 hours at a time.
4. Set scaffolding and ladder legs away from plants.

E. Existing Drains: Prior to the start of work or any cleaning operations, test drains and other water removal systems to ensure that drains and systems are functioning properly. Notify Commissioner immediately of drains or systems that are stopped or blocked. Do not begin Work of this Section until the drains are in working order.

1. Provide a method to prevent solids, including stone or mortar residue, from entering the drains or drain lines. Clean out drains and drain lines that become blocked or filled by sand or any other solids because of work performed under this Contract.
2. Protect storm drains from pollutants. Block drains or filter out sediments, allowing only clean water to pass.

3.2 PROTECTION DURING USE OF HEAT-GENERATING EQUIPMENT:

A. No roofing work requiring the use of an open flame shall be permitted on any Landmark Structure or any Landmark Quality Structure, whose roof or wall structure is made of wood or primarily of wood.

B. Comply with the following procedures while performing work with heat-generating equipment, including welding, cutting, soldering, brazing, paint removal with heat, and other operations where open flames or implements utilizing heat are used:

1. Obtain Commissioner's approval for operations involving use of open-flame or welding equipment. Notification shall be given for each occurrence and location of work with heat-generating equipment.
2. As far as practical, use heat-generating equipment in shop areas or outside the building.
3. Before work with heat-generating equipment commences, furnish personnel to serve as a fire watch (or watches) for location(s) where work is to be performed.

4. Do not perform work with heat-generating equipment in or near rooms or in areas where flammable liquids or explosive vapors are present or thought to be present. Use a combustible gas indicator test to ensure that the area is safe.

5. Remove and keep the area free of combustibles, including, rubbish, paper, waste, etc., within area of operations.

6. If combustible material cannot be removed, provide fireproof blankets to cover such materials.

7. Where possible, furnish and use baffles of metal or gypsum board to prevent the spraying of sparks or hot slag into surrounding combustible material.

8. Prevent the extension of sparks and particles of hot metal through open windows, doors, holes, and cracks in floors, walls, ceilings, roofs, and other openings.

9. Inspect each location of the day's work not sooner than 30 minutes after completion of operations to detect hidden or smoldering fires and to ensure that proper housekeeping is maintained.

C. Where sprinkler protection exists and is functional, maintain it without interruption while operations are being performed. If operations are performed close to automatic sprinkler heads, shield the individual heads temporarily with guards.

3.3 PHOTOGRAPHIC DOCUMENTATION:

A. Photographs for Designated Landmark Structures: Show existing conditions prior to any historic treatments, including one overall photograph and two close-up photographs of all areas of work affected. Show one overall photograph and two close-up photographs of all areas of work after the successful execution of all historical treatments.

3.4 NEW YORK CITY LANDMARKS PRESERVATION COMMISSION FINAL APPROVALS SIGNOFF:

A. For all projects involving a Landmark Structure or Site, the Contractor, at the completion of the work, shall submit to the Commissioner, in accordance with Section 01 78 39, CONTRACT RECORD DOCUMENTS, all documentation concerning the successful execution of all historic treatments. This shall include, but not be limited to, copies of all before and after photographs of historic treatments, one copy of the Contractor's as-built drawings, copies of testing and analysis results, including cleaning, mortar analysis, pointing mortars and all other information pertaining to work performed under the New York City Landmarks Preservation Commission jurisdiction.

END OF SECTION 01 35 91

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SECTION 01 40 00
QUALITY REQUIREMENTS

PART 1 – GENERAL

1.1 RELATED DOCUMENTS:

A. The following documents apply to all required work for the Project: (1) the Contract Drawings, (2) the Specifications, (3) the General Conditions, (4) the Addendum, and (5) the Contract [City of New York Standard Construction Contract].

1.2 SUMMARY:

A. This Section includes the following:
1. Definitions
2. Conflicting Requirements
3. Quality Assurance
4. Quality Control
5. Approval of Materials
6. Special Inspections (Controlled Inspection)
7. Inspections by Other City Agencies
8. Certificates of Approval
9. Acceptance Tests
10. Repair and Protection

B. This Section includes administrative and procedural requirements for quality control to assure compliance with quality requirements specified in the Contract Documents.

C. Testing and inspecting services are required to verify compliance with requirements specified or indicated. These services do not relieve Contractor of responsibility for compliance with the Contract Document requirements.

D. Specified tests, inspections, and related actions do not limit Contractor's other quality-assurance and -control procedures that facilitate compliance with the Contract Document requirements.

E. Provisions of this Section do not limit requirements for the Contractor to provide quality-assurance and -control services required by the Commissioner or authorities having jurisdiction.

F. Specific test and inspection requirements are specified in the individual sections of the Specifications.

G. LEED: Refer to the Addendum to identify whether this project is designed to comply with a Certification Level according to the U.S. Green Building Council's Leadership in Energy & Environmental Design (LEED) Rating System, as specified in Section 01 81 13.03, "SUSTAINABLE DESIGN REQUIREMENTS FOR LEED v3 BUILDINGS" or Section 01 81 13.04 "SUSTAINABLE DESIGN REQUIREMENTS FOR LEED v4 BUILDINGS."

H. COMMISSIONING: Refer to the Addendum to identify whether this project will be Commissioned by an independent third party under separate contract with the City of New York. Commissioning shall be in accordance with ASHRAE and USGBC LEED-NC procedures, as described in Section 01 91 13, GENERAL COMMISSIONING REQUIREMENTS FOR MEP SYSTEMS, and/ or Section 01 91 15 GENERAL COMMISSIONING REQUIREMENTS FOR BUILDING ENCLOSURE. The Contractor shall cooperate with the commissioning agent and provide whatever assistance is required.

1.3 RELATED SECTIONS: Include without limitation the following:

A.	Section 01 10 00	SUMMARY
B.	Section 01 31 00	PROJECT MANAGEMENT AND COORDINATION
C.	Section 01 32 00	CONSTRUCTION PROGRESS DOCUMENTATION
D.	Section 01 33 00	SUBMITTAL PROCEDURES
E.	Section 01 77 00	CLOSEOUT PROCEDURES
F.	Section 01 78 39	CONTRACT RECORD DOCUMENTS

1.4 DEFINITIONS:

A. Refer to Article 2 of the Contract for definition of terms, words and expressions used in the General Conditions not otherwise defined herein.

B. Design Consultant: "Design Consultant" shall mean the entity responsible for providing design services for the Project, including without limitation, preparing the construction documents (drawings and specifications) and providing services in connection with such documents during construction. The entity serving as the "Design Consultant" may be a corporation, firm, partnership, joint venture, individual or combination thereof. Such entity may be either an employee(s) of the City or an entity engaged by the City to provide such services.

C. Commissioning: A Total Quality Assurance process that includes checking the design and installation of equipment, as well as performing functional testing of the same to confirm that the installed equipment is operating and in conformance with the Contract Documents and the City's requirements.

1.5 CONFLICTING REQUIREMENTS:

A. General: If compliance with two or more standards is specified and the standards establish different or conflicting requirements for minimum quantities or quality levels, the Contractor shall comply with the most stringent requirement as determined by the Commissioner. The Contractor shall refer any uncertainties and/or conflicting requirements to the Commissioner for a decision before proceeding.

B. Minimum Quantity or Quality Levels: The quantity or quality level shown or specified shall be the minimum provided or performed. The actual installation may comply exactly with the minimum quantity or quality specified, or it may exceed the minimum within reasonable limits. To comply with these requirements, indicated numeric values are minimum or maximum, as appropriate, for the context of requirements. The Contractor shall refer any uncertainties to the Commissioner for a decision before proceeding.

1.6 QUALITY ASSURANCE:

A. General: Qualifications paragraphs in this Article establish the minimum qualification levels required. Individual Specification Sections specify additional requirements.

B. Installer Qualifications: Special Experience Requirements may apply to the firm that will install, erect or assemble specified work required for the Project. If applicable, such Special Experience Requirements are set forth in the Bid Booklet.

C. Manufacturer Qualifications: Special Experience Requirements may apply to the firm that will manufacture equipment, products or systems specified for the Project. If applicable, such Special Experience Requirements are set forth in the Bid Booklet.

D. Fabricator Qualifications: Special Experience Requirements may apply to the firm that will fabricate material, products or systems specified for the Project. If applicable, such Special Experience Requirements are set forth in the Bid Booklet.

E. Professional Engineer Qualifications: A professional engineer who is licensed to practice in the State of New York and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of the system, assembly, or products that are similar to those indicated for this Project in material, design, and extent.

F. Factory-Authorized Service Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.

G. Mockups: Before installing portions of the Work requiring mockups, build mockups for each form of construction and finish required to comply with the following requirements, using materials indicated for the completed Work:

1. Build mockups in location and of size indicated or, if not indicated, as directed by the Resident Engineer.
2. Notify Resident Engineer seven (7) days in advance of dates and times when mockups will be constructed.
3. Demonstrate the proposed range of aesthetic effects and workmanship.
4. Obtain Design Consultant's approval of mockups before starting work, fabrication, or construction.
5. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
6. Demolish and remove mockups when directed, unless otherwise directed or indicated.

1.7 QUALITY CONTROL:

A. City's Responsibilities: Where quality-control services are indicated as the City's responsibility in the Specifications, the City will engage a qualified testing agency to perform these services.

1. COST OF TESTS BORNE BY THE CITY: Where the City directs tests to be performed to determine compliance with the Specifications regarding materials or equipment, and where such compliance is ascertained as a result thereof, the City will bear the cost of such tests.
2. The City will furnish the Contractor with names, addresses, and telephone numbers of testing entities engaged and a description of the types of testing and inspecting they are engaged to perform.
3. Costs for retesting and re-inspecting construction that replaces or is necessitated by work that failed to comply with the Contract Documents will be charged to the Contractor.

B. Contractor's Responsibility: Tests and inspections not explicitly assigned to the City are the Contractor's responsibility. Unless otherwise indicated, the Contractor shall provide quality-control services as set forth in the Specifications and those required by Authorities having jurisdiction. The Contractor shall provide quality-control services required by Authorities having jurisdiction, whether specified or not.

1. COST OF TESTS BORNE BY CONTRACTOR – In the case of tests which are specifically called for in the Specifications to be provided by the Contractor or tests which are required by any Authority having jurisdiction, but are not indicated as the responsibility of the City, the cost thereof shall be borne by the Contractor and shall be deemed to be included in the Contract price. The Contractor shall reimburse the City for expenditures incurred in providing tests on materials and equipment submitted by the Contractor as the equivalent of that specifically named in the Specifications and rejected for non-compliance.
2. Where services are indicated as Contractor's responsibility, the Contractor shall engage a qualified testing agency to perform these quality-control services. Any testing agency engaged by the Contractor to perform quality control services is subject to prior approval by the Commissioner.

3. The Contractor shall not employ same entity engaged by the City, unless agreed to in writing by the Commissioner.
4. The Contractor shall notify testing agencies and the Resident Engineer at least 72 hours in advance of the date and time for the performance of Work that requires testing or inspecting.
5. Where quality-control services are indicated as Contractor's responsibility, the Contractor shall submit a certified written report, in triplicate to the Commissioner, of each quality-control service.
6. Testing and inspecting requested by the Contractor and not required by the Contract Documents are Contractor's responsibility.
7. The Contractor shall submit additional copies of each written report directly to authorities having jurisdiction, when they so direct.

C. Manufacturer's Field Services: Where indicated, the Contractor shall engage a factory-authorized service representative to inspect field-assembled components and equipment installation, including service connections. Results shall be submitted in writing as specified in Section 01 33 00 SUBMITTAL PROCEDURES.

D. Retesting/Re-inspecting: Regardless of whether the original tests or inspections were the Contractor's responsibility, the Contractor shall provide quality-control services, including retesting and re-inspecting, for construction that replaced Work that failed to comply with the Contract Documents.

E. Associated Services: The Contractor shall cooperate with entities performing required tests, inspections, and similar quality-control services, and shall provide reasonable auxiliary services as requested. The Contractor shall notify the testing agency sufficiently in advance of operations to permit assignment of personnel. Provide the following:

1. Access to the Work.
2. Incidental labor and facilities necessary to facilitate tests and inspections.
3. Adequate quantities of representative samples of materials that require testing and inspecting. Assist testing entity in obtaining samples.
4. Facilities for storage and field curing of test samples.
5. Delivery of samples to testing entities.
6. Design mix proposed for use for material mixes that require control by the testing entity.
7. Security and protection for samples and for testing and inspecting equipment at the Project site.

F. Coordination: Coordinate sequence of activities to accommodate required quality-assurance and -control services with a minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspecting.

1. Schedule times for tests, inspections, obtaining samples, and similar activities.

2. Coordinate and cooperate with the Commissioning Authority/Agent as applicable for start-up, inspection and functional testing in the implementation of the Commissioning Plan.

G. Manufacturer's Directions: Where the Specifications provide that the manufacturer's directions are to be used, such printed directions shall be submitted to the Commissioner.

H. Inspection of Material: In the event that the Specifications require the Contractor to engage the services of an entity to witness and inspect any material especially manufactured or prepared for use in or part of the permanent construction, such entity shall be subject to prior written approval by the Commissioner.

1. NOTICE - The Contractor shall give notice in writing to the Commissioner sufficiently in advance of its intention to commence the manufacture or preparation of materials especially manufactured or prepared for use in or as part of the permanent construction. Such notice shall contain a request for inspection, the date of commencement and the expected date of completion of the manufacture or preparation of materials. Upon receipt of such notice, the Commissioner will arrange to have a representative present at such times during the manufacture as may be necessary to inspect the materials, or the Commissioner will notify the Contractor that the inspection will be made at a point

other than the point of manufacture, or the Commissioner will notify the Contractor that inspection will be waived.

I. No Shipping Before Inspection: The Contractor shall comply with the foregoing before shipping any material.

J. Certificate of Manufacture: When the Commissioner so requires, the Contractor shall furnish to the Commissioner authoritative evidence in the form of Certificates of Manufacture that the materials to be used in the work have been manufactured and tested in conformity with the Specifications. These certificates shall include copies of the results of physical tests and chemical analyses where necessary, that have been made directly on the product, or on similar products being fabricated by the manufacturer. This may include such approvals as B.S.A., M.E.A., B.E.C. Advisory Board, etc.

K. Acceptance: When materials or manufactured products shall comprise such quantity that it is not practical to make physical tests or chemical analyses directly on the product furnished, a certificate stating the results of such tests or analyses of similar materials which were concurrently produced may, at the discretion of the Commissioner, be considered as the basis for the acceptance of such material or manufactured product.

L. Testing Compliance: The testing personnel shall make the necessary inspections and tests, and the reports thereof shall be in such form as will facilitate checking to determine compliance with the Specifications, indicating thereon all analyses and/or test data and interpreted results thereof.

M. Reports: Six (6) copies of the reports shall be submitted and authoritative certification thereof must be furnished to the Commissioner as a prerequisite for the acceptance of any material or equipment.

N. Rejections: If, in making any test, it is ascertained by the Commissioner that the material or equipment does not comply with the Specifications, the Contractor will be notified thereof, and will be directed to refrain from delivering said materials or equipment, or to promptly remove it from the site or from the work and replace it with acceptable material at no additional cost to the City.

O. Furnish Designated Materials: Upon rejection of any material or equipment submitted as the equivalent of that specifically named in the Specifications, the Contractor shall immediately proceed to furnish the designated material or equipment.

1.8 APPROVAL OF MATERIALS:

A. Local Laws: All materials, appliances and types or methods of construction shall be in accordance with the Specifications and shall in no event be less than that necessary to conform to the requirements of the New York City Construction Codes, Administrative Code and Charter of the City of New York.

B. Approval of Manufacturer: The names of proposed manufacturers, material suppliers, and dealers who are to furnish materials, fixtures, equipment, appliances or other fittings shall be submitted to the Commissioner for approval, as early as possible, to afford proper review and analysis. No manufacturer will be approved for any materials to be furnished under the Contract unless it shall have a plant of ample capacity and shall have successfully produced similar products. All approvals of materials or equipment that are legally required by the New York City Construction Codes and other governing Authorities must be obtained prior to installation.

C. All Materials: Fixtures, fittings, supplies and equipment furnished under the Contract shall be new and unused, except as approved by the Commissioner, and of standard first-grade quality and of the best workmanship and design. The City of New York encourages the use of recycled products where practical.

D. INFORMATION TO SUPPLIERS - In asking for prices on materials under any item of the Contract, the Contractor shall provide the manufacturer or dealer with such complete information from the

Specifications and Contract Drawings as may in any case be necessary, and in every case the Contractor shall inform the manufacturer or dealer of all the General Conditions and requirements herein contained.

1.9 SPECIAL INSPECTIONS:

A. SPECIAL INSPECTIONS:

1. Inspection of selected materials, equipment, installation, fabrication, erection or placement of components and connections made during the progress of the Work to ensure compliance with the Contract Documents and provisions of the New York City Construction Codes, shall be made by a Special Inspector. The City of New York will retain the services of the Special Inspector and bear the costs for the performance of Special Inspections in compliance with NYC Construction Codes requirements or as additionally may be called for in the project specifications, except as noted below for Form TR-3: Technical Report for Concrete Design Mix. The Special Inspector shall be an entity compliant with the requirements of the New York City Construction Codes. The Contractor shall notify the relevant Special Inspector in writing at least 72 hours before the commencement of any work requiring special inspection.
2. Form TR3: Technical Report Concrete Design Mix: The contractor shall be responsible for, and bear all costs associated with the filing and securing of approvals, if any, for Form TR3: Technical Report Concrete Design Mix, including, but not limited to, engaging the services of a New York City licensed Concrete Testing Lab for the review and approval of concrete design mix, testing, signatures and professional seals, etc., compliant with NYC Department of Buildings requirements, for each concrete design mix.
3. The Contractor shall notify the relevant Special Inspector in writing at least 72 hours before the commencement of any work requiring Special Inspection. The contractor shall be responsible for, and bear related costs to assure that all construction or work shall remain accessible and exposed for inspection purposes until the required inspection is completed.
4. Inspections and tests performed under "Special Inspection" shall not relieve the Contractor of the responsibility to comply with the Contract Documents, and that there is no warranty given to the Contractor by the City of New York in connection with such inspection and tests or certifications made under "Special Inspections".
5. The contractor must coordinate with the Resident Engineer or DDC Project Manager to provide access and schedule the work for inspection by the Special Inspector.

1.10 INSPECTIONS BY OTHER CITY AGENCIES:

A. Letter of Completion: Just prior to substantial completion of this Project, the Commissioner will file with the Department of Buildings, an application for a Letter of Completion or a Certificate of Occupancy for the structure.

B. Final Inspections: In connection with the above mentioned application for a Letter of Completion or a Certificate of Occupancy and before certificates of final payments are issued, the Contractor will be required to arrange for all final inspections by the inspection staff of the Department of Buildings, Fire Department or other Governmental Agencies having jurisdiction, and secure all reports, sign offs, certificates, etc., by such inspection staff or other governmental agencies, in order that a Letter of Completion or Certificate of Occupancy can be issued promptly.

1.11 CERTIFICATES OF APPROVAL:

A. Responsibility: The Contractor shall be responsible for and shall obtain all final approvals for the work installed under the Contract in the form of such certificates that are required by all governmental agencies having jurisdiction over the work of the Contract.

B. Transmittal: All such certificates shall be forwarded to the Commissioner through the Resident Engineer.

1.12 ACCEPTANCE TESTS:

A. Government Agencies: All equipment and appliances furnished and installed under the Contract shall conform to the requirements of the Specifications, and shall in no event be less than that necessary to comply with the minimum requirements of the law and all of the governmental agencies having jurisdiction.

B. Notice of Tests: Whenever the Specifications and/or any governmental agency having jurisdiction requires the acceptance test, the Contractor shall give written notice to all concerned of the time when these tests will be conducted.

C. Energy: The City will furnish all energy, fuel, water and light required for tests.

D. Labor and Materials: The Contractor shall furnish labor and all other material and instruments necessary to conduct the acceptance tests at no additional cost to the City.

E. Certificates: The final acceptance by the Commissioner shall be contingent upon the Contractor delivering to the Commissioner all necessary certificates evidencing compliance in every respect with the requirements of the regulatory agencies having jurisdiction.

F. Results: If the results of tests and Special Inspections indicate that the material or procedures do not meet requirements as set forth on the Contract Drawings or in the Specifications or are otherwise unsatisfactory, the Contractor shall only proceed as directed by the Resident Engineer. Additional costs resulting from retesting, re-inspecting, replacing of material and/or damage to the work and any delay caused to the schedule shall be borne by the Contractor.

PART II – PRODUCTS (Not Used)

PART III – EXECUTION

3.1 REPAIR AND PROTECTION

A. General: On completion of testing, inspecting, sample taking, and similar services, the Contractor shall repair damaged construction and restore substrates and finishes.
   1. Provide materials and comply with installation requirements specified in other Specification Sections. Restore patched areas and extend restoration into adjoining areas with durable seams that are as invisible as possible.

END OF SECTION 01 40 00

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SECTION 01 42 00
REFERENCES

PART 1 – GENERAL

1.1 RELATED DOCUMENTS:

A. The following documents apply to all required work for the Project: (1) the Contract Drawings, (2) the Specifications, (3) the General Conditions, (4) the Addendum, and (5) the Contract [City of New York Standard Construction Contract].

1.2 DEFINITIONS:

REFER TO THE ADDENDUM, Article IX, FOR ADDITIONAL DEFINITIONS AND REVISIONS TO THE CONTRACT AND SPECIFICATIONS

A. Refer to Article 2 of the Contract for definition of terms, words and expressions used in the General Conditions not otherwise defined herein.

B. "APPROVED," ETC. - "Approved," "acceptable," "satisfactory," and words of similar import shall mean and intend approved, acceptable or satisfactory to the Commissioner.

C. Design Consultant: "Design Consultant" shall mean the entity responsible for providing design services for the Project, including without limitation, preparing the construction documents (drawings and specifications) and providing services in connection with such documents during construction. The entity serving as the "Design Consultant" may be a corporation, firm, partnership, joint venture, individual or combination thereof. Such entity may be either an employee(s) of the City or an entity engaged by the City to provide such services.

D. "DIRECTED," "REQUIRED," ETC.- Wherever reference is made in the Contract to the work or its performance, the terms "directed," "required," "permitted," "ordered," "designated," "prescribed," "determined," and words of similar import shall, unless expressed otherwise, imply the direction, requirements, permission, order, designation or prescription of the Commissioner.

E. "Indicated": Requirements expressed by graphic representations or in written form on Drawings, in Specifications, and in other Contract Documents. Other terms including "shown," "noted," "scheduled," and "specified" have the same meaning as "indicated."

F. "Furnish": Supply and deliver to Project site, ready for unloading, unpacking, assembly, installation, and similar operations.

G. "Install": Operations at Project site including unloading, temporarily storing, unpacking, assembling, erecting, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning, and similar operations.

H. "Provide": Furnish and install, complete and ready for the intended use.

I. "Project Site": Space available for performing construction activities. The extent of Project site is shown on Drawings.

1.3 CODES, AGENCIES AND REGULATIONS:

A.D.A.A.G.	Americans with Disabilities Act (ADA) – Architectural Barriers Act (ABA)
B.G. & E.	Bureau of Gas and Electricity of the City of New York
B.S. & A.	New York City Board of Standards and Appeals
DOE	Department of Energy
E.C.C.C.N.Y.S.	Energy Conservation Construction Code of New York State
EPA	Environmental Protection Administration
N.Y.C.C.C.	New York City Construction Codes – includes:
	New York City Plumbing Code
	New York City Building Code
	New York City Mechanical Code
	New York City Fuel Gas Code
N.Y.S.D.O.L	New York State Department of Labor
N.Y.C.D.E.P	New York City Department of Environmental Protection
N.Y.C.E.C.	New York City Electrical Code
N.Y.C.E.C.C	New York City Energy Conservation Code
N.Y.C.F.C	New York City Fire Code
N.Y.S...D.E.C.	New York State Department of Environmental Conservation
O.S.H.A.	Occupational Safety & Health Administration

1.4 INDUSTRY STANDARDS:

A. STANDARD REFERENCES – Unless otherwise specifically indicated in the Contract Documents, whenever reference is made to the furnishing of materials or testing thereof that conforms to the standards of any technical society, organization or body, it shall be construed to mean the latest standard, code, specification adopted and published by that technical society, organization or body, as of the date of the bid opening, Unless the provisions of the New York City Construction Codes adopts a different or earlier dated version of such standard.

B. APPLICABILITY OF STANDARDS: Unless the Contract Documents include more stringent requirements, applicable construction industry standards have the same force and effect, to the extent referenced, as if bound or copied directly into the Contract Documents. Such standards are made a part of the Contract Documents by reference.

C. CONFLICTING REQUIREMENTS: Where compliance with two or more standards is specified and the standards establish different or conflicting requirements for minimum quantity or quality, comply with the most stringent requirements. Immediately refer uncertainties, and requirements that are different but apparently equal, to the Commissioner in writing for a decision before proceeding.

D. STANDARD SPECIFICATIONS - When no reference is made to a code, standard or specification, the Standard Specifications of the ASTM or the AIEE, as the case may be, shall govern.

E. REFERENCES - Reference to a technical society, organization or body may be made in the Specifications by abbreviations. Abbreviations and acronyms used in the Specifications and other Contract Documents mean the associated name. The following names are subject to change and are

believed, but are not assured, to be accurate and up-to-date as of the Issue Date of the Contract Documents.

AA	Aluminum Association, Inc. (The)
AAADM	American Association of Automatic Door Manufacturers
AABC	Associated Air Balance Council
AAMA	American Architectural Manufacturers Association
AASHTO	American Association of State Highway and Transportation Officials
AATCC	American Association of Textile Chemists and Colorists (The)
ABAA	Air Barrier Association of America
ABMA	American Bearing Manufacturers Association
ACI	ACI International (American Concrete Institute)
ACPA	American Concrete Pipe Association
AEIC	Association of Edison Illuminating Companies, Inc. (The)
AF&PA	American Forest & Paper Association
AGA	American Gas Association
AGC	Associated General Contractors of America (The)
AGMA	American Gear Manufacturer Association
AHA	American Hardboard Association (Now part of CPA)
AHAM	Association of Home Appliance Manufacturers
AI	Asphalt Institute
AIA	American Institute of Architects (The)
AIEE	American Institute of Electrical Engineers

AISC	American Institute of Steel Construction
AISI	American Iron and Steel Institute
AITC	American Institute of Timber Construction
ALCA	Associated Landscape Contractors of America (Now PLANET - Professional Landcare Network)
ALSc	American Lumber Standard Committee, Incorporated
ALI	Automotive Lift Institute
AMCA	Air Movement and Control Association International, Inc.
ANSI	American National Standards Institute
AOSA	Association of Official Seed Analysts, Inc.
APA	APA - The Engineered Wood Association
APA	Architectural Precast Association
API	American Petroleum Institute
ARI	Air-Conditioning & Refrigeration Institute
ARMA	Asphalt Roofing Manufacturers Association
ASA	American Standards Association
ASAE	American Society of Agricultural Engineers
ASCE/SEI	American Society of Civil Engineers, Structural Engineering Institute
ASHRAE	American Society of Heating, Refrigerating and Air-Conditioning Engineers
ASME	American Society of Mechanical Engineers
ASSE	American Society of Sanitary Engineering
ASTM	ASTM International (American Society for Testing and Materials International)
AWCI	AWCI International (Association of the Wall and Ceiling Industry International)

AWCMA	American Window Covering Manufacturers Association (Now WCSC)
AWI	Architectural Woodwork Institute
AWPA	American Wood-Preservers' Association
AWSC	American Welding Society
AWWA	American Water Works Association
BHMA	Builders Hardware Manufacturers Association
BIA	Brick Industry Association (The)
BICSI	BICSI
BIFMA	BIFMA International (Business and Institutional Furniture Manufacturer's Association International)
BISSC	Baking Industry Sanitation Standards Committee
CIBSE	Charted Institute of Building Services Engineers
CCC	Carpet Cushion Council
CDA	Copper Development Association
CEA	Canadian Electricity Association
CFFA	Chemical Fabrics & Film Association, Inc.
CGA	Compressed Gas Association
CGSB	Canadian General Standards Board
CIMA	Cellulose Insulation Manufacturers Association
CIPRA	Cast Iron Pipe Research Association
CISCA	Ceilings & Interior Systems Construction Association
CISPI	Cast Iron Soil Pipe Institute
CLFMI	Chain Link Fence Manufacturers Institute

CPA	Composite Panel Association
CPPA	Corrugated Polyethylene Pipe Association
CPSC	Consumer Product Safety Commission
CRI	Carpet & Rug Institute (The)
CRSI	Concrete Reinforcing Steel Institute
CSA	Canadian Standards Association
CSI	Cast Stone Institute
CSI	Construction Specifications Institute (The)
CSSB	Cedar Shake & Shingle Bureau
CTI	Cooling Technology Institute (Formerly: Cooling Tower Institute)
DASMA	Door and Access Systems Manufacturer's Association International
DHI	Door and Hardware Institute
DOC	U.S. Department of Commerce – National Institute of Standards and Technology
EIA	Electronic Industries Alliance
DOJ	U.S. department of Justice
EIMA	EIFS Industry Members Association
DOL	U.S. Department of labor
EJCDC	Engineers Joint Contract Documents Committee
DOTn	U.S. Department of Transportation
EN	European Committee of Standards
EJMA	Expansion Joint Manufacturers Association, Inc.
ESD	ESD Association
EVO	Efficiency Valuation Organization
FEME	Federal Emergency Management Agency
FIBA	Federation Internationale de Basketball Amateur (The International Basketball Federation)

FIVB	Federation Internationale de Volleyball (The International Volleyball Federation)
FMG	FM Global (Formerly: FM - Factory Mutual System)
FMRC	Factory Mutual Research (Now FMG)
FRSA	Florida Roofing, Sheet Metal & Air Conditioning Contractors Association, Inc.
FSA	Fluid Sealing Association
FSC	Forest Stewardship Council
GA	Gypsum Association
GANA	Glass Association of North America
GRI	(Now GSI)
GS	Green Seal
GSI	Geosynthetic Institute
HI	Hydraulic Institute
HI	Hydronics Institute
HMMA	Hollow Metal Manufacturers Association (Part of NAAMM)
HPVA	Hardwood Plywood & Veneer Association
HPW	H. P. White Laboratory, Inc.
HUD	U.S. Department of Housing and Urban Development
IAPMO	International Association of Plumbing and Mechanical Officials
IAS	International Approval Services (Now CSA International)
IBF	International Badminton Federation
ICC	International Code Council, Inc.
ICEA	Insulated Cable Engineers Association, Inc.
ICRI	International Concrete Repair Institute, Inc.

IEC	International Electrotechnical Commission
IEEE	Institufe of Electrical and Electronics Engineers, Inc. (The)
IESNA	Illuminating Engineering Society of North America
IEST	Institute of Environmental Sciences and Technology
IGCC	Insulating Glass Certification Council
IGMA	Insulating Glass Manufacturers Alliance
ILI	Indiana Limestone Institute of America, Inc.
ISO	International Organization for Standardization
ISSFA	International Solid Surface Fabricators Association
ITS	Intertek
ITU	International Telecommunication Union
KCMA	Kitchen Cabinet Manufacturers Association
LMA	Laminating Materials Association (Now part of CPA)
LPI	Lightning Protection Institute
MBMA	Metal Building Manufacturers Association
MFMA	Maple Flooring Manufacturers Association, Inc.
MFMA	Metal Framing Manufacturers Association
MH	Material Handling (Now MHIA)
MHIA	Material Handling Industry of America
MIA	Marble Institute of America
MPI	Master Painters Institute
MSS	Manufacturers Standardization Society of The Valve and Fittings Industry Inc.
NAAMM	National Association of Architectural Metal Manufacturers

NACE	NACE International (National Association of Corrosion Engineers International)
NADCA	National Air Duct Cleaners Association
NAGWS	National Association for Girls and Women in Sport
NAIMA	North American Insulation Manufacturers Association
NBGQA	National Building Granite Quarries Association, Inc.
NCAA	National Collegiate Athletic Association (The)
NCMA	National Concrete Masonry Association
NCPI	National Clay Pipe Institute
NCTA	National Cable & Telecommunications Association
NEBB	National Environmental Balancing Bureau
NECA	National Electrical Contractors Association
NeLMA	Northeastern Lumber Manufacturers' Association
NEMA	National Electrical Manufacturers Association
NETA	InterNational Electrical Testing Association
NFHS	National Federation of State High School Associations
NFPA	NFPA (National Fire Protection Association)
NFRC	National Fenestration Rating Council
NGA	National Glass Association
NHLA	National Hardwood Lumber Association
NLGA	National Lumber Grades Authority
NIS	National Institute of Standards and Technology
NOFMA	NOFMA: The Wood Flooring Manufacturers Association (Formerly: National Oak Flooring Manufacturers Association)

NRCA	National Roofing Contractors Association
NRMCA	National Ready Mixed Concrete Association
NSF	NSF International (National Sanitation Foundation International)
NSSGA	National Stone, Sand & Gravel Association
NTMA	National Terrazzo & Mosaic Association, Inc. (The)
NTRMA	National Tile Roofing Manufacturers Association (Now TRI)
NWWDA	National Wood Window and Door Association (Now WDMA)
OPL	Omega Point Laboratories, Inc. (Acquired by ITS - Intertek)
PCI	Precast / Pre-stressed Concrete Institute
PDCA	Painting & Decorating Contractors of America
PDI	Plumbing & Drainage Institute
PGI	PVC Geomembrane Institute
PLANET	Professional Landcare Network (Formerly: ACLA - Associated Landscape Contractors of America)
PPS	Power Piping Society
PTI	Post-Tensioning Institute
RCSC	Research Council on Structural Connections
RFCI	Resilient Floor Covering Institute
RIS	Redwood Inspection Service
RMI	Rack Manufacturers Institute
RTI	(Formerly: NTRMA - National Tile Roofing Manufacturers Association) (Now TRI)
SAE	SAE International
SCAQMD	South Coast Air Quality Management District

SCS	Scientific Certification System
SDI	Steel Deck Institute
SDI	Steel Door Institute
SEFA	Scientific Equipment and Furniture Association
SGCC	Safety Glazing Certification Council
SHBI	Steel Heating Boiler Institute
SIA	Security Industry Association
SIGMA	Sealed Insulating Glass Manufacturers Association (Now IGMA)
SJI	Steel Joist Institute
SMA	Screen Manufacturers Association
SMACNA	Sheet Metal and Air Conditioning Contractors' National Association
SMPTE	Society of Motion Picture and Television Engineers
SPFA	Spray Polyurethane Foam Alliance (Formerly: SPI/SPFD - The Society of the Plastics Industry, Inc.; Spray Polyurethane Foam Division)
SPIB	Southern Pine Inspection Bureau (The)
SPRI	Single Ply Roofing Industry
SSINA	Specialty Steel Industry of North America
SSPC	SSPC: The Society for Protective Coatings
STI	Steel Tank Institute
SWI	Steel Window Institute
SWRI	Sealant, Waterproofing, & Restoration Institute
TCA	Tile Council of America, Inc.
TIA/EIA	Telecommunications Industry Association/Electronic Industries Alliance

TMS	The Masonry Society
TPI	Truss Plate Institute, Inc.
TPI	Turfgrass Producers International
TRI	Tile Roofing Institute (Formerly: RTI - Roof Tile Institute)
UL	Underwriters Laboratories Inc.
ULC	Underwriters Laboratories of Canada
UNI	Uni-Bell PVC Pipe Association
USAV	USA Volleyball
USC	United States Code
USGBC	U.S. Green Building Council
USITT	United States Institute for Theatre Technology, Inc.
WASTEC	Waste Equipment Technology Association
WCLIB	West Coast Lumber Inspection Bureau
WCMA	Window Covering Manufacturers Association (Now WCSC)
WCSC	Window Covering Safety **Council** (Formerly: WCMA - Window Covering Manufacturers Association)
WDMA	Window & Door Manufacturers Association (Formerly: NWWDA - National Wood Window and Door Association)
WI	Woodwork Institute (Formerly: WIC - Woodwork Institute of California)
WIC	Woodwork Institute of California (Now WI)
WMMPA	Wood Moulding & Millwork Producers Association
WRI	Wire Reinforcement Institute, Inc.
USEPA	United States Environmental Protection Agency
WSRCA	Western States Roofing Contractors Association
WWPA	Western Wood Products Association

PART II – PRODUCTS (Not Used)

PART III – EXECUTION (Not Used)

END OF SECTION 01 42 00

(No Text on This Page)

SECTION 01 50 00
TEMPORARY FACILITIES, SERVICES AND CONTROLS

PART 1 – GENERAL

1.1 RELATED DOCUMENTS:

A. The following documents apply to all required work for the Project: (1) the Contract Drawings, (2) the Specifications, (3) the General Conditions, (4) the Addendum, and (5) the Contract [City of New York Standard Construction Contract].

1.2 SUMMARY:

A. This section includes the following:
1. Temporary Water System
2. Temporary Sanitary Facilities
3. Temporary Electric Power, Temporary Lighting System, And Site Security Lighting
4. Temporary Heat
5. Dewatering Facilities and Drains
6. Temporary Field Office for Contractor
7. Resident Engineer's Office
8. Material Sheds
9. Temporary Enclosures
10. Temporary Partitions
11. Temporary Fire Protection
12. Work Fence Enclosure
13. Rodent and Insect Control
14. Plant Pest Control Requirements
15. Project Identification Signage
16. Security Guards/Fire Guards on Site
17. Project Sign and Rendering
18. Safety

1.3 RELATED SECTIONS: include without limitation the following:

A. Section 01 10 00 SUMMARY

B. Section 01 42 00 REFERENCES

C. Section 01 54 11 TEMPORARY ELEVATORS AND HOISTS

D. Section 01 54 23 TEMPORARY SCAFFOLDS AND SWING STAGING

E. Section 01 77 00 CLOSE OUT PROCEDURES

1.4 DEFINITIONS:

A. Refer to Article 2 of the Contract for definition of terms, words and expressions used in the General Conditions not otherwise defined herein.

B. Permanent Enclosure: As determined by Commissioner, permanent or temporary roofing that is complete, insulated, and weather tight; exterior walls which are insulated and weather tight; and all openings that are closed with permanent construction or substantial temporary closures.

C. Design Consultant: "Design Consultant" shall mean the entity responsible for providing design services for the Project, including without limitation, preparing the construction documents (drawings and specifications) and providing services in connection with such documents during construction. The entity serving as the "Design Consultant" may be a corporation, firm, partnership, joint venture, individual or combination thereof. Such entity may be either an employee(s) of the City or an entity engaged by the City to provide such services.

1.5 SUBMITTALS:

A. Site Plan: Show temporary facilities, utility hookups, staging areas, and parking areas for construction personnel.

B. Reports: Submit reports of tests, inspections, meter readings and similar procedures for temporary use.

1.6 PROJECT CONDITIONS:

A. Temporary Use of Permanent Facilities and Services: The Contractor shall be responsible for the operation, maintenance, and protection of each permanent facility and service during its use as a construction facility before Final Acceptance by the City, regardless of previously assigned responsibilities.

B. Install, operate, maintain and protect temporary facilities, services and controls.
1. Keep temporary services and facilities clean and neat in appearance.
2. Operate temporary services in a safe and efficient manner.
3. Relocate temporary services and facilities as needed as Work progresses.
4. Do not overload temporary services and facilities or permit them to interfere with progress.
5. Provide necessary fire prevention measures.
6. Do not allow hazardous, dangerous or unsanitary conditions, or public nuisances to develop or persist on-site.

1.7 NON-REGULAR WORK HOURS (OVERTIME):

A. The Contractor shall provide the temporary services, facilities and controls set forth in this Section during other than regular working hours if the Drawings and/or the Specifications indicate that the Work, or specific components thereof, must be performed during other than regular working hours. In such case, all costs for the provision of temporary services, facilities and controls during other than regular working hours shall be deemed included in the total Contract Price.

B. The Contractor shall provide the temporary services, facilities and controls set forth in this Section during other than regular working hours if a change order is issued directing the Contractor to perform the Work, or specific components thereof, during other than regular working hours. In such case, compensation for the provision of temporary services, facilities and controls during other than regular working hours shall be provided through the change order.

1.8 SERVICES BEYOND COMPLETION DATE:

A. The Contractor shall provide the temporary services, facilities and controls set forth in this Section until the date on which it completes all required work at the site, including all punch list work, as certified in writing by the Resident Engineer, or earlier if so directed in writing by the Commissioner. The Contractor shall provide such temporary services, facilities and controls even if completion of all required work at the

site occurs after the time fixed for such completion in Schedule A.

PART II – PRODUCTS

2.1 MATERIALS:

A. Provide undamaged materials in serviceable condition and suitable for use intended.
B. Tarpaulins: Waterproof, fire-resistant UL labeled with flame spread rating of 15 or less. For temporary enclosures, provide translucent, nylon-reinforced, laminated polyethylene or polyvinyl chloride, fire-retardant tarpaulins.
C. Water: Potable and in compliance with requirements of the Department of Environmental Protection.

2.2 EQUIPMENT:

A. Provide undamaged equipment in serviceable condition and suitable for use intended.
B. Water Hoses: Heavy-duty abrasive-resistant flexible rubber hoses, 100 feet (30 m) long with pressure rating greater than the maximum pressure of the water distribution system. Provide adjustable shutoff nozzles at hose discharge.
C. Electric Power Cords: Grounded extension cords.
   1. Provide hard-service cords where exposed to abrasion or traffic.
   2. Provide waterproof connectors to connect separate lengths of electric cords where single lengths will not reach areas of construction activity.
   3. Do not exceed safe length-voltage ratio.
D. Fire Extinguishers: Portable, UL rated; with class and extinguishing agent as required by locations and classes of fire exposures.

PART III –EXECUTION:

3.1 INSTALLATION, GENERAL:

A. Locate facilities where they will serve the Project adequately and result in minimum interference with performance of the Work. Relocate and modify facilities as required by progress of the Work.
B. Provide each facility ready for use when needed to avoid delay. Do not remove until facilities are no longer needed or are replaced by authorized use of completed permanent facilities as approved by the Resident Engineer.

3.2 TEMPORARY WATER SYSTEM:

REFER TO THE ADDENDUM FOR THE APPLICABILITY OF SUB-SECTION 3.2 A

A. TEMPORARY WATER SYSTEM - NEW FACILITIES: During construction, the Contractor shall furnish a Temporary Water System as set forth below.
   1. Immediately after the Commissioner has issued an order to start work, the Contractor shall file an application with the Dept. of Environmental Protection for the schedule of charges for water use during construction. The Contractor will be responsible for payment of water charges.
   2. Immediately after the Commissioner has issued an order to start work, the Contractor shall file an application with the Department of Environmental Protection's Bureau of Water Supply and obtain a permit to install the temporary water supply system. The system shall be installed and maintained for the use of the Contractor and its subcontractors. A copy of the above mentioned permit shall be filed with the Commissioner. The Contractor shall provide temporary water main, risers and waste stacks as directed and install on each floor, outlets with two (2) 3/4" hose valve connections over a

barrel installed on a steel pan. The Contractor shall provide drains from the pans to the stack and house sewer and hose bibs to drain the water supply risers and mains. During winter months, the Contractor shall take the necessary precautions to prevent the temporary water system from freezing. The Contractor shall provide repairs to the temporary water supply system for the duration of the project until said temporary system is dismantled and removed.

3. Disposition of Temporary Water System: The Contractor shall be responsible for dismantling the temporary water system when no longer required for the construction operations, or when replaced by the permanent water system installed for the project, or as otherwise directed by the Resident Engineer. All repair work resulting from the dismantling of the temporary water system shall be the responsibility of the Contractor.

REFER TO THE ADDENDUM FOR THE APPLICABILITY OF SUB-SECTION 3.2 B

B. TEMPORARY WATER SYSTEM – PROJECTS IN EXISTING FACILITIES:
   1. When approved by the Commissioner, use of existing water system will be permitted for temporary water service during construction, as long as the system is cleaned and maintained in a condition acceptable to the Commissioner. At Substantial Completion, the Contractor shall restore the existing water system to conditions existing before initial use.
   2. The Contractor shall be responsible for all repairs to the existing water system permitted to be used for temporary water service during construction. The Contractor shall be responsible to maintain the existing system in a clean condition on a daily basis, acceptable to the Commissioner.
   3. The Contractor will be responsible for payment of water charges as directed by the Commissioner. Billing will be in accordance with the Department of Environmental Protection schedule of charges for Building Purposes.

C. WASH FACILITIES: The Contractor shall install wash facilities supplied with potable water at convenient locations for personnel involved in handling materials that require wash-up for a healthy and sanitary condition.
   1. Dispose of drainage properly.
   2. Supply cleaning compounds appropriate for each condition.
   3. Include safety showers, eyewash fountains and similar facilities for the convenience, safety and sanitation of personnel.

D. DRINKING WATER FACILITIES: The Contractor shall provide drinking water fountains or containerized tap-dispenser bottled-drinking water units, complete with paper cup supplies. Where power is accessible, provide electric water coolers to maintain dispensed water temperature at 45 to 55 deg. F (7 to 13 deg. C).

3.3 TEMPORARY SANITARY FACILITIES:

A. The Contractor shall provide toilets, wash facilities and drinking water fixtures in compliance with regulations and health codes for type, number, location, operation and maintenance of fixtures and facilities. Provide toilet tissue, paper towels, paper cups and similar disposable materials as appropriate for each facility, and provide covered waste containers for used materials.

REFER TO THE ADDENDUM FOR THE APPLICABILITY OF SUB-SECTION 3.3 B

B. SELF-CONTAINED TOILET UNITS:
   1. The Contractor shall provide temporary single-occupant toilet units of the chemical, aerated re-circulation, or combustion type for use by all construction personnel. Units shall be properly vented and fully enclosed with a glass-fiber-reinforced polyester shell or similar nonabsorbent material. Quantity of toilet units shall comply with the latest OSHA regulations.
   2. Toilets: Install separate self-contained toilet units for male and female personnel. Shield toilets to ensure privacy.

REFER TO THE ADDENDUM FOR THE APPLICABILITY OF SUB-SECTION 3.3 C

C. EXISTING TOILETS:

1. TOILET FACILITIES: When approved by the Commissioner, the Contractor shall arrange for the use of existing toilet facilities by all personnel during the execution of the work. The Contractor shall be responsible to clean and maintain facilities in a condition acceptable to the Resident Engineer and, at completion of construction, to restore facilities to their condition at the time of initial use.
2. MAINTENANCE - The Contractor shall maintain the temporary toilet facilities in a clean and sanitary manner and make all necessary repairs.
3. NUISANCES - The Contractore shall not cause any sanitary nuisance to be committed by its employees or the employees of its subcontractors in or about the work and shall enforce all sanitary regulations of the City and State Health Authorities.

3.4 TEMPORARY ELECTRIC POWER, TEMPORARY LIGHTING SYSTEM, AND SITE SECURITY LIGHTING:

A. SCOPE: This Section sets forth the General Conditions and procedures relating to Temporary Electric Power, Temporary Lighting System and Site Security Lighting during the construction period.

B. TEMPORARY ELECTRIC POWER:
The Contractor shall provide and maintain a Temporary Electric Power service and distribution system of sufficient size, capacity and power characteristics required for construction operations for all required work by the Contractor and its subcontractors, including but not limited to power for the Temporary Lighting System, Site Security Lighting, construction equipment, hoists, temporary elevators and all field offices. Temporary Electric Power shall be provided as follows:

REFER TO THE ADDENDUM FOR THE APPLICABILITY OF SUB-SECTION 3.4 B (1)

1. CONNECTION TO UTILITY LINES:
   a. Temporary Electric Power Service for use during construction shall be provided as follows: The Contractor shall make all necessary arrangements with the Public Utility Company and pay all charges for the Temporary Electric Power system. The Contractor shall include in its total Contract Price any charges for Temporary Electric Power, including charges that may be made by the Public Utility Company for extending its electrical facilities, and for making final connections. The Contractor shall make payment directly to the Public Utility Company.
   b. APPLICATIONS FOR METER: The Contractor shall make application to the Public Utility Company and sign all documents necessary for, and pay all charges incidental to, the installation of a watt hour meter or meters for Temporary Electric Power. The Contractor shall pay to the Public Utility Company, all bills for Temporary Electric energy used throughout the work, as they become due.
   c. SERVICE AND METERING EQUIPMENT - The Contractor shall furnish and install, at a suitable location on the site, approved service and metering equipment for the Temporary Electric Power System, ready for the installation of the Public Utility Company's metering devices. The temporary service mains to and from the metering location shall be not less than 100 Amperes, 3-phase, 4-wire and shall be of sufficient capacity to take care of all demands for all construction operations and shall meet all requirements of the NYCEC.

REFER TO THE ADDENDUM FOR THE APPLICABILITY OF SUB-SECTION 3.4 B (2)

2. CONNECTION TO EXISTING ELECTRICAL POWER SERVICE:
   a. When approved by the Commissioner, electrical power service for the Temporary Lighting System and for the operation of small tools and equipment less than ¼ horsepower may be taken from the existing electric distribution system if the existing system is of adequate capacity for the temporary power load. The Contractor shall cooperate and coordinate with the facility custodian, so as not to interfere with the normal operation of the facility.
   b. There will be no charge to the Contractor for the electrical energy consumed.
   c. The Contractor shall provide, maintain and pay all costs for separate temporary electric power for any temporary power for equipment larger than 1/4 horsepower. When directed by the Commissioner, the Contractor shall remove its own temporary power system.

REFER TO THE ADDENDUM FOR THE APPLICABILITY OF SUB-SECTION 3.4 B (3)

3. ELECTRICAL GENERATOR POWER SERVICE:
   a. When connection to Utility Lines or existing facility electric service is not available or is not adequate to supply the electric power need for construction operations, the Contractor shall provide self-contained generators to provide power beyond that available.
   b. Pay for all energy consumed in the progress of the Work, exclusive of that available from the existing facility or Utility Company.
   c. Provide for control of noise from the generators.
   d. Comply with the Ultra Low Sulfur Fuel in Non-Road Vehicles requirements as set forth in Article 5.4 of the Contract.

C. USE OF COMPLETED PORTIONS OF THE ELECTRICAL WORK:
   1. USE OF MAIN DISTRIBUTION PANEL: As soon as the permanent electric service feeders and equipment, metering equipment and main distribution panel are installed and ready for operation, the Contractor shall have the temporary lighting and power system changed over from the temporary service points to the main distribution panel.
   2. COST OF CHANGE OVER - The Contractor shall be responsible for all costs due to this change over of service and it shall also make application to the Public Utility Company for a watt hour meter to be set on the permanent meter equipment.
   3. The requirements for temporary electric power service specified herein shall be adhered to after change over of service until final acceptance of the project.
   4. NO EXTRA COST - The operation of the service and switchboard equipment shall be under the supervision of the Contractor, but this shall in no way be interpreted to mean the acceptance of such part of the installation or relieve the Contractor from its responsibility for the complete work or any part thereof. There shall be no additional charge for supervision by the Contractor.

REFER TO THE ADDENDUM FOR THE APPLICABILITY OF SUB-SECTION 3.4 D

D. TEMPORARY LIGHTING SYSTEM:
   1. The Contractor shall provide adequate service for the temporary lighting system, or a minimum of 100 Amperes, 3-phase, 4-wire service for the temporary lighting system, whichever is greater, and make all necessary arrangements with the Public Utility Company and pay all charges by them for the Temporary Lighting System

2. The Contractor shall furnish and connect to the metered service point, a Temporary Lighting System to illuminate the entire area where work is being performed and points adjacent to the work, with separately fused circuits for stairways and bridges. Control switches for stairway circuits shall be located near entrance on ground floor.
3. ITEMS: The Temporary Lighting System provided by the Contractor shall consist of wiring, fixtures, left-hand double sockets, (one (1) double socket for every 400 square feet, with one (1) lamp and one (1) three-prong outlet) lamps, fuses, locked type guards, pigtails and any other incidental material. Additional details may be outlined in the detailed Specifications for the Electrical Work. Changes may be made, provided the full equivalent of those requirements is maintained.
4. The Temporary Lighting System shall be progressively installed as required for the advancement of the work under the Contract.
5. RELOCATION: The cost for the relocation or extension of the original Temporary Lighting System, required by the Contractor or its subcontractors, that is not required due to the normal advancement of the work, as determined by the Resident Engineer, shall be borne by the Contractor.
6. PIGTAILS: shall be furnished with left-hand sockets with locked type guards and 40 feet of rubber covered cable. The Contractor shall furnish and distribute a minimum of three (3) complete pigtails to each subcontractor. See the detailed Electrical Specifications for possible additional pigtails required.
7. LAMPS: The Contractor shall furnish and install one (1) complete set of lamps, including those for the trailers. Broken and burned out lamps in the temporary lighting system, DDC field office and construction trailers, shall be replaced by the Contractor. All lamps shall be compact fluorescent.
8. CIRCUIT PROTECTION: The Contractor shall furnish and install GFI protection for the Temporary Lighting and Site Security Lighting Systems.
9. MAINTENANCE OF TEMPORARY LIGHTING SYSTEM:
   a. The Contractor shall maintain the Temporary Lighting System in good working order during the scheduled hours established.
   b. The Contractor shall include in its total Contract Price all costs in connection with the Temporary Lighting System, including all costs for installation, maintenance and electric power.
10. REMOVAL OF TEMPORARY LIGHTING SYSTEM: The temporary lighting system shall be removed by the Contractor when authorized by the Commissioner.
11. HAND TOOLS: The temporary lighting system shall not be used for power purposes, except that light hand tools not larger than 1/4 horsepower may be operated from such system by the Contractor and its subcontractors.

REFER TO THE ADDENDUM FOR THE APPLICABILITY OF SUB-SECTION 3.4 E

E. SITE SECURITY LIGHTING (FOR NEW CONSTRUCTION ONLY):
1. The Contractor shall furnish, install and maintain a system of site security lighting, as herein specified, to illuminate the construction site of the project, and it shall be connected to and energized from the Temporary Lighting System. All costs in connection with site security lighting shall be deemed included in the total Contract Price.
2. It is essential that the site security lighting system be completely installed and operating, at the earliest possible date. The Contractor shall direct its subcontractors to cooperate, coordinate and exert every effort to accomplish an early complete installation of the site security lighting system. After the system is installed and in operation, if a part of the system interferes with the work of any trade, the Contractor shall be completely responsible for the expense of removing, relocating and replacing all equipment necessary to reinstate the system to proper operating conditions.
3. The system shall consist of flood lighting by pole mounted guarded sealed-beam units. Floodlight units shall be mounted 16 feet above grade. Floodlights shall be spaced around the perimeter of the site to produce an illumination level of no less than one (1) foot candle around the perimeter of

the site, as well as in any potentially hazardous area or any other area within the site that might be deemed by the Resident Engineer to require security illumination. The system shall be installed in a manner acceptable to the Resident Engineer. The first lighting unit in each circuit shall be provided with a photoelectric cell for automatic control. The photoelectric cell shall be installed as per manufacturer's recommendations.

4. All necessary poles shall be furnished and installed by the Contractor.
5. The site security lighting shall be kept illuminated at all times during the hours of darkness. The Contractor shall, at its own expense, shall keep the system in operation, and shall furnish and install all material necessary to replace all damaged or burned out parts.
6. The Contractor shall be on telephone call alert for maintaining the system during the operating period stated above.
7. All materials and equipment furnished under this section shall remain the property of the Contractor and shall be removed and disposed of by the Contractor when authorized in writing by the Resident Engineer.

REFER TO THE ADDENDUM FOR THE APPLICABILITY OF SUB-SECTION 3.5

3.5 TEMPORARY HEAT:

A. GENERAL:

1. Definition: The provision of Temporary Heat shall mean the provision of heat in order to permit construction to be performed in accordance with the Progress Schedule during all seasons of the year and to protect the work from the harmful effects of low temperature. In the event the building, or any portion thereof, is occupied during construction, the provision of Temporary Heat shall include the provision of heat to permit normal operations in such occupied areas.
   a. The provision of Temporary Heat shall be in accordance with the temperature requirements set forth in Sub-Section 3.5 C herein.
   b. The provision of Temporary Heat shall include the provision of: 1) all fuel necessary and required, 2) all equipment necessary and required, and 3) all operating labor necessary and required. Operating labor shall mean that minimum force required for the safe day to day operation of the system for the provision of Temporary Heat and shall include, without limitation, heating maintenance labor and/or Fire Watch as required by NYC Fire Department regulations. Operating labor may be required seven (7) days per week and during other than normal working hours, for the period of time required by seasonal weather conditions.
   c. In the event the building, or any portion thereof, is occupied and the Project involves the replacement, modification and/or shut down of the permanent heating system, or any key component thereof; and such system is a combined system which furnishes domestic hot water for the building occupants, the provision of Temporary Heat shall include the provision of domestic hot water at the same temperature as the system which is being replaced. Domestic hot water shall be provided in accordance with the phasing requirements set forth in the Contract Documents.
2. Responsibility: The Contractor's responsibility for the provision of Temporary Heat, including all expenses in connection therewith, shall be as set forth below:
   a. Projects Involving Enclosure of the Building:
      1) Prior to Enclosure - Until the Commissioner determines that the building has been enclosed, as set forth in Sub-Section 3.5 B; the Contractor shall be responsible for the provision of Temporary Heat.
      2) Post Enclosure - Once the Commissioner determines that the building, or any portion thereof, has been enclosed, as set forth in Sub-Section 3.5 B, the Contractor shall be responsible for the provision of Temporary Heat by one or more of the following means: 1) by an existing heating system (if any), 2) by a permanent heating system which is being installed as part of the Project, or 3) by a temporary heating system(s).

3) The Contractor shall, within two (2) weeks of the kick-off meeting, submit to DDC for review its proposed plan to provide Temporary Heat. Such plan is subject to approval by the Resident Engineer. The Contractor shall provide Temporary Heat in accordance with the approved plan until written acceptance by the Commissioner of the work of all Contractors, including punch list work, unless directed otherwise in writing by the Commissioner. The responsibility of the Contractor provided for herein is subject to the exception set forth in Sub-Section 3.5 A.2 (b) herein.

b. Projects not involving Enclosure of the Building:
   1) If the Project involves the installation of a new permanent heating system if one did not exist previously, or the replacement, modification and/or shut down of the existing permanent heating system, or any key component thereof, the Contractor shall be responsible for the provision of Temporary Heat, except as otherwise provided in Sub-Section 3.5 H.3(b).2 herein.
   2) If the Project does not involve the installation of a new permanent heating system if one did not exist previously, or the replacement, modification and/or shut down of the existing permanent heating system, or any key component thereof; there is no Contractor responsibility of the provision of Temporary Heat, unless otherwise specified in the Contract Documents. However, if the Commissioner, pursuant to Sub-Section 3.5 H.3 (b).1 herein, determines that the provision of Temporary Heat is necessary due to special and/or unforeseen circumstances, the Contractor shall be responsible for the provision of Temporary Heat and shall be paid for the same in accordance with Sub-Section 3.5 H.3 (b).1 herein.

B. ENCLOSURE OF STRUCTURES:
1. Notification: The Contractor shall notify all its subcontractors and the Resident Engineer at least 30 days prior to the anticipated date that the building(s) will be enclosed.
2. Commissioner Determination: The Commissioner shall determine whether the building, or any portion thereof, has been enclosed. As indicated in Sub-Section 3.5 A.2 above, once the building has been enclosed, the Contractor shall be responsible for the provision of Temporary Heat. The Commissioner's determination with respect to building enclosure shall be based upon all relevant facts and circumstances, including without limitation, 1) whether the building meets the criteria set forth in Paragraph 3 below, and 2) whether the openings in the building, such as doorways and windows, have been sufficiently covered so as to provide reasonable heat retention and protection from the elements.
3. Criteria for enclosure:
   a. Roof Area:
      1) A building shall be considered to be roofed when the area to be roofed is covered by a permanent structure and all openings through the permanent structure are covered and protected by temporary covers as described in Paragraph (c) below.
      2) Intermediate floor structures of multi-floor buildings shall be considered to be roofed subject to the same requirements of the building roof.
      3) The final roofing system need not be in place for the building or structure to be determined to be enclosed; provided, however, all openings through the permanent structure covering the roof must be covered and protected by temporary covers, as described in Paragraph (c) below.
   b. Walls: For the walls to be determined to be enclosed permanent exterior wall elements or facing material must be in place and all openings must be covered and protected by temporary covers, as described in Paragraph (c) below.
   c. Temporary Covers: In order to be acceptable, temporary covers must be securely fixed to prevent the entrance of rain, snow and direct wind. The minimum material requirements for temporary covers are as follows: 1) minimum 10 mil. Plastic 2) minimum 12 ounce waterproof canvas tarpaulins, or 3) a minimum three-eighths (3/8) inch thickness exterior grade plywood.

d. Temporary covers for openings shall be the responsibility of the Contractor and such work shall be deemed included in the Contract price.

C. TEMPERATURE REQUIREMENTS:

1. Unoccupied Buildings: The temperature requirement for the provision of Temporary Heat in unoccupied buildings shall be the GREATER of the following: 1) 50 degrees Fahrenheit, or 2) the temperature requirement for the particular type of work set forth in the Contract Documents.

2. Occupied Buildings: The temperature requirement for the provision of Temporary Heat in occupied buildings, or portions thereof, shall be the GREATER of the following: 68 degrees Fahrenheit or the temperature requirement for the particular type of work set forth in the Contract Documents.

D. DURATION:

1. The Contractor shall be required to provide Temporary Heat until the date on which it completes all required work at the site, including all punch list work, as certified in writing by the Resident Engineer, or earlier if so directed in writing by the Commissioner. The Contractor shall be responsible for the provision of Temporary Heat for the time specified herein, regardless of any delays in completion of the Project, including delays that result in the commencement of the provision of Temporary Heat during a season that is later than that which may have been originally anticipated. The Contractor shall include in its Total Contract Price all expenses in connection with the provision of Temporary Heat in accordance with the requirements specified herein.
2. The total Contract duration is set forth in consecutive calendar days in Schedule A of the Addendum. The Table set forth below indicates the number of full heating seasons that are deemed included in various contract durations, which are specified in consecutive calendar days (ccd)s. At a minimum, a full heating season shall extend from October 15th to April 15th.

Contract Duration	Full Heating Seasons Required
up to 360 ccds	1 full heating season
360 to 720 ccds	2 full heating seasons
more than 720 ccds	3 full heating seasons

E. METHOD OF TEMPORARY HEAT:

1. The method of temporary heat shall be in conformance with the New York City Fire Code and with all applicable laws, rules and regulations. Prior to implementation, such method shall be subject to the written approval of the Commissioner.
2. The method of temporary heat shall:
   a. Not cause the deposition of dirt or smudges upon any finished work or cause any defacement or discoloration to the finished work.
   b. Not be injurious or harmful to people or materials.
   c. Portable fueled heating devises or equipment SHALL NOT BE ALLOWED for use as temporary heat other than construction-related curing or drying in conformance with the NYC Fire Code.
3. No open fires will be permitted.

F. TEMPORARY HEATING SYSTEM:

1. The temporary system for the provision of Temporary Heat provided by the Contractor following enclosure of the building shall be complete including, subject to provisions of paragraph E above, boilers pumps, radiators, space heaters, water and heating piping, insulation and controls. The temporary system for the provision of Temporary Heat shall be capable of maintaining the minimum temperature requirements set forth in Paragraph C above.

G. COORDINATION:

1. The Contractor, in the provision of Temporary Heat, shall coordinate its operations in order to insure sufficient and timely performance of all required work, including work performed by trade subcontractors. The Contractor shall supply and pay for all water required and used in the building for the operation of the heating system(s) for the purpose of Temporary Heat. The Contractor shall include all expenses in connection with the supply of water for Temporary Heat in its Total Contract Price. During the period in which Temporary Heat in an enclosed building is being furnished and maintained, the Contractor shall provide proper ventilating and drying, open and close the windows and other openings when necessary for the proper execution of the work and also when directed by DDC. The Contractor shall maintain all permanent or temporary enclosures at its own expense.

H. USE OF PERMANENT HEATING SYSTEMS:

1. Use of Permanent Heating System for Temporary Heat after Building Enclosure
   a. The Contractor shall provide all labor and materials to promptly furnish and set all required equipment and convectors and/or radiators, piping, valves, fitting, etc., in ample time for their use for the provision of Temporary Heat after enclosure of the building.
   b. New portions of the permanent heating system that are used for furnishing Temporary Heat shall be left in near perfect condition when delivered to the City for operation. Any repairs required, other than for ordinary wear and tear on the equipment, shall be made by the Contractor at his/her expense. The starting date for the warranty or guarantee period for such equipment shall be the date of Substantial Completion acceptance.
   c. In the event that the Contractor does not advance the installation of the permanent heating system in sufficient time to permit its use for Temporary Heat as determined by DDC, the Contractor shall furnish and install a separate system for the provision of Temporary Heat as required to maintain the minimum temperature requirements set forth in Paragraph C above.
2. All equipment for the system for the provision of Temporary Heat shall be placed so as to comply with the requirements specified hereinbefore, and shall be connected, disconnected and suitably supported and located so as to permit construction work, including finish work such as wall plastering and painting, to proceed. The installation of the system for the provision of Temporary Heat by the Contractor, including the placing of ancillary system equipment, shall be coordinated with the operations of all trade subcontractors so as to insure sufficient and timely performance of the work. Once the permanent heating system is operating properly, the Contractor shall remove all portions of the system for Temporary Heat not part of the permanent heating system.

3. Temporary Heat Allowance for Special Conditions or and/or Unforeseen Circumstances.
   a. The City may establish an allowance in the Contract for payment of costs and expenses in connection with the provision of Temporary Heat as set forth herein. If established, the City will include an amount for such allowance on the Bid Form, and the Contractor shall include such allowance amount in its Total Contract Price. The Contractor shall only be entitled to payment from this allowance under the conditions and in accordance with the requirements set forth below. In the event this allowance or any portion thereof remains unexpended at the conclusion of the Contract, such allowance shall remain the sole property of the City. Should the amount of the allowance be insufficient to provide payment for the expenses specified below, the City will increase the amount of the allowance.
   b. The allowance set forth herein may be utilized only under the conditions set forth below.
      1. In the event the Project does not involve the installation of a new permanent heating system if one did not exist previously, or the replacement, modification and/or shut down of the existing permanent heating system, or any key component thereof, and the Commissioner determines that the provision of Temporary Heat is necessary due to special and/or unforeseen circumstances, the Contractor shall be responsible for the provision of Temporary Heat, as directed by the Commissioner. The City shall pay such Contractor for all costs for labor, material, and equipment necessary and required

for the same. Payment shall be made in accordance with Article 26 of the Contract, except that the cost of fuel shall be as set forth in Paragraph (c) below.

2. In the event the Commissioner determines that there is a need for maintenance of the permanent heating system by the Contractor after written acceptance by the Commissioner of the work, and that the need for such maintenance is not the fault of the Contractor, the Contractor shall provide the required maintenance of the permanent heating system for the period of time directed by the Commissioner. The City shall pay the Contractor for the cost of direct labor and fuel necessary and required in connection with such maintenance, excluding the cost of any foremen or other supervision. Payment shall be made in accordance with Article 26 of the Contract, except that the cost of fuel shall be as set forth in Paragraph (c) below.

c. Payment for Fuel Costs - Payment from the allowance set forth herein for the cost of fuel necessary and required to operate the system for the provision of Temporary Heat or to maintain the permanent heating system under the conditions set forth in Paragraph b above shall be limited to the direct cost of such fuel. The Contractor shall not be entitled to any overhead and/or profit for such fuel costs. In order to receive payment for such fuel costs, the Contractor must present original invoices for the same. DDC reserves the right to furnish the required fuel.

I. RELATED ELECTRICAL WORK:

1. The Contractor shall be responsible for providing the items set forth below and shall include all expenses in connection with such items in its Total Contract Price. The Contractor shall provide such items promptly when required and shall in all respects coordinate its work with the work performed by trade subcontractors in order to facilitate the provision of Temporary Heat.
   a. The Contractor shall provide all labor, materials, equipment and power necessary and required to furnish and maintain any temporary or permanent electrical connections to all equipment specified to be connected as part of the work of the Contractor's Contract.
   b. The Contractor shall supply and pay for all power necessary and required for the operation of the system for the provision of Temporary Heat and/or the permanent heating system used for Temporary Heat. Such power shall be provided by the Contractor for the duration the Contractor is required to provide Temporary Heat, as set forth in Sub-section 3.5 D herein.
2. In providing the items set forth in Paragraph 1 above, the Contractor is advised that labor may be required seven (7) days a week and/or during other than normal working hours for the period of time required by seasonal weather conditions.

J. RELATED PLUMBING WORK:

1. The Contractor shall be responsible for providing all labor, materials and equipment necessary and required to furnish and maintain all temporary or permanent connections to all equipment or plumbing outlets specified to be provided as part of the work of this Contract. The Contractor shall include all expenses in connection with such items of work in its Total Contract Price. The Contractor shall provide such items of work promptly when required and shall in all respects coordinate its work with the work performed by trade subcontractors in order to facilitate the provision of Temporary Heat.
2. In the event portions of the permanent plumbing equipment furnished by the Contractor as part of the work of this Contract are used for the provision of Temporary Heat either during construction or prior to acceptance by the City of the complete plumbing system, the Contractor shall be responsible to provide such plumbing equipment to the City in near perfect condition and shall make any repairs required, other than for ordinary wear and tear on the equipment, at Contractor's expense. The starting date for warranty and/or guarantee period for such plumbing equipment shall be the date of Substantial Completion acceptance by the City.
3. For Projects requiring the installation of new and/or modified gas service, as well as associated meter installations, the Contractor shall promptly perform all required filings and coordination with

the Utility Companies in order to expedite the installation, testing, and approval of the gas service and associated meter(s).

3.6 STORM WATER CONTROL, DEWATERING FACILITIES AND DRAINS:

A. PUMPING:
1. Comply with requirements of authorities having jurisdiction. Maintain Project site, excavations, and construction free of water. Provide barriers in and around excavations and subgrade construction to prevent flooding by runoff of storm water from heavy rainfall.
2. Contractor shall furnish and install all necessary automatically operated pumps of adequate capacity with all required piping to run-off agencies, so as to maintain the excavation, cellar floor, pits and exterior depressions and excavations free from accumulated water during the entire period of construction and up to the date of final acceptance of work of the Contract.
3. All pumps shall be maintained at all times in proper working order.
4. Dispose of rainwater in a lawful manner that will not result in flooding Project or adjoining properties nor endanger permanent Work or temporary facilities.
5. Remove snow and ice as required to minimize accumulations.

3.7 TEMPORARY FIELD OFFICE FOR CONTRACTOR:

A. The Contractor shall establish a temporary field office for its own use at the site during the period of construction, at which readily accessible copies of all Contract Documents shall be kept.
B. The field office shall be located where it will not interfere with the progress of any part of the work or with visibility of traffic control devices.
C. CONTRACTOR'S REPRESENTATIVE: In charge of the office there shall be a responsible and competent representative of the Contractor, duly authorized to receive orders and directions and to put them into effect.
D. Arrangements shall be made by the Contractor whereby its representative may be readily accessible by telephone.
E. All temporary structures shall be of substantial construction and neat appearance, and shall be painted a uniform gray unless otherwise directed by the Commissioner.
F. CONTRACTOR'S SIGN - The Contractor shall post and keep posted, on the outside of its field office, office or exterior fence or wall at site of work, a legible sign giving full name of the company, address of the company and telephone number(s) of responsible representative(s) of the firm who can be reached in event of an emergency at any time.
G. ADVERTISING PRIVILEGES - The City reserves the right to all advertising privileges. The Contractor shall not cause any signs of any kind to be displayed at the site unless specifically required herein or authorized by the Commissioner.

3.8 DDC FIELD OFFICE:

REFER TO THE ADDENDUM FOR THE APPLICABILITY OF SUB-SECTION 3.8 A

A. OFFICE SPACE IN EXISTING BUILDING:
1. The Resident Engineer will arrange for office space for sole use in the building where work is in progress. The Contractor shall provide and install a lockset for the door to secure the equipment in the room. The Contractor shall provide two (2) keys to the Resident Engineer. After completion of the project the Contractor shall replace the original lockset on the door and ensure its proper operation.
2. In addition to equipment specified in Sub-Section 3.8 D, the Contractor shall provide, for exclusive use of the DDC Field Office, the following:

a. Two (2) single pedestal desks, 42" x 32"; two (2) swivel chairs with arms and three (3) side chairs without arms to match desk. Two metal (2) lockers, single units, 15" x 18" x 78" overall including 6" legs. Lockers to have flat key locks with two (2) keys each, General Steel products or approved equal. Two (2) full ball bearing suspension four (4) drawer vertical legal filing cabinets with locks, approximately 52"H x 28 ½"D x 18"W.
b. One (1) 9000 B.T.U air conditioner or as directed by Commissioner. Wiring for the air conditioner shall be minimum No. 12 AWG fed from individual circuits in the fuse box.
c. One (1) folding conference table, 96" x 30" and ten (10) folding chairs.
d. Two (2) metal wastebaskets.
e. One (1) fire extinguisher, one (1) quart vaporizing liquid type, brass, wall mounted by Pyrene No. C21 or approved equal.
f. One (1) Crystal Springs water cooler with bottled water, Model No. LP14058 or approved equal to be furnished for the duration of the project as required.

3. The Contractor shall provide one (1) telephone, where directed and shall pay all costs for telephone service for calls within the New York City limits for the duration of the project.
4. All furniture and equipment, except computer equipment specified in Sub-Section 3.8 D.3, shall remain the property of the Contractor.
5. Computer Workstation quantities shall be provided as specified in Sub-Section 3.8 B 3-a for DDC Managed Projects, or Sub-Section 3.8 B 3-b for CM Managed Projects.

REFER TO THE ADDENDUM FOR THE APPLICABILITY OF SUB-SECTION 3.8 B

B. DDC FIELD OFFICE TRAILER:

1. GENERAL: The Contractor shall, for the time frame specified herein, provide and maintain at its own cost and expense a DDC Construction Field Office and all related items as specified herein [hereinafter collectively referred to as the "DDC Field Office"] for the exclusive use of the Resident Engineer. The DDC Field Office shall be located at the Project site and shall be solely dedicated to the Project. Provision of the DDC Field Office shall commence within THIRTY (30) days from Notice to proceed and shall continue through forty-five (45) days after Substantial Completion of the required construction at the Project site. The Contractor shall remove the DDC Field Office forty-five (45) days after Substantial Completion of the required construction, or as otherwise directed in writing by the Commissioner.
2. TRAILER: The Contractor shall provide at its own cost and expense a mobile office trailer for use as the DDC Field Office. The Contractor shall install and connect all utility services to the trailer within thirty (30) days from Notice to Proceed. The trailer shall have equipment in compliance with the minimum requirements hereinafter specified. Any permits and fees required for the installation and use of said trailer shall be borne by the Contractor. The trailer including furniture and equipment therein, except computer equipment specified in Sub-Section 3.8D.3 herein, shall remain the property of the Contractor.
3. Trailer shall be an office type trailer of the size specified herein, with exterior stairs at entrance. Trailer construction shall be minimum 2 x 4 wall construction fully insulated with paneled interior walls, pre-finished gypsum board ceilings and vinyl tile floors.

REFER TO THE ADDENDUM FOR THE APPLICABILITY OF SUB-SECTION 3.8.B.3a or SUB-SECTION 3.8.B.3b.

a. DDC Managed Project Trailer: DDC Field Office Trailer Size, Layout and Computer Workstation:
   1) Overall length: 32 Feet
      Overall width: 10 Feet

2) Interior Layout:
Provide one (1) general office/conference room area and one (1) private office at one end of the trailer. Provide equipment and amenities as specified in Sub-Section 3.8.B herein.

3) Computer Workstation: Provide one (1) complete computer workstation, as specified in Sub-Section 3.8.D herein, in the private office area as directed by the Resident Engineer.

b. CM Managed Project Trailer: DDC Field Office Trailer Size, Layout and Computer Workstation:

1) Overall length: 50 Feet
Overall width: 10 Feet

2) Interior Layout:
Provide one (1) large general office/conference room in the center of the trailer and two (2) private offices, one (1) each at either end of the trailer. Provide equipment and amenities as specified in Sub-Section 3.8.B herein.

3) Computer Workstation:
Provide three (3) complete computer workstations as specified in Sub-Section 3.8.D herein. Provide one (1) each complete computer workstation in each private office and one (1) complete computer workstation at the secretarial position as directed by the Resident Engineer.

4. The exterior of the trailer shall be lettered with black block lettering of the following heights with white borders:

CITY OF NEW YORK	2-1/2"
DEPARTMENT OF DESIGN AND CONSTRUCTION	3-3/4"
DIVISION OF PUBLIC BUILDINGS	3-1/2"
DDC FIELD OFFICE	2-1/2"

NOTE: In lieu of painting letters on trailer the Contractor may substitute a sign constructed of a good quality weatherproof material with the same type and size of lettering above.

5. All windows and doors shall have aluminum insect screens. Provide wire mesh protective guards at all windows.
6. The interior shall be divided by partitions into general and private office areas as specified herein. Provide a washroom located adjacent to the private office and a built-in wardrobe closet opposite the washroom. Provide a built-in desk in the private office(s) with fixed overhead shelf and clearance below for two (2) file cabinets.
7. Provide a built-in drafting or reference table, located in the general office/conference room, at least 60 inches long by 36 inches wide with cabinet below and wall type plan rack at least 42 inches wide.
8. The washroom shall be equipped with a flush toilet, wash basin with two (2) faucets, medicine cabinet, complete with supplies and a toilet roll tissue holder. Plumbing and fixtures shall be approved house type, with each appliance trapped and vented and a single discharge connection. Five (5) gallon capacity automatic electric heater for domestic hot water shall be furnished.
9. HVAC: The trailer shall be equipped with central heating and cooling adequate to maintain a temperature of 72 degrees during the heating season and 75 degrees during the cooling season when the outside temperature is 5 degrees F. winter and 89 degrees F. summer.
10. Lighting shall be provided via ceiling mounted fluorescent lighting fixtures to a minimum level of 50 foot candles in the open and private office(s) along with sufficient lighting in the washroom. Broken and burned out lamps shall be replaced by the Contractor. A minimum of four (4) duplex convenience outlets shall be provided in the open office and two (2) each in the private office(s). These outlets shall be in addition to special outlet requirements for computer stations, copiers, HVAC unit, etc.

11. Electrical service switch and panel shall be adequately sized for the entire trailer load. Provide dedicated circuits for HVAC units, hot water heater, copiers and other equipment as required. All wiring and installation shall conform to the New York City Electrical Code.
12. The following movable equipment shall be furnished:
    a. Two (2) single pedestal desks, 42" x 32"; two (2) swivel chairs with arms and three (3) side chairs without arms to match desk. Two (2) full ball bearing suspension four (4) drawer vertical legal filing cabinets with locks and two (2) full ball bearing two (2) drawer vertical legal filing cabinets in each private office located below built-in desk.
    b. One (1) folding conference table, 96" x 30" and ten (10) folding chairs.
    c. Three (3) metal wastebaskets.
    d. One (1) fire extinguisher one (1) quart vaporizing liquid type, brass, wall mounted by Pyrene No. C21 or approved equal.
    e. One (1) Crystal Springs water cooler with bottled water, Model No. LP14058 or approved equal to be furnished for the duration of the Contract as required.
13. TRAILER TEMPORARY SERVICE: Plumbing and electrical work required for the trailer will be furnished and maintained as below.

    a. PLUMBING WORK: The Contractor shall provide temporary water and drainage service connections to the DDC Field Office trailer for a complete installation. Provide all necessary soil, waste, vent and drainage piping.

       Contractor to frost-proof all water pipes to prevent freezing.
       1) REPAIRS, MAINTENANCE: The Contractor shall provide repairs for the duration of the project until the trailer is removed from the site.
       2) DISPOSITION OF PLUMBING WORK: At the expiration of the time limit set forth in Sub-Section 3.8 B 1 herein, the temporary water and drainage connections and piping to the DDC Field Office trailer shall be removed by the Contractor and shall be plugged at the mains. All piping shall become the property of the Contractor for Plumbing Work and shall be removed from the site, all as directed. All repair work due to these removals shall be the responsibility of the Contractor.

    b. ELECTRICAL WORK:
       1) The Contractor shall furnish, install and maintain a temporary electric feeder to the DDC Field Office trailer immediately after it is placed at the job site.
       2) The temporary electrical feeder and service switch/fuse shall be adequately sized based on the trailer load and installed per the New York City Electrical Code and complying with utility requirements.
       3) Make all arrangements and pay all costs to provide electric service.
       4) The Contractor shall pay all costs for current consumed and for maintenance of the system in operating condition, including the furnishing of the necessary bulb replacements lamps, etc., for the duration of the project and for a period of forty-five (45) days after the date of Substantial Completion.
       5) Disposition of Electric Work: At the expiration of the time limit set forth, the temporary feeder, safety switch, etc., shall be removed and disposed of as directed.
       6) All repair work due to these removals shall be the responsibility of the Contractor.

    c. MAINTENANCE
       1) The Contractor shall provide and pay all costs for regular weekly janitor service and furnish toilet paper, sanitary seat covers, cloth towels and soap and maintain the DDC Field Office in first-class condition, including all repairs, until the trailer is removed from the site.
       2) Supplies: The Contractor shall be responsible for providing (a) all office supplies, including without limitation, pens, pencils, stationery, filtered drinking water and sanitary supplies, and (b) all supplies in connection with required computers and printers,

including without limitation, an adequate supply of blank CD's/DVD's, storage boxes for blank CDs/DVDs, and paper and toner cartridges for the printer.

3) Risk of Loss: The entire risk of loss with respect to the DDC Field Office and equipment shall remain solely and completely with the Contractor. The Contractor shall be responsible for the cost of any insurance coverage determined by the Contractor to be necessary for the Field Office.

4) At forty-five (45) days after the date of Substantial Completion, or sooner as directed by the Commissioner, the Contractors shall have all services disconnected and capped to the satisfaction of the Commissioner. All repair work due to these removals shall be the responsibility of the Contractor.

d. TELEPHONE SERVICE: The Contractor shall provide and pay all costs for the following telephone services for the DDC Field Office trailer:

1) Separate telephone lines for one (1) desk phone in each private office.
2) One (1) wall phone (with six (6) foot extension cord) at plan table.
3) Separate telephone lines for the fax machine and internet access in each private office. Telephone service shall include voice mail.
4) A remote bell located on outside of trailer
5) The telephone service shall continue until the trailer is removed from the site.

e. PERMITS: The Contractor shall make the necessary arrangements and obtain all permits and pay all fees required for this work.

C. RENTED SPACE: The Contractor has the option of providing, at its cost and expense, rented office or store space in lieu of trailer. Said space shall be in the immediate area of the Project and have adequate plumbing, heating and electrical facilities. Space chosen by the Contractor for the DDC Field Office must be approved by the Commissioner before the area is rented. All insurance, maintenance and equipment, including computer workstations specified in Sub-Section 3.8 D in quantities required as specified in Sub-Section 3.8 B 3 for the DDC Field Office trailer, shall also apply to rented spaces.

REFER TO THE ADDENDUM FOR THE APPLICABILITY OF SUB-SECTION 3.8 D

D. ADDITIONAL EQUIPMENT FOR THE DDC FIELD OFFICE:

1. The Contractor shall provide a high volume copy machine (50 copies per minute) for paper sizes 8½ x 11, 8½ x 14 & 11 x 17. Copier shall remain at job site until the DDC Field office trailer is removed from the site.
2. The Contractor shall furnish a fax machine and a telephone answering machine at commencement of the project for the exclusive use of the DDC Field Office. All materials shall be new, sealed in manufacturer's original packaging and shall have manufacturers' warrantees. All items shall remain the property of the City of New York at the completion of the project.
3. COMPUTER WORKSTATION: The Contractor shall provide one complete computer workstation, in quantities specified in Sub-Section 3.8.B.3, as specified herein:

a. Hardware/Software Specification:

1) Computer Equipment - Computers shall be provided for all contracts that have a Total Consecutive Calendar Days for construction duration as set forth in Schedule "A" of 180 CCD's or greater. Contracts of lesser duration shall not require computers.
2) Computers furnished by the Contractor for use by City Personnel, for the duration of the contract, shall be in accordance with Specific Requirements, contained herein, shall remain the property of the City of New York at the completion of the project and shall meet the following minimum requirements:
3) Personal Computer(s) – Each Workstation Configuration.

a) Make and Model: Dell; HP; Gateway; Acer; or, an approved

equivalent. (Note: an approved equivalent requires written approval of the Assistant Commissioner of ITS.)

b)	Processor:	i5-2400 (6MB Cache, 3.1GHz) or faster computer - Single Processor.
c)	System RAM:	Minimum of 4GB (Gigabytes) Dual Channel DDR3 SDRAM at 1333MHz – 2 DIMMSs
d)	Hard Disk Drive(s):	500 GB (Gigabytes) Serial ATA (7200RPM) w/DataBurst Cache, or larger.
e)	CD-RW:	Internal CD-RW, 48x Speed or faster.
f)	16xDVD+/-RW	DVD Burner (with double layer write capability) 16x Speed or faster
g)	I/O Ports:	Must have at least one (1) Serial Port, one (1) Parallel Port, and three (3) USB Ports.
h)	Video Display Card:	HD Graphics (VGA, HDMI) with a minimum of 64 MB of RAM.
i)	Monitor:	22" W, 23.0 Inch VIS, Widescreen, VGA/DVI LCD Monitor.
j)	Available Exp. Slots:	System as configured above shall have at least two (2) full size PCI Slots available.
k)	Network Interface:	Integrated 10/100/1000 Ethernet card.
l)	Other Peripherals:	Optical scroll Mouse, 101 Key Keyboard, Mouse Pad and all necessary cables.
m)	Software Requirement:	Microsoft Windows 7 Professional SP1, 32 bit; Microsoft Office Professional 2010 or 2013; Microsoft Project 2010; Adobe Acrobat reader; Anti-Virus software package with 2 year updates subscription; and, either Auto Cad LT or Microsoft Visio Standard Edition, as directed by the Resident Engineer.

4) DDC Field Office Specs: DDC Field Offices requiring computers shall be provided with the following:

a) One (1) broad-band internet service account. Wideband Internet connectivity at a minimum throughput of 15 Mbps download and 5 Mbps upload is required at each field office location with 1-5 staffers. For larger field offices see table below for minimum required upload speeds. Telephone service should be bundled together with Internet connectivity. Because of throughput requirements Verizon FIOS is the preferred connectivity provider where available.

Office Personnel #	**Upload Speeds (*Minimum*)**
1 – 5	5 Mbps
6 – 10	10 Mbps
11 – 15	15 Mbps
16 – 20 …	20 Mbps

This account will be active for the life of the project. The e-mail name for the account shall be the DDC Field Office/project Id (e.g. FLD K HWK666 McGuinness@earthlink.com).

b) One (1) 600 DPI HP Laser Jet Printer (twelve (12) pages per minute or faster) with one (1) Extra Paper (Legal Size)
c) All necessary cabling for equipment specified herein.
d) Storage Boxes for Blank CD's
e) Printer Table
f) UPS/Surge Suppressor combo

5) All computers required for use in the Engineer's Field Office shall be delivered, installed, and setup in the Field Office by the Contractor.

6) All Computer Hardware shall come with a three (3) year warranty for on-site repair or replacement. Additionally, and notwithstanding any terms of the warranty to the contrary, the Contractor is responsible for rectifying all computer problems or equipment failures within one (1) business day.

7) An adequate supply of blank CDs/DVDs, and paper and toner cartridges for the printer shall be provided by the Contractor and shall be replenished by the Contractor as required by the Resident Engineer.

8) It is the Contractor's responsibility to ensure that electrical service and phone connections are also available at all times; that is, the Field Office Computer(s) is to be powered and turned on twenty-four (24) hours each day.

9) Broadband connectivity is preferred at each field office location. Please take into consideration that an extra phone line dedicated to the modem must be ordered as part of the contract unless Internet broadband connectivity, via Cable or DSL, is available at the planned field office location. Any questions regarding this policy should be directed to the Assistant Commissioner of Information Technology Services at 718-391-1761.

10) Ownership: The equipment specified above shall, unless otherwise directed by the Commissioner, be the sole property of the City of New York upon delivery to the DDC Field Office. The Contractor shall prepare and maintain an accurate inventory of all equipment which it purchases for the DDC Field Office. Such inventory shall be provided to the City of New York. Upon completion of the required services, as directed by the Commissioner, the Contractor shall turn such equipment over to the City of New York.

E. HEAD PROTECTION (HARD HATS):
1. The Contractor shall provide a minimum of 10 standard protective helmets for the exclusive use of Department of Design and Construction personnel and their visitors. Helmets shall be turned over to the Resident Engineer and kept in the DDC Field Office.
2. Upon completion of the project, the helmets shall become the property of the Contractor.

3.9 MATERIAL SHEDS:

A. Material sheds used by the Contractor for the storage of its materials shall be kept at locations which will not interfere at any time with the progress of any part of the work or with visibility of traffic control devices.

B. Store combustible materials apart from the facility.

3.10 TEMPORARY ENCLOSURES:

A. Provide temporary enclosures for protection of construction, in progress and completed, from exposure, foul weather, other construction operations, and similar activities. Provide temporary weather tight enclosure for building exterior.

B. Where heating or cooling is needed and permanent enclosure is not complete, insulate temporary enclosures.

3.11 TEMPORARY PARTITIONS:

A. Provide floor-to-ceiling dustproof partitions to limit dust and dirt migration and to separate occupied tenant areas from fumes and noise.
   1. Construct dustproof partitions with gypsum wallboard with joints taped on occupied side, and fire-retardant plywood on construction operations side.
   2. Construct dustproof partitions with 2 layers of 3-mil (0.07-mm) polyethylene sheet on each side. Cover floor with 2 layers of 3-mil (0.07-mm) polyethylene sheet, extending sheets 18 inches (460 mm) up the sidewalls. Overlap and tape full length of joints. Cover floor with fire-retardant plywood.
      a. Construct vestibule and airlock at each entrance through temporary partition with not less than 48 inches (1219 mm) between doors. Maintain water-dampened foot mats in vestibule.
   3. Insulate partitions to provide noise protection to occupied areas.
   4. Seal joints and perimeter. Equip partitions with dustproof doors and security locks.
   5. Protect air-handling equipment.
   6. Weather strip openings.
   7. Provide walk-off mats at each entrance through temporary partition.

3.12 TEMPORARY FIRE PROTECTION:

A. Install and maintain temporary fire-protection facilities of types needed to protect against reasonably predictable and controllable fire losses. Comply with NFPA 241.

B. Prohibit smoking in all areas.

C. Supervise welding operations, combustion-type temporary heating units, and similar sources of fire ignition according to requirements of authorities having jurisdiction.

D. Develop and supervise an overall fire-prevention and -protection program for personnel at Project site. Review needs with local fire department and establish procedures to be followed. Instruct personnel in methods and procedures. Post warnings and information.

E. Provide temporary standpipes and hoses for fire protection. Hang hoses with a warning sign stating that hoses are for fire-protection purposes only and are not to be removed. Match hose size with outlet size and equip with suitable nozzles.

REFER TO THE ADDENDUM FOR THE APPLICABILITY OF SUB-SECTION 3.13

3.13 WORK FENCE ENCLOSURE:

A. The Contractor shall furnish, erect and maintain a wood construction or chain-link fence to the extent shown on the drawings or required by the work enclosing the entire project on all sides. All materials used shall be new. Any permit required for the installation and use of said fence and costs shall be borne by the Contractor.

B. WOOD FENCE shall be 7'-0" high with framing construction of yellow pine, using 4" x 4" approved preservative-treated posts on not more than 6'-0" centers, with three (3) rails of at least 2" x 4" size to which shall be secured minimum 1/2 inch thick exterior grade plywood. Posts shall be firmly fixed in the

ground at least 30" and thoroughly braced. Top edge of fence shall be trimmed with a rabbeted edge mould. Provide on the street traffic sides of fence, observation openings as directed.

1. GATES - Provide an adequate number of double gates, complete with hardware, located as approved by the Resident Engineer. Double gates shall have a total clear opening of 14'-0" with two (2) 7'-0" hinged swinging sections. Hanging posts shall be 6" x 6" and shall extend high enough to receive and be provided with tension or sag rods for the swinging sections.
2. PAINTING - The fence and gates shall be entirely painted on the street and public sides with one (1) coat of exterior primer and one (1) top coat of exterior grade acrylic-latex emulsion paint. Black stenciled signs reading "POST NO BILLS" shall be painted on fence with three (3) inch high letters on 25 foot spacing for the entire length of fence on street traffic sides. Signs shall be stenciled five (5) feet above the sidewalk.

C. CHAIN-LINK FENCING shall be minimum 2-inch thick, galvanized steel, chain-link fabric fencing; 8 feet high with galvanized steel pipe posts; minimum 2-3/8-inch OD line posts and 2-7/8-inch OD corner and pull posts, with 1-5/8-inch OD top and bottom rails. Fence shall be accurately aligned and plumb, adequately braced and complete with gates, locks and hardware as required. Under no condition shall fencing be attached or anchored to existing construction or trees.

D. ADDITIONAL REQUIREMENTS:

1. It shall be the obligation of the Contractor to remove all posters, advertising signs, and markings, etc., immediately.
2. Should the fencing be required to be relocated during the course of the Contract, it shall be done by the Contractor at no additional cost to the City.
3. Where sidewalks are used for "drive over" purposes for Contractor vehicles, a suitable wood mat or pad shall be provided for protection of sidewalks and curbs.
4. Where required, make provision for fire hydrants, lampposts, etc.
5. REMOVAL - When directed by the Resident Engineer, the fence shall be removed.

3.14 RODENT AND INSECT CONTROL:

A. DESCRIPTION: The Contractor shall provide all labor, materials, plant and equipment, and incidentals required to survey and monitor rodent activity and to control any infestation or outbreak of rodents, rats, mice, water beetles, roaches and fleas within the project area. Special attention should be paid to the following conditions or areas:

1 Wet areas within the project area, including all temporary structures.
2 All exterior and interior temporary toilet structures within the project area.
3 All Field Offices and shanties within the project area of all subcontractors and DDC.
4 Wherever there is evidence of food waste and/or discarded food or drink containers, in quantity, that would cause breeding of rodents or the insects herein specified.
5 Any other portion of the premises requiring such special attention.

B. MATERIALS:

1 All materials shall be approved by the New York State Department of Environmental Conservation and comply with the New York City Health Code, OSHA and the laws, ordinances and regulations of State and Federal agencies pertaining to such chemical and/or materials.

C. PERSONNEL:

1 All pest control personnel must be supervised by an exterminator licensed in categories 7A and 8.

D. METHODS:

1. Application and dosage of all materials shall be done in strict compliance with the manufacturer's recommendations.

2. Any unsanitary conditions, such as uncollected garbage or debris, resulting from all Contractor's activities, which will provide food and shelter to the resident rodent population shall be corrected by the Contractor immediately after notification of such condition by the Resident Engineer.

E. RODENT CONTROL WORK:

1 In wetlands, woodlands and areas adjacent to a stream, special precautions must be taken to protect water quality and to ensure the safety of other wildlife. To prevent poisoned bait from entering streams, no poisoned bait shall be used in areas within seventy-five (75) feet of all stream banks. Live traps must be used in these seventy-five (75) foot buffer zone areas and within wetland and woodland areas.

2 In areas outside the seventy-five (75) foot zone of protection adjacent to streams, and in areas outside wetlands and woodlands, tamper proof bait stations with poisoned bait shall be placed during the period of construction and any consumed or decomposed bait shall be replenished as directed.

3 At least one month prior to initiation of the construction work, and periodically thereafter, live traps and/or rodenticide bait in tamper proof bait stations, as directed above, shall be placed at locations that are inaccessible to pets, human beings, children and other non-target species, particularly wildlife (for example-birds) in the project area.

4 The Contractor shall be responsible for collecting and disposing of all trapped and poisoned rodents found in live traps and tamper proof bait stations. The Contractor shall also be responsible for posting and maintaining signs announcing the baiting of each particular location.
The Contractor shall be responsible for the immediate collection and disposal of any visible rodent remains found on streets or sidewalks within the project area.

5 It is anticipated that public complaints will be addressed to the Commissioner. The Contractor, where directed by the Commissioner, shall take appropriate actions, like baiting, trapping, proofing, etc., to remedy the source of complaint within the next six (6) hours of normal working time which is defined herein for the purposes of this section as 7 A.M. to 6 P.M. on Mondays through Saturdays.

6 Emergency service during the regular workday hours (Monday through Friday) shall be rendered within 24 hours, if requested by the Commissioner, at no additional cost to the City.

F. EDUCATION & NOTICES:

1 The Contractor shall post notices on all Construction Bulletin Boards advising workers, employees, and residents to call the Engineer's Field Office to report any infestation or outbreak of rodents, rats, mice, water beetles, roaches and fleas within the project area. The Contractor shall provide and distribute literature pertaining to IPM techniques of rodent control to affected businesses and superintendents of nearby residential buildings to ensure their participation in maintaining their establishments free of unsanitary conditions, harborage removal and rodent proofing.

2 Prior to application of any chemicals, the Contractor shall furnish to the Commissioner copies or sample labels for each pesticide, antidote information, and Material Data Safety Sheets (MSDS) for each chemical used.

G. RECORDS

1. The Contractor shall keep a record of all rodent and waterbug infestation surveys conducted by him/her and make available, upon request, to the Commissioner. The findings of each survey shall include, but not be limited to, recommended Integrated Pest Management (IPM) techniques, like baiting, trapping, proofing, etc., proposed for rodent and waterbug pest control.

2. The Contractor shall maintain records of all locations baited along with the type and quantity of rodenticide and insecticide bait used.

3.15 PLANT PEST CONTROL REQUIREMENTS and TREE PROTECTION REQUIREMENTS:

A. Plant Pest Control Requirements: The Contractor and its subcontractors, including the Certified Arborist described below, shall comply with all Federal and New York State laws and regulations concerning Asian Longhorned Beetle (ALB) management, including protocols for ALB eradication and containment promulgated by the New York State Department of Agriculture and Markets (NYSDAM). The Contractor is referred to: (1) Part 139 of Title 1 NYCRR, Agriculture and Markets Law, Sections 18, 164 and 167, as amended, and (2) State Administrative Procedure Act, Section 202, as amended.

1. All tree work performed within the quarantine areas must be performed by New York State Department of Agriculture and Markets (NYSDAM) certified entities. Transportation of all host material, living, dead, cut or fallen, inclusive of nursery stock, logs, green lumber, stumps, roots, branches and debris of a half inch or more in diameter from the quarantine areas is prohibited unless the Contractor or its sub-contractor performing tree work has entered into a compliance agreement with NYSDAM. The terms of said compliance agreement shall be strictly complied with. Any host material so removed shall be delivered to a facility approved by NYSDAM. For the purpose of this contract host material shall be ALL species of trees.

2. Any host material that is infested with the Asian Longhorned Beetle must be immediately reported to NYSDAM for inspection and subsequent removal by either State or City contracts, at no cost to the Contractor.

3. Prior to commencement of tree work, the Contractor shall submit to the Commissioner a copy of a valid Asian Longhorned Beetle compliance agreement entered into with NYSDAM and the Contractor or its sub-contractor performing tree work. If any host material is transported from the quarantine area the Contractor shall immediately provide the Commissioner with a copy of the New York State 'Statement of Origin and Disposition' and a copy of the receipt issued by the NYSDAM approved facility to which the host materials are transported.

4. Quarantine areas, for the purpose of this contract shall be defined as all five boroughs of the City of New York. In addition, prior to the start of any tree work, the Contractor shall contact the NYC Department of Parks & Recreation's Director of Landscape Management at (718) 699-6724, to determine the limits of any additional quarantine areas that may be in effect at the time when tree work is to be performed. The quarantine area may be expanded by Federal and State authorities at any time and the Contractor is required to abide by any revisions to the quarantine legislation while working on this contract. For further information please contact: NYSDAM (631) 288-1751.

B. Tree Protection Requirements: The Contractor shall retain a Certified Arborist, as defined by New York City Department of Parks and Recreation (NYCDPR) regulations, to provide the services described below.

1. Surveys and Reports: The Certified Arborist shall, at the times indicated below, conduct a survey and prepare a plant material assessment report which includes: (1) identification, by species and pertinent measurements, of all plant material located on the project site, or in proximity to the project site, as described below, including all trees, significant shrubs and/or planting masses; (2) identification and plan for the containment of plant pests and pathogens, including the ALB, as described in paragraph A above; (3) evaluation of the general health and condition of any infected plant material.

2. Frequency of Reports: The Certified Arborist shall conduct a survey and provide a plant material assessment report at two (2) points in time: (1) prior to the commencement of construction work; and (2) at the time of substantial completion. In addition, for projects exceeding 24 months in duration, the Certified Arborist shall conduct a survey and prepare a report at the midpoint of

construction. Copies of each plant material assessment report shall be submitted to the Resident Engineer within two (2) weeks of the survey.

3. Proximity to Project Site: Off-site trees, significant shrubs and/or planting masses shall be considered to be located in proximity to the project site under the circumstances described below.

   a. The tree trunk, significant shrub, or primary cluster of stems in a planting mass is within 50 (fifty) feet of the project's Contract Limit Lines (CLLs) or Property Lines (PLs).

   b. Any part of the tree or shrub stands within 50 (fifty) feet of: (a) a path for site access for vehicles and/or construction equipment; or (b) scaffolding to be erected for construction activity, including façade remediation projects.

   c. The Certified Arborist determines that the critical root zone (CRZ) of an off-site tree, significant shrub, or primary cluster of stems in a planting mass extends into the project site, whether or not that plant material is located within the 50-foot inclusionary perimeter as outlined above.

4. Tree Protection Plan: The Certified Arborist shall prepare, and the Contractor shall implement, a Tree Protection Plan, for all trees that may be affected by any construction work, excavation or demolition activities, including without limitation, (1) on-site trees, (2) street trees, as defined below, (3) trees under NYCDPR jurisdiction as determined by the Department of Transportation, and (4) all trees that are located in proximity to the project site, as defined above. The Tree Protection Plan shall comply with the NYC DPR rules, regulations and specifications. The Contractor is referred to Chapter 5 of Title 56 of the Official Compilation of the Rules of the City of New York. Copies of the Tree Protection Plan shall be submitted to the Resident Engineer prior to the commencement of construction. Implementation of the Tree Protection Plan for street trees and trees under NYCDPR jurisdiction shall be in addition to any tree protection requirements specified or required for the project site. For the purpose of this article, a "street tree" means the following: (1) a tree that stands in a sidewalk, whether paved or unpaved, between the curb lines or lateral lines of a roadway and the adjacent property lines of the project site, or (2) a tree that stands in a sidewalk and is located within 50 feet of the intersection of the project's site's property line with the street frontage property line.

C. No Separate Payment. No separate payment shall be made for compliance with Plant Pest Control Requirements or Tree Protection Requirements. The cost of compliance with Plant Pest Control Requirements and Tree Protection Requirements shall be deemed included in the Contractor's bid for the Project.

3.16 PROJECT IDENTIFICATION SIGNAGE:

A. The Contractor shall provide, install and maintain Project identification and other signs where indicated to inform public and individuals seeking entrance to the Project.

B. In order to properly convey notice to persons entering upon a City construction site, the Contractor shall furnish and install a sign at the entrance (gates) as follows:

NO TRESPASSING

AUTHORIZED PERSONNEL ONLY

C. If no construction fence exists at the site, this notice shall be conveyed by incorporating the above language into safety materials (barriers, tape, and signs).
D. Provide temporary, directional signs for construction personnel and visitors.
E. Maintain and touch up signs so that they are legible at all times.

3.17 PROJECT CONSTRUCTION SIGN AND RENDERING:

A. PROJECT SIGN:
1 Responsibility: The Contractor shall produce and install one (1) project sign which shall be posted and maintained upon the site of the project at a place and in a position directed by the Commissioner. The Contractor shall protect the sign from damage during the continuance of work under the Contract and shall do all patching of lettering, painting and bracing thereof necessary to maintain the sign in first class condition and in proper position. Prior to fabrication, the Contractor shall submit an 8-1/2" x 11" color match print proof from the sign manufacturer of the completed sign for approval by the Commissioner.
2 Sign Quality: The Contractor shall provide all materials required for the production of the sign as specified herein. Workmanship shall be of the best quality, free from defects and shall be produced in a timely manner.
3 Schedule: Upon project mobilization, the Contractor shall commence production and installation of the sign.
4 Removal: At the completion of all work under the Contract, the Contractor shall remove and dispose of the project sign away from the site.
5 Sign construction:
a. Frame: The frame shall be from quality dressed 2"x2" pine, fire retardant, pressure treated lumber, that surrounds the inside back edge of the sign. The sign shall have one (1) intermediate vertical and two (2) diagonal supports, glued and screwed for rigidity. Frame shall be painted white with two (2) coats of exterior enamel paint, prior to mounting of sign panel.
b. Edging: U-shaped, 22 gauge aluminum edging, with a white enameled finish to match sign background, shall run around entire edging of sign panel and frame. Corners shall be mitered for a tight fit. Channel dimensions shall be 1" inch (overlap to sign panel face) x 1 3/4" (or as required across frame depth) x 1" (back overlap).
c. Sign Panel: 4' x 8' panel shall be constructed in one (1) piece of 14 gauge (.0785") 6061-T6 aluminum. This panel shall be pre-finished both sides with a glossy white baked-on enamel finish and be flush with edge of 2" x 2" wood frame. Samples must be submitted for approval.
d. Fastening: Fasten sign panel to wood frame using cadmium plated no. 8 sheet metal screws at ½" below edge of panel and 8" on center. The U-shaped aluminum channel shall be applied over the wood frame edge and fastened with cadmium plated no. 8 sheet metal screws at 12" on center around the entire perimeter.

6 Sign Graphics:
a. A digital file of the project sign will be provided to the Contractor by the Commissioner's representative for printing. The Commissioner's representative shall insert the project name and names and titles of personnel (3 or more) and any other required information associated with the project. All signs may include a second panel for a project rendering as described in Sub-Section 3.17.B herein.
b. The digital file shall be reproduced at the Sign Panel size of 4' x 8' on 3M High Performance Vinyl or approved equal. The 3M High Performance Vinyl or equivalent shall be guaranteed for nine (9) years. Guarantee must cover fading, peeling, chipping or cracking. The sign manufacturer is required to maintain all specified Pantone Matching System (PMS) type and other composition elements represented in the digital file of the project sign.

REFER TO THE ADDENDUM FOR THE APPLICABILITY OF SUB-SETION 3.17 B

B. PROJECT RENDERING:

1. Responsibility: In addition to the Project Sign, the Contractor shall furnish and install one (1) sign showing a rendering of the project. A digital file of the project rendering will be provided to the Contractor by the Commissioner's representative. From an approved image file provided by DDC, the Project Rendering is to be sized, printed, and mounted in an identical manner as described in Sub-Section 3.17.A above for the Project Sign. A color match print proof from the sign manufacturer of the Rendering Sign printed from the supplied file is to be submitted to DDC for approval before fabrication. The Rendering Sign is to be posted at the same height as the Project Sign. Where possible, the Rendering Sign shall be mounted with a perfect match of the short sides of the rectangle so that the Rendering Sign and the Project Sign together will create one long rectangle.
2. Removal: At the completion of all work under the Contract, the Contractor shall remove and dispose of the project rendering away from the site.

REFER TO THE ADDENDUM FOR THE APPLICABILITY OF SUB-SECTION 3.18

3.18 SECURITY GUARDS/FIRE GUARDS ON SITE:

A. SECURITY GUARDS (WATCHMEN):

1. The Contractor shall provide competent Security Guard Service on the site, beginning on the date on which the Contractor commences actual construction work, or on such earlier date on which there is activity at the site related to the work, including without limitation, delivery of materials or construction set-up. The Contractor shall continue to provide such Security Guard Service until the date on which it completes all required work at the site, including all punch list work, as certified in writing by the Resident Engineer, or earlier if so directed in writing by the Commissioner. Throughout the specified time period, there shall be no less than one (1) Security Guard on duty every day, including Saturdays, Sunday and Holidays, 24 hours a day, except between the hours of 8:00 A.M. and 4:00 P.M. on any day which is a regular working day for a majority of the trade subcontractors. This exception during the working day shall not apply after the finishing painting of the plaster work is commenced; thereafter, not less than one (1) Security Guard shall be on duty continuously, 24 hours a day.
2. Every Security Guard shall be required to hold a "Certificate of Fitness" issued by the Fire Department. Every Security Guard shall, during his/her tour of duty, perform the duties of Fire Guard in addition to his/her security obligations.
3. Should the Commissioner find that any Security Guard is unsatisfactory; such guard shall be replaced by the Contractor upon the written demand of the Commissioner.
4. Each Security Guard furnished by the Contractor shall be instructed by the Contractor to include in his/her duties the entire construction site including the Field Office, temporary structures, and equipment, materials, etc.
5. Should the Contractor or any other subcontractor consider the security requirements outlined above inadequate, the Contractor shall provide such additional security as it thinks necessary, after obtaining the written consent of the Commissioner. The additional cost of such approved increased protection will be paid by the Contractor.
6. Nothing contained in this Sub-Section shall diminish in any way the responsibility of the Contractor and each subcontractor for its own work, materials, tools, equipment, nor for any of the other risks and obligations outlined hereinbefore in this Article.

B. COSTS - The Contractor shall employ Security Guards/Fire Guards throughout the specified time period, except as otherwise modified by the detailed Specifications and as approved by the Commissioner, for the purpose of safeguarding and protecting the site. All costs for Security Guards/Fire Guards shall be

borne by the Contractor.

C. RESPONSIBILITY - The Contractor and its subcontractors will be responsible for safeguarding and protecting their own work, materials, tools and equipment.

3.19 SAFETY:

A. The Contractor, in compliance with requirements of Section 01 35 26, SAFETY REQUIREMENTS PROCEDURES, shall provide and maintain all necessary temporary closures, guard rails, and barricades to adequately protect all workers and the public from possible injury. Any removal of these items, during the progress of the work, shall be replaced by the Contractor at no additional cost to the City.

END OF SECTION 01 50 00

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SECTION 01 54 11
TEMPORARY ELEVATORS AND HOISTS

PART 1 – GENERAL

1.1 RELATED DOCUMENTS:

A. The following documents apply to all required work for the Project: (1) the Contract Drawings, (2) the Specifications, (3) the General Conditions, (4) the Addendum, and (5) the Contract [City of New York Standard Construction Contract].

1.2 SUMMARY:

A. This section includes the following:
   1. Temporary Use, Operation and Maintenance of Elevators during Construction
      a. For New buildings up to 15 Stories
      b. For New buildings over 15 Stories
      c. For Existing Buildings
   2. Temporary Construction Hoists and Hoist ways (For Material and Personnel)

1.3 RELATED SECTIONS: include without limitation the following:

A. Section 01 10 00 SUMMARY
B. Section 01 42 00 REFERENCES
C. Section 01 50 00 TEMPORARY FACILITIES AND CONTROLS
D. Section 01 54 23 TEMPORARY SCAFFOLDS AND SWING STAGING
E. Section 01 77 00 CLOSE OUT PROCEDURES

PART II – PRODUCTS (Not Used)

PART III – EXECUTION

REFER TO THE ADDENDUM FOR THE APPLICABILITY OF SUB-SECTION 3.1

3.1 TEMPORARY USE, OPERATION AND MAINTENANCE OF ELEVATORS DURING CONSTRUCTION FOR NEW BUILDINGS UP TO AND INCLUDING 15 STORIES:

A. INSTALLATION: The Contractor shall install, complete, operate, and maintain in good working order, as indicated herein, one (1) selected main elevator for the transport of employees of the Contractor and/or its subcontractors, and representatives of the DDC and other Governmental Agencies having jurisdiction of work at the project. The Contractor shall furnish, install, and maintain such elevator in good working order, including all necessary hoisting ropes, governor cables, traveling conductor cables, operating devices, temporary hand reset target annunciators, temporary signal devices, and all other permanent or temporary parts. The installation, operation and maintenance of the temporary elevator and all equipment and/or parts utilized in connection therewith shall be in accordance with the rules and regulations of all agencies and/or entities having jurisdiction over elevators in temporary use.

B. RESPONSIBILITY: The Contractor shall be responsible for any injury to persons or damage to property arising out of the temporary elevator and all equipment and/or parts utilized in connection therewith.

C. COSTS: The Contractor shall be responsible for all costs in connection with the temporary elevator, including without limitation: (1) installing and operating the temporary elevator, (2) maintaining the temporary elevator in clean, proper operating condition, including the cost of lubricants and/or parts for such maintenance, (3) performing all work in pits, shaft ways and machine rooms necessary for the operation of the temporary elevator, (4) replacing the temporary elevator or any equipment or parts utilized in connection therewith, if required, due to damage, destruction or excessive wear or corrosion, except for the replacement of hoisting ropes as set forth below, (5) performing all required electrical work in connection with the temporary elevator, (6) providing all electric power required to operate the temporary elevator, (7) providing all necessary conduit and wiring connections for the proper operation and signaling of the temporary elevator, and (8) providing all labor for the operation and maintenance of the temporary elevator, including on an overtime basis if necessary. The total Contract Price shall include all costs in connection with the temporary elevator, including without limitation, the costs specified herein.

D. COMMENCEMENT OF SERVICE: The Contractor shall begin to provide temporary elevator service using the selected main passenger elevator no later than eight (8) weeks (40 working days) after the machine room roof slab, or that portion of it surrounding the elevator shaft, has been placed. No later than three (3) weeks (15 working days) after the machine room roof slab, or that portion of it surrounding the elevator shaft, has been placed the following work shall have been completed:

1. The shaft shall have been completely enclosed by either the permanent or a temporary enclosure meeting the requirements of the law.
2. The machine room shall have been made completely watertight either by permanent or temporary construction. Beams or other devices, either permanent or temporary shall be provided which will enable the safe and practicable hoisting of the elevator machinery for installation.
3. There shall have been installed on all floors at the shaft way entrances to the elevator, solid substantial frames and either sliding or swing doors with substantial hardware and door locks and any necessary approved wire mesh barricades for adjacent shaft ways.
4. There shall have been furnished and installed solid substantial enclosures at front, back, sides and top of car platform enclosure, with emergency exit at top of car, excepting that the portion of the front at the elevator entrance shall have been provided with a substantial temporary door or gate.

E. ELECTRICAL INSTALLATION: The Contractor, not later than 20 calendar days after the machine room roof slab or that portion of its surrounding the elevator has been placed, shall have furnished and installed temporary or permanent power and light feeders as required for the elevator used for temporary service and shall have connected such feeders to the terminals on the starter panels or controllers in the machine room to the low voltage transformers and car light outlets in the center of shaft way and for the car control and signal traveling cables. The Contractor shall make all these required connections as soon as the equipment is declared ready for such connections by the Resident Engineer.

F. REMOVAL: When elevators for permanent use have been installed and are in condition for service, and when directed by the Commissioner, the Contractor shall remove the temporary enclosures and all temporary elevator equipment and promptly proceed with the installation of the permanent equipment as required under the Contract.

G. INSPECTION: Before temporary elevator equipment is removed, a joint inspection of the equipment shall be made by the Contractor and the Commissioner to determine the condition of this equipment upon the discontinuation of its temporary use. If this inspection deems it necessary, the Contractor shall furnish and install new governor and compensating ropes, new traveling cables and new controller parts, etc. The car and counterweight safeties shall be thoroughly cleaned of all dirt and all foreign matter, then properly lubricated and placed in good operating condition to the satisfaction of the Commissioner. If it is

determined and ordered by the Commissioner that new hoist ropes are required, such ropes shall be installed and payment therefore will be made in accordance with Article 26 of the Contract.

H. REPLACEMENT: The Contractor shall furnish and install new equipment or parts for any equipment or parts of the temporary elevator installation that have been damaged, destroyed, or that indicate excessive wear or corrosion, excepting the replacement of hoisting ropes. All shaft ways, pits, motor rooms and sheave spaces used for temporary operation of elevators shall be thoroughly cleaned. Where lubricated rails are used they shall be washed down. If roller guides are used, all rust, dirt, etc., must be moved from the rails. The full cost of parts replacement, cleaning, etc., shall be borne by the Contractor except for the replacement of hoisting ropes.

I. LIMITATIONS ON USE: The temporary elevator shall not be used during its operation for the hoisting of materials or the removal of rubbish, but shall be limited only to the transportation of employees of the Contractor and/or its subcontractors, and representatives of DDC and other Governmental Agencies having jurisdiction of work at the project. However, the Resident Engineer may grant special permission at specified times to the Contractor and/or its subcontractors to hoist materials, which in the Resident Engineer's opinion will not overload or damage the elevator installation, but only after such times as all plastering has been completed from the second floor up. In the event of any damage to the temporary elevator, the Contractor shall notify the Resident Engineer within 24 hours after such damage has occurred. As indicated above, the Contractor shall be responsible for the replacement of any equipment or parts of the temporary elevator that have been damaged.

J. LIQUIDATED DAMAGES: The Contractor will be charged at the rate of $100 per day for each day it fails to provide the temporary elevator service described in this section beginning with the 41st working day after the machine room roof slab, or that portion of it surrounding the elevator shaft, has been placed and stripped. This charge will be deducted from any amount due and owing to the Contractor.

REFER TO THE ADDENDUM FOR THE APPLICABILITY OF SUB-SECTION 3.2

3.2 TEMPORARY USE, OPERATION AND MAINTENANCE OF ELEVATORS DURING CONSTRUCTION FOR NEW BUILDING OVER 15 STORIES:

A. INSTALLATION: The Contractor shall install, complete, operate, and maintain in good working order, as indicated herein, two (2) selected main elevators for the transport of employees of the Contractor and/or its subcontractors, and representatives of the DDC and other Governmental Agencies having jurisdiction of work at the project. The Contractor shall furnish, install, and maintain such elevators in good working order, including all necessary hoisting ropes, governor cables, traveling conductor cables, operating devices, temporary hand reset target annunciators, temporary signal devices, and all other permanent or temporary parts. The installation, operation and maintenance of the temporary elevators and all equipment and/or parts utilized in connection therewith shall be in accordance with the rules and regulations of all agencies and/or entities having jurisdiction over elevators in temporary use. The two (2) elevators shall not be operated simultaneously.

B. RESPONSIBILITY: The Contractor shall be responsible for any injury to persons or damage to property arising out of the temporary elevators and all equipment and/or parts utilized in connection therewith.

C. COSTS: The Contractor shall be responsible for all costs in connection with the temporary elevators, including without limitation: (1) installing and operating the temporary elevators, (2) maintaining the temporary elevators in clean, proper operating condition, including the cost of lubricants and/or parts for such maintenance, (3) performing all work in pits, shaft ways and machine rooms necessary for the operation of the temporary elevators, (4) replacing the temporary elevators or any equipment or parts utilized in connection therewith, if required due to damage, destruction or excessive wear or corrosion, except for the replacement of hoisting ropes as set forth below, (5) performing all required electrical work in connection with the temporary elevators, (6) providing all electric power required to operate the temporary elevators, (7) providing all necessary conduit and wiring connections for the proper operation

and signaling of the temporary elevators, and (8) providing all labor for the operation and maintenance of the temporary elevators, including on an overtime basis if necessary. The total Contract Price shall include all costs in connection with the temporary elevators, including without limitation, the costs specified herein.

D. LOW RISE ELEVATOR: The Contractor shall begin to provide temporary elevator service using one (1) selected main passenger elevator no later than six (6) weeks (30 working days) after the 12th Floor slab, or that portion of it surrounding the elevator shaft, has been placed and stripped. No later than one (1) week, five (5) working days, after the 12th Floor slab, or that portion of it surrounding the elevator shaft, has been placed and stripped the following work shall have been completed:

1. The shaft shall have been completely enclosed up to the 12th Floor by either the permanent or a temporary enclosure meeting the requirements of the law.
2. A temporary machine room enclosure shall have been provided at the 11th Floor and shall have been made completely watertight either by permanent or temporary construction. Beams or other devices, either permanent or temporary, shall be provided which will enable the safe and practicable hoisting of the elevator machinery for installation.
3. There shall have been installed on all floors up to and including the 9th Floor at the shaft entrances to the elevator, solid substantial wood frames and either sliding or swing doors with substantial hardware and door locks, also any necessary approved wire mesh barricades for adjacent shaft ways.
4. There shall have been furnished and installed solid substantial enclosures at front, back, sides and top of car platform enclosure, with an emergency exit at top of car, excepting that the portion of the front at the elevator entrance shall have been provided with a substantial temporary door or gate.

E. ELECTRICAL INSTALLATION: The Contractor not later than 10 calendar days after the 12th Floor slab or that portion of it surrounding the elevator, has been poured and stripped, shall have furnished and installed temporary or permanent power and light feeders as required for the elevator used for temporary service and shall have connected such feeders to the terminals on the starter panels or controllers in the temporary machine room, to the low voltage transformers and car light outlets in the center of the shaftway and for the car control and signal traveling cables. The Contractor shall make all these required connections as soon as the Equipment is declared ready for such connections by the Resident Engineer.

F. HIGH RISE ELEVATOR: The Contractor shall begin to provide temporary elevator service to all floors, using a selected main passenger elevator, no later than eight (8) weeks (40 working days) after the machine room roof slab, or that portion of it surrounding the elevator shaft, has been placed. No later than three (3) weeks (15 working days) after the machine room roof slab, or that portion of it surrounding the elevator shaft, has been placed, the following work shall have been completed:

1. The shaft shall have been completely enclosed by either the permanent or temporary enclosure, meeting the requirements of the law.
2. The machine room shall have been made completely watertight either by permanent or temporary construction. Beams or other devices, either permanent or temporary shall be provided which will enable the safe and practicable hoisting of the elevator machinery for installation.
3. There shall have been installed on all floors at the shaft way entrances to the elevator, solid substantial frames and either sliding or swing doors with substantial hardware and door locks, also any necessary approved wire mesh barricades for adjacent shaft ways.
4. There shall have been furnished and installed, solid substantial enclosures at front, back, sides and top of car platform enclosure, with an emergency exit at top of car, excepting that the portion of the front at the elevator entrance shall have been provided with a substantial temporary door or gate.

G. ELECTRICAL INSTALLATION: The Contractor, not later than 20 calendar days after the machine room slab or that portion of it surrounding the elevator shaft has been placed, shall have furnished and installed temporary or permanent power and light feeders as required for the high rise elevator to be used for temporary service and shall have connected such feeders to the terminals on the motor-generator starter panels or controllers in the machine room, to the signal circuits low voltage transformers for the annunciators and car light outlets in the center of shaft way. The Contractor shall make all these required connections as soon as the equipment is declared ready for such connections by the Resident Engineer.

H. When the high rise elevator is completed and ready for temporary operation, the low rise temporary elevator shall be shut down.

I. REMOVAL: When one (1) or more elevators for permanent use have been installed and are in condition for service, and when directed by the Commissioner, the Contractor shall remove the temporary enclosures and all temporary elevator equipment, and promptly proceed with the installation of the permanent equipment as required under the Contract.

J. INSPECTION: Before temporary elevator equipment is removed, a joint inspection of the equipment shall be made by the Contractor and the Commissioner to determine the condition of this equipment upon the discontinuation of its temporary use. If this inspection determines it necessary, the Contractor shall furnish and install new governor and compensating ropes, new traveling cables, new controller parts, etc. The car and counterweight safeties shall be thoroughly cleaned of all dirt and all foreign matter, then properly lubricated and placed in good operating condition to the satisfaction of the Commissioner. If it is determined and ordered by the Commissioner that new hoist ropes are required, such ropes shall be installed and payment therefore will be made in accordance with Article 26 of the Contract.

K. REPLACEMENT: The Contractor shall furnish and install new equipment or parts for any equipment or parts of the temporary elevator installations that have been damaged, destroyed, or that indicate excessive wear or corrosion, excepting the replacement of hoisting ropes. All shaft ways, pits, motor rooms and sheaves spaces used for temporary operation of elevators shall be thoroughly cleaned down. Where lubricated rails are used they shall be washed down, if roller guides are used, all rust, dirt, etc., must be removed from the rails. The full cost of parts replacement cleaning, etc., shall be borne by the Contractor except for the replacement of hoisting ropes.

L. LIMITATIONS ON USE: The temporary elevators shall not be used during their operation for the hoisting of materials or the removal of rubbish, but shall be limited only to the transportation of employees of the Contractor and/or its subcontractors, and representatives of DDC and other Governmental Agencies having jurisdiction of work at the project. However, the Resident Engineer may grant special permission at specified times to the Contractor and/or its subcontractors to hoist materials, which in the Resident Engineer's opinion will not overload or damage the elevator installation, but only after such times as all plastering has been completed from the second floor up. In the event of any damage to the temporary elevator, the Contractor shall notify the Resident Engineer within 24 hours after such damage has occurred. As indicated above, the Contractor shall be responsible for the replacement of any equipment or parts of the temporary elevator that have been damaged.

M. LIQUIDATED DAMAGES: The Contractor will be charged at the rate of $100 per day for each day it fails to provide the temporary elevator service described in this Section beginning with the 31st working day after the 12th Floor slab, or that portion of the 12th Floor slab surrounding the elevator shaft, has been placed and stripped. This charge will be deducted from any amount due and owing to the Contractor.

REFER TO THE ADDENDUM FOR THE APPLICABILITY OF SUB-SECTION 3.3

3.3 TEMPORARY USE, OPERATION AND MAINTENANCE OF ELEVATORS DURING CONSTRUCTION FOR EXISTING BUILDINGS:

A. The Contractor may use, at the Commissioner's discretion, one (1) selected elevator in the building for temporary operation by the Contractor for the transportation of employees of the Contractor and/or its subcontractors, and representatives of DDC and other Governmental Agencies having jurisdiction over

the work at the Project. The operation of the temporary elevator and all equipment and/or parts utilized in connection therewith shall be in accordance with the rules and regulations of all agencies and/or entities having jurisdiction over elevators in temporary use.

B. RESPONSIBILITY: The Contractor shall be responsible for any injury to persons or damage to property arising out of the temporary elevator and all equipment and/or parts utilized in connection therewith.

C. REPLACEMENT: The Contractor shall furnish and install new equipment or parts for any equipment or parts of the elevator for temporary operation that have been damaged, destroyed, or that indicate excessive wear or corrosion, excepting the replacement of hoisting ropes. All shaft ways, pits, motor rooms and sheave spaces used for temporary operation of elevators shall be thoroughly cleaned down. Where lubricated rails are used they shall be washed down, if roller guides are used, all rust, dirt, etc., must be moved from the rails. The full cost of parts replacement, cleaning, etc., shall be borne by the Contractor except for the replacement of hoisting ropes. If it is determined and ordered by the Commissioner that new hoist ropes are required, such ropes shall be installed and payment therefore will be made in accordance with Article 26 of the Contract.

D. LIMITATIONS ON USE: The temporary elevator shall not be used during its operation for the hoisting of materials or the removal of rubbish, but shall be limited only to the transportation of employees of the Contractor and/or its subcontractors, and representatives of DDC and other Governmental Agencies having jurisdiction of work at the project. However, the Resident Engineer may grant special permission at specified times to the Contractor and/or its subcontractors to hoist materials, which in the Resident Engineer's opinion will not overload or damage the elevator installation. In the event of any damage to the temporary elevator, the Contractor shall notify the Resident Engineer within 24 hours after such damage has occurred. As indicated above, the Contractor shall be responsible for the replacement of any equipment or parts of the temporary elevator that have been damaged.

E. LIQUIDATED DAMAGES: The Contractor will be charged at the rate of $100 per day for each day it fails to provide elevator services described in this section beginning with 15 consecutive calendar days from Notice to Proceed. This charge will be deducted from any amount due and owing to the Contractor.

3.4 TEMPORARY HOISTS AND HOISTWAYS (FOR MATERIAL AND PERSONNEL):

A. RESPONSIBILITY: The Contractor shall provide adequate numbers of material hoists for the most expeditious performance of all parts of the work including the work of all its subcontractors. .

B. LOCATIONS: No hoists shall be constructed at such locations as will interfere with, or affect the construction of, floor arches, or the work of subcontractors. The hoists may be located at the exterior sides of the structure or in the courtyard and extend upward adjacent to the line of window openings. The hoists shall be located a sufficient distance from the exterior walls and be so protected as to prevent any of the permanent work from being damaged, stained or marred.

C. ELEVATOR SHAFT: Wherever possible, one or more of the permanent elevator shafts may be used as temporary hoist ways, providing such use complies with the requirements of the Building Code of the City of New York and has been approved by the Commissioner, and providing further it entails no interference with the progress of the work.

D. PROTECTION FOR INTERIOR HOISTS: All interior material hoist ways shall be enclosed on each floor and shall be adequately protected with appropriate safety guards. In no event shall the protection be less than that required by law.

END OF SECTION 01 54 11

SECTION 01 54 23
TEMPORARY SCAFFOLDING AND PLATFORMS

PART 1 – GENERAL

1.1 RELATED DOCUMENTS:

A. The following documents apply to all required work for the Project: (1) the Contract Drawings, (2) the Specifications, (3) the General Conditions, (4) the Addendum, and (5) the Contract [City of New York Standard Construction Contract].

B. Section 01 35 26: Safety Requirements Procedures.

C. The Contractor shall comply with the requirements of "*The City of New York Department of Design and Construction Safety Requirements*". This document is included in the Information for Bidders.

1.2 SUMMARY:

A. This Section includes administrative and general procedural requirements for Temporary Scaffolding and Platforms, including:

1. Conformance
2. Responsibility
3. Jobsite Documentation and Submittals
4. Inspections

B. This Section governs ALL scaffold used on DDC project sites including, but not limited to, Suspended Scaffold, Supported Scaffold and Sidewalk Sheds.

1.3 CONFORMANCE:

A. Unless otherwise indicated, the Contractor is responsible for providing, erecting, installing and maintaining all temporary scaffolding and platforms which shall comply with requirements of Chapter 33 (Safeguards During Construction or Demolition) of the NYC Building Code, NYC Local Law 52 of 2005, OSHA Construction Standard 1926 Subpart L, and furnishing the items and personnel set forth in this section.

1.4 RESPONSIBILITY:

A. Jobsite Safety Coordinator: The Contractor shall designate and employ a Jobsite Safety Coordinator, who shall be a competent person, who shall have a daily presence on the project site during scaffold use. This designee must possess and maintain a valid New York City Department of Buildings supported scaffold certificate of completion. An alternate shall also be designated, in the event that the Jobsite Safety Coordinator is absent. The Jobsite Safety Coordinator shall:

1. Verify completeness of documentation and submittals (as described below).
2. Verify that inspections are performed, including pull tests (see below), reports are filed and reported deficiencies are corrected.
3. Monitor trades using scaffold.
4. Limit access to scaffold areas that are tagged for non-use.
5. Inform trades of scaffold load limitations.
6. Monitor loading of decks.
7. Verify that any ties that are temporarily removed are properly restored in the same shift.
8. Verify that outriggers and planks that are moved are properly set up and secured.
9. Verify that all scaffold decks in use have proper access/egress.

10. Verify that all open sides of decks in excess of 14 inches have proper guardrails and toe-boards.
11. Notify appropriate parties, including but not limited to the Resident Engineer, site safety coordinator / monitor, site safety consultant, scaffold users, contractor and the scaffold engineer, of misuses, non-conformances, hazards and accidents.
12. Keep a log of significant actions and events connected with the scaffolding.

B. The Contractor shall be responsible for erecting, maintaining and dismantling the scaffolding and/or sidewalk shed in conformance with requirements of the New York City Building Code, OSHA and the Contract documents, including the specifications. The Contractor shall also be guided by generally accepted standards of scaffold industry practice as promulgated by the Scaffold Industry Association.

C. The Contractor shall require the subcontractor responsible for erecting the scaffolding to engage a Scaffold Engineer, licensed as a professional engineer by the State of New York. The Scaffold Engineer shall be responsible to ensure the following: (1) that the installation design is in compliance with requirements of the New York City Building Code and OSHA, (2) that the design comports with the capabilities of the components and the characteristics of the site, (3) that scaffold loads on the host building, including netting, have been properly considered, and (4) that the design documents provide accurate information for erectors and users.

D. Scaffold users are trade contractors assigned to work on the scaffold. Training certificates from a New York City Department of Buildings approved training provider are mandatory. These users have the duty to become familiar with the New York City Building Code and OSHA requirements germane to users, to obey the instructions of the Jobsite Safety Coordinator and to inform the Jobsite Safety Coordinator of known hazards, non-conformances or violations.

1.5 JOBSITE DOCUMENTATION AND SUBMITTALS:

The Contractor shall prepare, obtain and submit the following to the Resident Engineer:

A. NYC Department of Buildings permit(s) for scaffold and sidewalk sheds (as applicable) including filing applications signed and sealed by a Professional Engineer licensed in the State of New York;

B. Site logistics plan / site safety plan;

C. Installation drawing(s), design and product data to be provided for **all** scaffold(s) and shed(s) must include, at a minimum:

1. Plan(s);
2. Elevation(s);
3. Duty load designation; "standard" (150 psf live load) or "heavy duty" (300 psf live load).
4. Details including base support, anchors and ties;
5. Notes and specifications including load limits, number of planked levels, tie spacing, netting, and sequence of installation and removal.
6. Anchorage into sound material.
7. Load limits based on pull tests;
8. Specifications for pull test(s), method, proof load and the number of trials;
9. Elevations, levels or heights, where anchorage is made into masonry;
10. Specifications for frames, planks, screw jacks, anchors, and any other ancillary hardware;
11. Samples for anchors, ties and netting;
12. Sequence of operations for erection and demolition;
13. Location plan, heights, widths, "jumps" over doorways and driveways;
14. Specify size, maximum span and maximum spacing of headers and stringers;
15. Specify legs, girts, braces, nailing and connections;
16. All sidewalk sheds shall be designed, engineered, signed and sealed by a Professional Engineer licensed in the State of New York;

a. Generic (not job specific) engineering drawings are satisfactory for standard sheds and arrangements.
b. Special engineering is required for custom sheds, site-specific problems or non-standard arrangements.

1.6 INSPECTIONS:

A. Signed inspection reports shall be issued for each inspection and pull-test below, and shall be logged and maintained on site by the Jobsite Safety Coordinator for the duration of the project.

B. Pull testing shall be required during design, and during or post erection, where anchorage is made into masonry. The Scaffold Engineer shall specify the test method, proof load and the number of trials.

C. Sidewalk sheds shall be inspected after initial installation, major modification, or damage and thence every three months. Inspections shall be by a Scaffold Engineer for custom sheds and by a Competent Person employed by the Contractor for standard sheds.

D. Scaffolds shall be inspected by the Scaffold Engineer during erection, post-erection and prior to use and thence every three months. The Scaffold Engineer shall repeat inspections after major alteration/modification, damage.

E. A Qualified Person assigned by the Contractor shall inspect the progress of erection and dismantling, and the condition and integrity of the sidewalk sheds after high winds, major storms and at least once per month during usage.

F. A Qualified Person assigned by the Contractor shall inspect the progress of erection and dismantling at least weekly, and the condition and integrity of the scaffold after high winds, major storms and at least once per month during usage.

G. Scaffolds and Sidewalk Sheds shall be inspected daily by the Jobsite Safety Coordinator or alternate prior to use by scaffold users. The inspection results must be recorded in the maintenance log, and be available on-site at all times.

H. At the completion of the project, submit all inspection documents as Miscellaneous Record Documents in accordance with Section 01 78 39, CONTRACT RECORD DOCUMENTS.

1.7 LADDERS AND STAIRS:

A. The Contractor shall provide and maintain ladders or temporary stairs extending from the street to the first story, and to and from every floor and roof level of the project.

1.8 ACCESS AND EXITS:

A. The ladders or temporary stairs shall be of acceptable size, number and location, so that proper and convenient access may be had by those required to proceed to and from all parts of the project.

PART II – PRODUCTS (Not Used)

PART III – EXECUTION (Not Used)

END OF SECTION 01 54 23

(No Text on This Page)

SECTION 01 73 00
EXECUTION

PART 1 – GENERAL

1.1 RELATED DOCUMENTS:

A. The following documents apply to all required work for the Project: (1) the Contract Drawings, (2) the Specifications, (3) the General Conditions, (4) the Addendum, and (5) the Contract [City of New York Standard Construction Contract].

1.2 SUMMARY:

A. This Section includes general procedural requirements governing execution of the Work including without limitation the following:

1. Delivery of Materials
2. Contractor's Superintendent
3. Surveys
4. Borings
5. Examination
6. Environmental Assessment
7. Preparation
8. Deferred Construction
9. Installation
10. Permits
11. Transportation
12. Sleeves and Hangers
13. Sleeve and Hanger Drawings
14. Cutting and Patching
15. Location of Partitions
16. Furniture and Equipment
17. Removal of Rubbish and Surplus Material
18. Cleaning
19. Security and Protection of Work Site
20. Maintenance of Site and Adjoining Property
21. Maintenance of Project Site
22. Safety Precautions for Control Circuits
23. Obstructions in Drainage Lines

1.3 RELATED SECTIONS: Include without limitation the following:

A.	Section 01 10 00	SUMMARY
B.	Section 01 31 00	PROJECT MANAGEMENT AND COORDINATION
C.	Section 01 33 00	SUBMITTAL PROCEDURES
D.	Section 01 74 19	CONSTRUCTION WASTE MANAGEMENT & DISPOSAL
E.	Section 01 77 00	CLOSEOUT PROCEDURES
F.	Section 01 78 39	CONTRACT RECORD DOCUMENTS

1.4 DEFINITIONS:

A. Refer to Article 2 of the Contract for definition of terms, words and expressions used in the General Conditions not otherwise defined herein.

B. Design Consultant: "Design Consultant" shall mean the entity responsible for providing design services for the Project, including without limitation, preparing the construction documents (drawings and specifications) and providing services in connection with such documents during construction. The entity serving as the "Design Consultant" may be a corporation, firm, partnership, joint venture, individual or combination thereof. Such entity may be either an employee(s) of the City or an entity engaged by the City to provide such services.

1.5 QUALITY ASSURANCE:

A. Land Surveyor Qualifications: A professional land surveyor who is licensed in the State of New York and who is experienced in providing land-surveying services of the kind indicated.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 DELIVERY OF MATERIALS:

A. Material Orders: The Contractor shall furnish to the Commissioner a copy of each material order, indicating date of order and quantity of material, and shall also notify the Commissioner when materials have been delivered to the site and in what quantities.

B. Ample Quantities: The Contractor shall deliver materials in ample quantities to insure the most prompt and uninterrupted progress of the work so as to complete the work within the Contract time.

C. Containers: The manufacturer's containers shall be delivered with unbroken seals and shall bear proper labels.

D. Deliveries: The Contractor shall coordinate deliveries in order to avoid delaying or impeding the progress of the work.

E. Handling: The Contractor shall provide equipment and personnel to handle products by methods to prevent soiling or damage.

1. Promptly inspect shipments to assure products comply with requirements, quantities are correct, and products are undamaged.
2. Promptly return damaged shipments or incorrect orders to manufacturer.
3. For materials or equipment to be reused or salvaged, use special care in removal, storage and reinstallation to insure proper function in completed work.

F. Storage: Store products in accordance with provisions of Article 3.1, and periodically inspect to assure that stored products are undamaged and are maintained under required conditions.

G. Stacking: All materials shall be properly stacked in convenient places adjacent to the site, or where directed, and protected in a satisfactory manner. Stacked materials shall be so arranged as to not interfere with visibility of traffic control devices.

H. Overloading: If authority is given to store materials in any part of the project area, they shall be so stored as to cause no overloading.

I. No Interference: If it becomes necessary to remove and restack materials to avoid impeding the progress of any part of the work or interfering with the work to be done by any trade subcontractor, the Contractor shall remove and restack such materials at no additional cost to the City.

3.2 CONTRACTOR'S CONSTRUCTION SUPERINTENDENT:

A. Contractor's Construction Superintendent: The Contractor shall devote its time and personal attention to the work and shall employ and retain at the project site, from the commencement until the entire completion of the work, a Contractor's Construction Superintendent. The Contractor's Construction Superintendent shall be registered with the New York City Department of Buildings in compliance with the Construction Superintendent Rule of the City of New York and shall be competent and capable of maintaining proper supervision and care of the work and shall be acceptable to the Commissioner. The Construction Superintendent shall, in the absence of the Contractor, and irrespective of any superintendent or foreman employed by any subcontractor, shall see that the instructions of the Commissioner are carried out.

B. Replacement: The Contractor's Construction Superintendent on the job shall not be changed or removed without the consent of the Commissioner.

REFER TO THE ADDENDUM FOR THE APPLICABILITY OF SUB-SECTION 3.3

3.3 SURVEYS:

A. Line and Grade: The City will establish a baseline and bench mark near the site of the work for use of the Contractor in connection with the performance of the work.

B. Responsibility: The Contractor shall establish all other lines and elevations required for its work and shall be solely responsible for the accuracy thereof.

C. Safeguard All Points: The Contractor shall safeguard all points, stakes, grade marks and bench marks made or established by the Contractor on the work, shall re-establish same if disturbed and bear the entire expense of rectifying the work improperly installed due to not maintaining, not protecting or removing without authorization such established points, stakes, or marks.

D. City Monuments and Markers: No work shall be performed near City monuments or marks so as to disturb them until the said monuments or marks have been referenced or reset or otherwise disposed of by the relevant Agency or party who installed them.

E. Foundations: The Contractor shall furnish certification from a licensed Surveyor that all portions of the foundation work are located in accordance with the Contract Drawings and at the elevations required thereby. This certification shall show the actual locations and the actual elevations of all the work in relation to the locations and elevations shown on the Contract Drawings, including but not restricted to the following:

1. The locations and elevations of all piles, if any.
2. Elevations of tops of all spread footings, tops of pile caps, and tops of all foundation walls, elevator pit walls and ramp walls.
3. Location of all footing centers and pier centers including those for exterior wall columns.
4. Location of all foundation walls including wall columns, elevator pit walls and ramp walls.

F. Wall Lines: After the first courses of masonry or stone have been laid, the Contractor shall establish the permanent lines of exterior walls. The Contractor shall furnish promptly, certification from a licensed Surveyor, in the form of signed original drawings showing the exact location of such wall lines, of all portions of all structures. Except at its own risk, the Contractor shall not proceed further with the erection of walls until the Surveyor's certification has been submitted and verified for correct location of wall lines.

G. Surveyor: The Surveyor selected for any of the purposes mentioned in Paragraph E and Paragraph F above, and Paragraph I below, shall be a land Surveyor licensed in the State of New York and shall be subject to the approval of the Commissioner. The Surveyor shall not be a regular employee of the Contractor, nor shall the Surveyor have any interest in the Contract. The Surveyor shall not be employed by the Contractor in laying out any work, it being intended that the Surveyor's certification shall represent an independent and disinterested verification of such layout. The Surveyor shall report to the Department of Design and Construction's Resident Engineer each time upon arrival to and departure from the site and review with the Resident Engineer the data required for the project.

H. Final Certification: Final certification shall be submitted upon completion of the work or upon completion of any subdivision of the work as directed by the Commissioner. Any exceptions or deviations from the drawings shall be noted on the final certificate and there shall be included any maps, plates, notes, pertinent documents and data necessary, in the opinion of the Commissioner, to constitute a full and complete report.

I. Final Survey: The Contractor shall submit to DDC for submission to the Department of Buildings a final Survey by the licensed Surveyor showing the location of the new Structure, before completion of the Structure. This Survey shall show the location of the first tier of beams or of the first floor; the finish grades of the open spaces on the plot; the established curb level and the location of all other Structures on the plan, together with the location and boundaries of the lot or plot upon which the Structure is constructed, curb cuts, all yard dimensions, etc.

REFER TO THE ADDENDUM FOR THE APPLICABILITY OF SUB-SECTION 3.4

3.4 BORINGS:

A. The work of this article shall be the responsibility of the Contractor unless otherwise indicated.

B. Reference Drawings: The Boring Drawings as listed on the title sheet are for information to the bidder and are to be used under the conditions as follows:

1. Boring Logs: shown on the Boring Drawings, record information obtained under engineering supervision in the course of exploration carried out by or under the direction of forces of the Department of Design and Construction at the site.

2. Soils and Rock Samples: All inferences are drawn from the indications observed as made by engineering and scientific personnel. All such inferences and all records of the work including soil samples and rock cores, if any, are available to bidders for inspection.

3. Certification of Samples: The City certifies that the work was carried out as stated, and that the soil samples and rock cores, if any were referred to, were actually taken from the site at the times, places and in the manner indicated. The samples are available for inspection in the Department of Design and Construction Subsurface Exploration Section.

4. Bidder's Responsibility: The bidder, however, is responsible for any conclusions to be drawn from the work. If the bidder accepts those of the City, it must do so at its own risk. If the bidder prefers not to assume such risk, the bidder is under the obligation of employing its own experts to analyze the available information, and must be responsible for any consequences of acting on their conclusions.

5. Continuity Not Guarantee: The City does not guarantee continuity of conditions shown at actual boring locations over the entire site. Where possible, borings are located to avoid all obstructions and previous construction which can be found by inspection of the surface and the bidder is required to estimate the influence of such features from its own inspection of the site.

3.5 EXAMINATION:

A. Existing Conditions: The existence and location of site improvements, utilities, and other construction indicated as existing are not guaranteed. Before beginning work, investigate and verify the existence and location of mechanical and electrical systems and other construction affecting the Work.

1. Before construction, verify the location and points of connection of utility services.

B. Existing Utilities: The existence and location of underground utilities and other construction indicated as existing are not guaranteed. Before beginning site work, investigate and verify the existence and location of underground utilities and other construction affecting the Work.

1. Before construction, verify the location and invert elevation at points of connection of sanitary sewer, storm sewer, and water-service piping; and underground electrical services.
2. Furnish location data for work related to Project that must be performed by public utilities serving Project site.

C. Acceptance of Conditions: Examine substrates, areas, and conditions, with the subcontractor responsible for installation or application present where indicated, for compliance with requirements for installation tolerances and other conditions affecting performance. Record observations.

1. Verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.
2. Examine roughing-in for mechanical and electrical systems to verify actual locations of connections before equipment and fixture installation.
3. Examine walls, floors, and roofs for suitable conditions where products and systems are to be installed.
4. Proceed with installation only after unsatisfactory conditions have been corrected. Proceeding with the Work indicates acceptance of surfaces and conditions.

3.6 ENVIRONMENTAL ASSESSMENTS:

A. City Responsibilities: An Environmental Assessment and survey is performed by the NYC DDC and its findings are included in the Contract Documents. In accordance with the NYC Administrative Code Title 15 Chapter 1 an asbestos survey is required to be performed by an Asbestos Investigator certified by the NYC Department of Environmental Protection (DEP) to identify the presence of asbestos containing material (ACM) prior to any alteration, renovation or demolition activity. The findings of such survey are required for the submission of approvals and permits issued by the NYC Department of Buildings (DOB). When the findings indicate that asbestos containing material is present and will be disturbed during the alteration, renovation or demolition activity then abatement design specifications will be incorporated into the contract documents. The Contractor shall comply with all federal, state and local asbestos regulations affecting the work for this Contract.

B. Contractor Responsibility: The Contractor shall comply with all federal, state and local environmental regulations, including without limitation USEPA and OSHA regulations which require the Contractor to assess if lead based paint will be disturbed during the work in order to protect his/her workers and the building occupants from migration of lead dust into the air. The Contractor shall comply with all federal, state and local environmental waste disposal regulation which may be required during the work. The Contractor is required to hire licensed abatement and disposal companies for the requisite work.

3.7 PREPARATION:

A. Field Measurements: The Contractor shall verify all dimensions and conditions on the job so that all work will properly join the existing work.

B. The Contractor, before commencing work, shall examine all adjoining work on which its work is in any way dependent on good workmanship in accordance to the intent of the Specifications and the Contract

Drawings. The Contractor shall report to the Commissioner any condition that will prevent it from performing work that conforms to the required standard.

C. Existing Utility Information: Furnish information to the Commissioner that is necessary to adjust, move, or relocate existing utility structures, utility poles, lines, services, or other utility appurtenances located in or affected by construction. Coordinate with authorities having jurisdiction.

D. Space Requirements: Verify space requirements and dimensions of items shown diagrammatically on Drawings.

3.8 DEFERRED CONSTRUCTION:

A. Where necessity for deferred construction is certified by the Commissioner, in order to permit the installation of any item or items of equipment required to be furnished and installed concurrent with the time allowed for doing and completing the work of the Contract, the Contractor shall defer construction work limited to adequate areas as approved by the Commissioner.

B. The Contractor shall confer with the affected trade subcontractors and ascertain arrangements, time and facilities necessary to be made by the Contractor in order to execute the provisions specified herein.

3.9 INSTALLATION:

A. General: Locate the Work and components of the Work accurately, in correct alignment and elevation, as indicated.
   1. Make vertical work plumb and make horizontal work level.
   2. Where space is limited, install components to maximize space available for maintenance and ease of removal for replacement.
   3. Conceal pipes, ducts, and wiring in finished areas, unless otherwise indicated.

B. Comply with manufacturer's written instructions and recommendations for installing products in applications indicated.

C. Install products at the time and under conditions that will ensure the best possible results. Maintain conditions required for product performance until Substantial Completion.

D. Conduct construction operations so no part of the Work is subjected to damaging operations or loading in excess of that expected during normal conditions of occupancy.

E. Tools and Equipment: Do not use tools or equipment that produce harmful noise levels.

F. Templates: Obtain and distribute to the parties involved templates for work specified to be factory prepared and field installed. Check Shop Drawings of other work and work of trade subcontractors to confirm that adequate provisions are made for locating and installing products to comply with indicated requirements.

G. Anchors and Fasteners: Provide anchors and fasteners as required to anchor each component securely in place, accurately located and aligned with other portions of the Work.

   1. Mounting Heights: Where mounting heights are not indicated, mount components at heights directed by the Design Consultant.

   2. Allow for building movement, including thermal expansion and contraction.

   3. Coordinate installation of anchorages. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

H. Joints: Make joints of uniform width. Where joint locations in exposed work are not indicated, arrange joints for the best visual effect. Fit exposed connections together to form hairline joints.

I. Hazardous Materials: Use products, cleaners, and installation materials that are not considered hazardous.

3.10 PERMITS:

A. The Contractor shall comply with all local, state and federal laws, rules and regulations affecting the Work of this Project, including, without limitation, (1) obtaining all necessary permits for the performance of the Work prior to commencement thereof, and (2) complying with all requirements for the disposal of demolition and/or construction debris, waste, etc., including disposal in City landfills. The Contractor shall be responsible for all costs in connection with such regulatory compliance, unless otherwise specified in the Contract.

3.11 TRANSPORTATION:

A. Availability: It shall be the duty of the Contractor to determine the availability of transportation facilities and dockage for the use of its employees, equipment and material and the conditions under which such use will be permitted.

B. Costs: If transportation facilities and dockage are available and are permitted to be used by the governmental agency having jurisdiction, the Contractor shall pay all necessary costs and expenses, and abide by all rules and regulations promulgated in connection therewith.

C. Vehicles: With respect to the use of vehicles on highways and bridges, the Contractor's attention is directed to the limitations set forth in the Rules of the City of New York, Title 34, Chapter 4, Section 4-15.

D. Continued Use: It is understood that the Commissioner makes no warranty as to the continued use by the Contractor of such facilities.

REFER TO THE ADDENDUM FOR THE APPLICABILITY OF SUB-SECTION 3.12

3.12 SLEEVES AND HANGERS:

A. Coordinate with Progress Schedule: The Contractor shall promptly furnish and install conduits, outlets, piping sleeves, boxes, inserts and all other materials and equipment that is to be built into the work in conformity with the requirements of the project.

B. Cooperation of Subcontractors: All subcontractors shall fully cooperate with each other in connection with the performance of the above work as "cutting in" new work is neither contemplated nor will it be tolerated.

C. Timeliness: In the event that timely delivery of sleeves and other materials cannot be made, and to avoid delay, the Contractor may arrange to have boxes or other forms set at the locations where the piping or other material is to pass through or into the slabs, walls or other work. Upon the subsequent installation of the sleeves or other material, the Contractor shall fill around them with materials as required by the Contract. The necessary expenditures incurred for the boxing out and filling in shall be borne by the Contractor.

D. Inserts: The Contractor is to install strip inserts four (4) foot on center and perpendicular to beams in ceiling slabs of boiler, machine and mechanical equipment rooms. Inserts are to be installed for strippable concrete slabs only.

REFER TO THE ADDENDUM FOR THE APPLICABILITY OF SUB-SECTION 3.13

3.13 SLEEVE AND PENETRATION DRAWINGS:

A. As soon as practicable after the commencement of work and when the order in which concrete for the first slabs, walls, etc. to be poured is determined, the Contractor shall submit to the DDC a sketch indicating the location and size of all penetrations for sleeves, ducts, etc. which will be required to accommodate the mechanical trades, in order to determine if such penetrations will materially weaken the project's structure. The sketch shall be stamped and returned if approved and/or comments will be transmitted. The Contractor shall continue to submit sketches as the pouring schedule and the concrete work progresses and, until approvals for the penetration sketches have been given. The Contractor shall not predicate its layout work on unapproved sketches.

3.14 CUTTING AND PATCHING:

A. Responsibility: The Contractor shall do all cutting, patching and restoration required by its work, unless otherwise particularly specified in the Specifications.

B. Restore Work: The Contractor shall restore any work damaged during the performance of the work.

C. Competent Workers: All restoration work shall be done to the satisfaction of the Commissioner by competent workers skilled in the trade required by such restoration. If, in the judgment of the Commissioner, workers engaged in restoration work are incompetent, they shall be replaced immediately by competent workers.

D. Structural Elements: Do not cut and patch structural elements without the prior approval, in writing, of the Resident Engineer.

E. Operational Elements: Do not cut and patch operating elements and related components.

F. Visual Requirements: Do not cut and patch construction in a manner that results in visual evidence of cutting and patching. Do not cut and patch construction exposed on the exterior or in occupied spaces in a manner that would, in Commissioner's opinion, reduce the building's aesthetic qualities. Remove and replace construction that has been cut and patched in a visually unsatisfactory manner.

G. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during cutting and patching operations, by methods and with materials so as not to void existing warranties.

H. Removals: The Contractor must remove from the premises all demolished materials of every nature or description resulting from cutting, patching and restoration work, in accordance with the requirements hereinafter stipulated under Sub-Section 3.17 herein and as further required in Section 01 74 19, CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL.

REFER TO THE ADDENDUM FOR THE APPLICABILITY OF SUB-SECTION 3.15

3.15 LOCATION OF PARTITIONS:

A. Within three (3) weeks after the concrete slabs have been poured on each floor level, the Contractor shall immediately locate accurately all of the partitions, including the door openings, on the floor slabs in a manner approved by the Resident Engineer.

3.16 FURNITURE AND EQUIPMENT:

A. Responsibility: The Contractor is responsible for moving all loose furniture and/or equipment in all areas where the location of such furniture and/or equipment interferes with the proper performance of its work.

B. Protection: All such furniture and/or equipment must be adequately protected with dust cloths and returned to their original locations when directed to do so by the Resident Engineer.

3.17 REMOVAL OF RUBBISH AND SURPLUS MATERIALS:

A. Of the waste that is generated during demolition, as many of the waste materials as economically feasible, and as stated here, shall be reused, salvaged, or recycled. Waste disposal in landfills shall be minimized. Comply with requirements of Section 01 74 19, CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL.

B. Rubbish: Rubbish shall not be thrown from the windows or other parts of the project. Mason's rubbish, dirt and other dust-producing material shall be wetted down periodically.

C. Location: The Contractor shall clean Project site and work area daily and sweep up and deposit, at a location designated on each floor, all of its rubbish, debris and waste materials, as it accumulates and when directed by the Resident Engineer. Wood crating shall be broken up, neatly bundled, tied and stacked ready for removal and be deposited at a location designated on each floor.
   1. Comply with requirements in NYC Fire Department for removal of combustible waste materials and debris.
   2. Do not hold materials more than 7 days during normal weather or 3 days if the temperature is expected to rise above 80 degrees F (27 degrees C).
   3. Containerize hazardous and unsanitary waste materials separately from other waste. Mark containers appropriately and dispose of legally, according to regulations.

D. Laborers: The Contractor shall be responsible for the removal of all rubbish, etc., from the site. The Contractor shall remove from the designated locations all piles of rubbish, debris, waste material and wood crating as they accumulate and when directed by the Resident Engineer, and shall remove them from the site. The Contractor shall employ and keep engaged for this purpose an adequate number of laborers.

E. Surplus Materials: The Contractor shall remove from the site all surplus materials when there is no further use for same.

F. Tools And Materials: At the conclusion of the work, all erection plant, tools, temporary structures and materials belonging to the Contractor shall be promptly removed.

G. Waste Disposal: Burying or burning waste materials on-site will not be permitted. Washing waste materials down sewers or into waterways will not be permitted.

3.18 CLEANING:

A. The Contractor shall thoroughly clean all equipment and materials furnished and installed and shall deliver such materials and equipment undamaged in a clean and new appearing condition up to date of Final Acceptance.

B. Site: Maintain Project site free of waste materials and debris.

C. Installed Work: Keep installed work clean. Clean installed surfaces according to written instructions of manufacturer or fabricator of product installed, using only cleaning materials specifically recommended. If specific cleaning materials are not recommended, use cleaning materials that are not hazardous to health or property and that will not damage exposed surfaces.

D. Concealed Spaces: Remove debris from concealed spaces before enclosing the space.

E. Exposed Surfaces in Finished Areas: Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration up to date of Final Acceptance.

F. During handling and installation, clean and protect construction in progress and adjoining materials already in place. Apply protective covering where required to ensure protection from damage or deterioration up to date of Final Acceptance.

3.19 SECURITY AND PROTECTION OF WORK SITE:

A. Provide protection of installed work, including appropriate protective coverings and maintain conditions that ensure installed Work is without damage or deterioration up to date of Final Acceptance.

B. Comply with manufacturer's written instructions for temperature and relative humidity.

C. Secure and protect work and work site against damage, loss, injury, theft and/or vandalism.

D. Maintain daily sign-in sheets of workers and visitors and make the sheets available to the Commissioner

3.20 MAINTENANCE OF SITE AND ADJOINING PROPERTY:

A. The Contractor shall take over and maintain the Project site, after order to start work.

B. The Contractor shall be responsible for the safety of the adjoining property, including sidewalks, paving, fences, sewers, water, gas, electric and other mains, pipes and conduits etc. until the date of Final Acceptance. The Contractor shall, at its own expense, except as otherwise specified, protect same and maintain them in at least as good a condition as that in which the Contractor finds them.

C. All pavements, sidewalks, roads and approaches to fire hydrants shall be kept clear at all times, maintained and repaired to serviceable condition with materials to match existing.

D. Provide and keep in good repair all bridging and decking necessary to maintain vehicular and pedestrian traffic.

E. The Contractor shall also remove all snow and ice as it accumulates on the sidewalks within the Contract Limits Lines.

3.21 MAINTENANCE OF PROJECT SITE:

A. The Contractor shall take over and maintain all project areas, after order to start work.

B. Until the date of Final Acceptance, the Contractor shall be responsible for the safety of all project areas, including water, gas, electric and other mains and pipes and conduits and shall at the Contractor's own expense, except as otherwise specified, protect same and maintain them in at least as good condition as that in which the Contractor finds them.

C. All pavements, sidewalks, roads and approaches to fire hydrants shall be kept clear at all times, maintained, and if damaged, repaired to serviceable conditions with materials to match existing.

D. The Contractor shall keep the space for the Resident Engineer in a clean condition.

3.22 SAFETY PRECAUTIONS FOR CONTROL CIRCUITS:

A. Control circuits, the failure of which will cause a hazard to life and property, shall comply with the New York City Dept. of Buildings, Bureau of Electrical Control requirements.

3.23 OBSTRUCTIONS IN DRAINAGE LINES:

A. The Contractor shall be responsible for all obstructions occurring in all drainage lines, fittings and fixtures after the installations and cleaning of these drainage lines, fittings and fixtures as certified by the Resident Engineer. Roof drains shall be kept clear of any and all debris. Any stoppage shall be repaired immediately at the expense of the Contractor.

END OF SECTION 01 73 00

SECTION 01 74 19
CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL

PART I – GENERAL

1.1 RELATED DOCUMENTS:

A. The following documents apply to all required work for the Project: (1) the Contract Drawings, (2) the Specifications, (3) the General Conditions, (4) the Addendum, and (5) the Contract [City of New York Standard Construction Contract].

1.2 SUMMARY:

A. This section includes administrative and procedural requirements for the management and disposal of construction waste and includes the following requirements:
   1. Waste Management Goals
   2. Waste Management Plan
   3. Progress Reports
   4. Progress Meetings
   5. Management Plan Implementation

B. This Section includes:
   1. Definitions
   2. Waste Management Performance Requirements
   3. Reference Resources
   4. Submittals
   5. Quality Assurance
   6. Waste Plan Implementation
   7. Additional Demolition and Salvage Requirements
   8. Disposal

1.3 RELATED SECTIONS: Include without limitation the following:

A. Section 01 10 00 SUMMARY
B. Section 01 31 00 PROJECT MANAGEMENT AND COORDINATION
C. Section 01 32 00 CONSTRUCTION PROGRESS DOCUMENTATION
D. Section 01 73 00 EXECUTION
E. Section 01 77 00 CLOSEOUT PROCEDURES
F. Section 01 78 39 CONSTRUCTION RECORD DOCUMENTS
G. Refer to the Addendum to identify whether this project is designed to comply with a Certification Level according to the U.S. Green Building Council's LEED Rating System, as specified in Section 01 81 13.03 "SUSTAINABLE DESIGN REQUIREMENTS FOR LEED v3 BUILDINGS" or Section 01 81 13.04 "SUSTAINABLE DESIGN REQUIREMENTS FOR LEED v4 BUILDINGS".

1.4 DEFINITIONS:

A. Refer to Article 2 of the Contract for definition of terms, words and expressions used in the General Conditions not otherwise defined herein.

B. Alternative Daily Cover (ADC): Material other than earthen material placed on the surface of the active face of a municipal solid waste landfill at the end of each operating day to control vectors, fires, odors, blowing litter and scavenging.

C. Design Consultant: "Design Consultant" shall mean the entity responsible for providing design services for the Project, including without limitation, preparing the construction documents (drawings and specifications) and providing services in connection with such documents during construction. The entity serving as the "Design Consultant" may be a corporation, firm, partnership, joint venture, individual or combination thereof. Such entity may be either an employee(s) of the City or an entity engaged by the City to provide such services.

D. Clean: Untreated and unpainted; not contaminated with oils, solvents, caulk or the like.

E. Construction and Demolition Waste: Solid wastes typically including building materials, trash debris and rubble resulting from remodeling, repair and demolition operations. Hazardous materials and land clearing waste are not included.

F. Diversion from Landfill: To remove, or have removed, from the site for recycling, reuse or salvage, material that might otherwise be sent to a landfill.

G. Recyclable: The ability of a product or material to be recovered at the end of its life cycle and remanufactured into a new product.

H. Recycle (recycling): To sort, separate, process, treat or reconstitute solid waste and other discarded materials for the purpose of redirecting such materials into the manufacture of useful products. Recycling does not include burning, incinerating or thermally destroying waste.

I. Return: To give back reusable items or unused products to vendors.

J. Reuse: To reuse excess or discarded construction material in some manner on the Project site.

K. Salvage: To remove a waste material from the Project site for resale or reuse.

L. Waste: Extra material or material that has reached the end of its useful life in its intended use. Waste includes salvageable, returnable, recyclable and reusable material.

M. Waste Management Plan: A Project-related plan for the collection, transportation and disposal of waste generated at the construction site. The purpose of the plan is to ultimately reduce the amount of material becoming landfill.

N. Waste-to-Energy: The conversion of non-recyclable waste materials into usable heat, electricity or fuel through a variety of processes, including combustion, gasification, pyrolization, anaerobic digestion and landfill gas recovery.

1.5 WASTE MANAGEMENT PERFORMANCE REQUIREMENTS:

A. The City of New York has established that this Project shall generate the least amount of waste possible and that processes that ensure the generation of as little waste as possible due to error, inaccurate planning, breakage, mishandling, contamination, or other factors shall be employed.

B. Of the waste that is generated during demolition, as many of the waste materials as economically feasible, and as stated here, shall be reused, salvaged, or recycled. Waste disposal in landfills shall be minimized.

REFER TO THE ADDENDUM FOR THE APPLICABILITY OF SUB-SECTION 1.5 C

C. LEED CERTIFICATION: The City of New York will seek LEED (Leadership in Energy and Environmental Design) certification for this Project as indicated in the Addendum to the General Conditions from the U.S. Green Building Council. The documentation required here will be used for this purpose. LEED awards points for a variety of sustainable design measures on a project, one of which is the reuse and recycling of project waste.

D. DIVERSION REQUIREMENTS. With the exception of LEED v4 projects with demolition ADC waste, a minimum of 75% of total Project demolition and construction waste (by weight) shall be diverted from landfill. LEED v4 projects with demolition ADC waste shall divert a minimum of 50% of total Project demolition and construction waste (by weight) from landfill. The following waste categories are likely candidates to be included in the diversion plan as applicable for this Project:

1. Concrete
2. Bricks
3. Concrete masonry units (CMU)
4. Asphalt
5. Metals (e.g. banding, stud trim, ceiling grid, ductwork, piping, rebar, roofing, other trim, steel, iron, galvanized, stainless steel, aluminum, copper, zinc, brass, bronze)
6. Clean dimensional wood
7. Carpet and pad
8. Drywall
9. Ceiling tiles
10. Cardboard, paper and packaging
11. Reuse items indicated on the Drawings and/or elsewhere in the Specification

E. All fluorescent lamps, HID lamps and mercury-containing thermostats removed from the site shall be recycled. Do not use bulb crusher on site.

F. Recycling on the job, subject to the Commissioner's approval, is encouraged on the site itself, such as the crushing and reuse of removed sound concrete and stone. Include these categories in the Waste Management Plan.

G. Land-clearing debris is not considered construction, demolition or renovation waste and is not to be included as contribution to waste diversion.

H. A minimum of five material types, both structural and nonstructural, are to be identified in the Construction Waste Management Plan for diversion.

I. For LEED v4 projects, material to be used as ADC does not qualify as material diverted from disposal.

1.6 REFERENCES, RESOURCES:

A. DDC encourages its contractors to seek information from websites and experts in salvage or recycling in order to minimize disposal costs. There are numerous opportunities to sell, salvage, or to donate materials and accrue tax benefits (which would accrue to the contractor); there are also outlets that will pick up, and in some cases, buy recyclable materials. Examples of information resources are as follows:

1. DDC's Sustainable Design web site: https://www1.nyc.gov/site/ddc/about/sustainable-design.page. A standard Construction and Demolition Waste Management Log form is included at the end of this section.
2. Web Resources

   (Information only; no warranty or endorsement is implied.)

   www.wastematch.org Site of New York Waste Match, a materials exchange database and service

   www.bignyc.org Site of Build It Green NYC, a non-profit outlet for salvaged and surplus building materials

www.usgbc.org Site of the United States Green Building Council, with a description of the LEED certification process and requirements for C&D waste recycling

http://www.epa.gov/epawaste/index.htm Site of the U.S. Environmental Protection Agency that discusses construction and demolition waste issues, and links to other resources.

3. For Waste-to-Energy Facilities that need to comply with European Standard (EN) for waste management and emissions into air, soil, surface water and groundwater:

   www.ec.europa.eu/environment/waste/framework/index.htm European Commission Waste Framework Directive 2008/98/EC

   http://www.europa.eu/legislation_summaries/environment/waste_management European Commission Waste Incineration Directive 2000/76/EC

   www.cen.eu/cen/Products EN standards 303-1, 303-2, 303-3, 303-4, 303-5, 303-6, 303-7

1.7 SUBMITTALS:

A. The Contractor shall refer to Section 01 33 00 SUBMITTAL PROCEDURES for submittal requirements.

B. The Contractor shall be responsible for the development and implementation of a Waste Management Plan for the Project. The Contractor's subcontractors shall assist in the development of that Plan, and collect and deposit their waste and recyclable materials in accordance with the approved Plan.

C. DRAFT WASTE MANAGEMENT PLAN. Within fifteen (15) days after receipt of 'Notice to Proceed', or prior to any waste removal, whichever occurs sooner, the Contractor shall submit to the Commissioner a Draft Waste Management Plan. Include separate sections for demolition and construction waste. The Plan shall demonstrate how the performance goals will be met, and contain the following:

   1. List of materials targeted for reuse, salvage, or recycling, and names, addresses, and phone numbers of receiving facilities/companies that will be purchasing or accepting each material.
   2. Description of on-site and/or off-site sorting methods for all materials to be removed from site.
   3. If mixed construction and demolition waste is to be sorted off-site, provide a letter from the processor stating the average percentage of mixed construction and demolition waste they recycle.
   4. Landfill information: Names of landfills where non-recyclable/reusable/salvageable waste will be disposed, and list of applicable tipping fees.
   5. Materials handling procedures: Specify whether materials shall be separated or commingled and describe the planned diversion strategies. Describe expected amount of each material type, where materials shall be taken and how the recycling facility shall process the material. Provide a description of the means by which any recyclable, salvaged, or reused materials will be protected from contamination, and collected in a manner that will meet the requirements for acceptance by the designated recycling processors.
   6. Transportation: A description of the means of transportation and destination for recycled materials.
   7. Meetings: Description of regular meetings to be held to address waste management.
   8. Sample spreadsheet and description of how the implementation of the plan will be documented and submitted on a monthly basis.

D. FINAL WASTE MANAGEMENT PLAN. Within fifteen (15) days of Commissioner's approval of the Draft Waste Management Plan, the Contractor shall submit a Final Waste Management Plan.

E. PROGRESS REPORTS. The Contractor shall submit monthly a Waste Management Progress Report, containing the following information:

1. Project title, name of company completing report, and dates of period covered by the report
2. Report on the disposal of all jobsite waste. A DDC C&D Waste Management Log form is included at the end of this section. For each shipment of material removed from the site, provide the following:
   a. Date and ticket number of removal
   b. Identity of material hauler
   c. Material category
   d. Total quantity of waste, in tons/cubic yards, by type
   e. Quantity of waste salvaged, recycled and/or reused, by type
   f. Total quantity of waste diverted from landfill (recycled, salvaged, reused) as a percentage of total waste
   g. Recipient of each material type
3. Provide monthly and cumulative Project totals of waste, quantity diverted, and percentage diverted.
4. Note that the unit of measure may be either tons or cubic yards, but must be consistent for all shipments and all materials throughout the Project. Reports with inconsistent or mixed units will not be reviewed and will be returned for re-submission.
5. Include legible copies of on-site logs, weight tickets and receipts. Receipts shall be from charitable organizations, recycling and/or disposal site operators who can legally accept the materials for the purpose of reuse, recycling or disposal. Contractor shall save such original documents for the life of the Project plus seven (7) years.

F. LEED Submittal: For LEED designated projects, submit final LEED construction waste report signed by the Contractor, tabulating total waste material, quantities diverted and means by which it is diverted, and statement that requirements for the credit have been met. Waste report must include:
   1. For diverted materials, include at least four material streams
   2. For commingled facilities, submit documentation of recycling rates
   3. For waste-to-energy strategy, submit documentation of facility adherence to relevant EN standards, and justification of strategy

G. Refrigerant Recovery: Where refrigerant is recovered, submit statement of refrigerant recovery, which must include:
   1. Name, address, qualification data and signature of the refrigerant recovery technician responsible for recovering refrigerant
   2. Statement that all refrigerant that was present was recovered and that recovery was performed according to EPA regulations
   3. Date refrigerant was recovered

1.8 QUALITY ASSURANCE:

A. The Contractor shall designate a Construction Waste Management Representative, to ensure compliance with this section. Coordinator shall be present at Project site full-time for the duration of the Project.

B. Refrigerant Recovery Technician Qualifications: Certified by EPA-approved certification program.

C. Regulatory Requirements: Comply with hauling and disposal regulations of authorities having jurisdiction.

D. Waste management plans, documentation and implementation shall be discussed at the following meetings:
   1. Pre-demolition kick-off meeting

2. Pre-construction kick-off meeting
3. Regular job-site meetings
4. Contractor toolbox meetings

E. For LEED v4 projects, Waste-to-Energy Facilities: Comply with EN standards for waste management and emissions into air, soil, surface water and groundwater.

PART II – PRODUCTS (Not Used)

PART III – EXECUTION

3.1 WASTE PLAN IMPLEMENTATION:

A. Prior to the demolition and construction start, the Contractor shall implement the Waste Management Plan, coordinate the Plan with all affected trades, and designate one individual as the Construction Waste Management Representative, who will be responsible for communicating the progress of the Plan with the Commissioner on a regular basis, and for assembling the required LEED documentation.

B. The Contractor shall be responsible for the provision of containers and the removal of all waste, non-returned surplus materials and rubbish from the site in accordance with the approved Waste Management Plan. The Contractor shall oversee and document the results of the Plan. Monies received for salvaged materials shall remain with the Contractor, except the monies for those items specifically identified elsewhere in the specifications or indicated on the drawings as belonging to others.

C. Responsibilities of Subcontractors: Each Subcontractor shall be responsible for collecting its waste, non-returned surplus materials and rubbish, in accordance with the Waste Management Plan.

D. Distribution: The Contractor shall distribute copies of the Waste Management Plan to each Subcontractor, Resident Engineer, Construction Manager and Commissioner.

E. Instruction: The Contractor shall provide on-site instruction of proper waste management procedures to be used by all parties in appropriate stages of the Project.

F. Procedures: Conduct waste management operations to ensure minimum interference with site vegetation, roads, streets, walks and other adjacent occupied and used facilities.

1. Collect commingled waste and/or separate all recyclable waste in accordance with the Plan. Specific areas on the Project site are to be designated, and appropriate containers and bins clearly marked with acceptable and unacceptable materials.
2. Inspect containers and bins for contamination and remove contaminated materials if found.
3. Comply with the General Conditions for controlling dust and dirt, environmental protection and noise control.

3.2 ADDITIONAL DEMOLITION AND SALVAGE REQUIREMENTS:

A. Demolition and salvage of additional items indicated in other sections of the Project Specifications require special attention as part of the overall 75% diversion from landfill. Specific requirements for special attention are designated in other sections of the Project Specifications.

3.3 DISPOSAL:

A. General: Except for items or material to be salvaged, recycled or otherwise reused, remove waste material from the Project site and legally dispose of them in a manner acceptable to authorities having jurisdiction.

1. Except as otherwise specified, do not allow waste materials that are to be disposed of to accumulate on site.
2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.

B. Burning: Do not burn waste materials.

C. Disposal: Transport waste materials off Project site and legally dispose of them.

END OF SECTION 01 74 19

Department of Design and Construction

CONSTRUCTION AND DEMOLITION WASTE MANAGEMENT LOG

Project Name: _____
Project I.D.: _____

Contractor: _____
Prepared by: _____
For Month: _____

Haul Date	Ticket #	Hauling Company	*Material Category[2]	Material Quantity (tons or cubic yards)[1]				*Material Recipient
				*Total Weight	Excluded Material[3]	*Diverted Material[4]	*Landfilled Material	
				*Total		*Diverted	*Landfilled	
			Monthly Totals					
			% Diverted this Month*					
			Cumulative Totals					
			% Diverted to Date					

Notes:
1. Volume (cubic yards) may be used instead of weight if used for ALL amounts and ALL materials.
2. Includes concrete; bricks; concrete masonry units (CMU); asphalt; metals; clean dimensional wood; carpet and pad; drywall; ceiling tiles; cardboard, paper, and packaging; and any other reuse items indicated on the Drawings and/or elsewhere in the Specification.
3. Excluded material includes soil or land clearing debris and for LEED v4 projects, alternative daily cover (ADC) such as screen fines and 6" minus.
4. Diverted material includes recycled and reused material diverted from landfill. Recycled material is reprocessed into new products. Reused material is reclaimed, salvaged or otherwise used in its original form, either on-site or off-site.

* These items must be listed in order to receive LEED credit.

SECTION 01 77 00
CLOSEOUT PROCEDURES

PART 1 – GENERAL

1.1 RELATED DOCUMENTS:

A. The following documents apply to all required work for the Project: (1) the Contract Drawings, (2) the Specifications, (3) the General Conditions, (4) the Addendum, and (5) the Contract [City of New York Standard Construction Contract].

1.2 SUMMARY:

A. This Section includes administrative and general procedural requirements for Closeout Procedures, including without limitation the following:

1. Definitions
2. Substantial Completion
3. Final Acceptance
4. Warranties
5. Final Cleaning
6. Repair of the Work

B. LEED: Refer to the Addendum to identify whether this Project is designed to comply with a Certification Level according to the U.S. Green Building Council's Leadership in Energy & Environmental Design (LEED) Rating System, as specified in Section 01 81 13, "SUSTAINABLE DESIGN REQUIREMENTS FOR LEED BUILDINGS."

C. COMMISSIONING: Refer to the Addendum to identify whether this Project will be commissioned by an independent third party under separate contract with the City of New York. Commissioning shall be in accordance with ASHRAE and USGBC LEED- NC procedures, as described in Section 01 91 13, GENERAL COMMISSIONING REQUIREMENTS. The Contractor shall cooperate with the commissioning agent and provide whatever assistance is required.

1.3 RELATED SECTIONS: include without limitation the following:

A. Section 01 10 00 SUMMARY
B. Section 01 33 00 SUBMITTAL PROCEDURES
C. Section 01 74 19 CONSTRUCTION WASTE MANAGEMENT & DISPOSAL
D. Section 01 78 39 CONTRACT RECORD DOCUMENTS
E. Section 01 79 00 DEMONSTRATION AND OWNER'S PRE-ACCEPTANCE ORIENTATION

1.4 DEFINITIONS:

A. Refer to Article 2 of the Contract for definition of terms, words and expressions used in the General Conditions not otherwise defined herein.

B. Design Consultant: "Design Consultant" shall mean the entity responsible for providing design services for the Project, including without limitation, preparing the construction documents (drawings and specifications) and providing services in connection with such documents during construction. The entity serving as the "Design Consultant" may be a corporation, firm, partnership, joint venture, individual or

combination thereof. Such entity may be either an employee(s) of the City or an entity engaged by the City to provide such services.

C. Substantial Completion: shall mean the written determination by the Commissioner that the Work required under the Contract is substantially, but not entirely, complete.

D. Final Acceptance: shall mean final written acceptance of all the Work by the Commissioner, a copy of which shall be sent to the Contractor.

1.5 SUBSTANTIAL COMPLETION:

A. Preliminary Procedures: Before requesting inspection to determine the date of Substantial Completion, the Contractor shall complete and supply all items required by the contract specifications, General Conditions, Addendum to the General Conditions, change orders or other directives from the Commissioner's representatives. The required items will include all contract requirements for substantial completion, including but not limited to items related to releases, regulatory approvals, warranties and guarantees, record documents, testing, demonstration and orientation, final clean up and repairs, and all specific checklist of items by the Resident Engineer. (See Attachment "A" at the end of this section for sample requirements for Substantial Completion).

B. Prepare and submit a list to the Resident Engineer of incomplete items, the value of incomplete construction, and reasons the work is not complete.

C. Inspection: The Contractor shall submit to the Resident Engineer a written request for inspection for Substantial Completion. Within ten (10) days of receipt of the request, the Resident Engineer will either proceed with inspection or notify Contractor of unfulfilled requirements. The Resident Engineer may request the services, as required, of the Design Consultant, Client Agency Representative and/or other entities having involvement with the Work to assist in the inspection of the Work .If the Resident Engineer makes a determination that the work is substantially complete and approves the Final Punch List and the date for Final Acceptance, he/she will so advise the Commissioner and recommend issuance of the Certificate of Substantial Completion. If the Resident Engineer determines that the work is not substantially complete, he/she will notify the Contractor of those items that must be completed or corrected before the Certificate of Substantial Completion will be issued.

1 Re-inspection: Contractor shall request re-inspection when the Work identified in previous inspections as incomplete is completed or corrected.
2 Results of completed inspection will form the basis of requirements for Final Acceptance.

1.6 FINAL ACCEPTANCE:

A. Preliminary Procedures: Before requesting final inspection for Final Acceptance of the Work, the Contractor shall complete the following. (Note that the following are to be completed, submitted as appropriate, and approved by the Commissioner, as applicable, prior to the final inspection and are not to be submitted for approval or otherwise at the final inspection unless specifically indicated). List exceptions in the request.

1. Verify that all required submittals have been provided to the Commissioner including but not limited to the following:
   a. Manufacturer's cleaning instructions
   b. Posted instructions
   c. As-built Record Documents (Drawings, specifications, and product data) as described in Section 01 78 39, CONTRACT RECORD DOCUMENTS, incorporating any changes required by the Commissioner as a result of the review of the submission prior to the pre-final inspection.
   d. Operation and Maintenance Manuals, including Preventive Maintenance, Special Tools, Repair Requirements, Parts List, Spare Parts List, and Operating Instructions.

e. Completion of required Demonstration and Orientation, as applicable, of designated personnel in operation and maintenance of systems, sub-systems and equipment.
f. Applicable LEED Building submittals as described in Section 01 81 13.03, SUSTAINABLE DESIGN REQUIREMENTS FOR LEED v3 BUILDINGS or Section 01 81 13.04 SUSTAINABLE DESIGN REQUIREMENTS FOR LEED v4 BUILDINGS.
g. Construction progress photographs as described in Section 01 32 33, PHOTOGRAPHIC DOCUMENTATION.

2. Submit a certified copy of the final approved Punch List of items to be completed or corrected. The certified copy of the Punch List shall state that each item has been completed or otherwise resolved for acceptance, and shall be endorsed and dated by the Contractor.
3. Submit pest-control final inspection report and survey as required in Section 01 50 00, TEMPORARY FACILITIES AND CONTROLS.
4. Submit record documents and similar final record information.
5. Deliver tools, spare parts, extra stock and similar items.
6. Complete final clean-up requirements including touch-up painting of marred surfaces.
7. Submit final meter readings for utilities, as applicable, a measured record of stored fuel, and similar data as of the date when the City took possession of and assumed responsibility for corresponding elements of the work.

B. Final Inspection: The Contractor shall submit to the Resident Engineer a written request for inspection for Final Acceptance of the Work. Within ten (10) days of receipt of the request, the Resident Engineer will either proceed with inspection or notify the Contractor of unfulfilled requirements. The Resident Engineer may request the services, as required, of the Design Consultant, Client Agency Representative and/or other entities having involvement with the Work to assist in the inspection of the Work. If the Resident Engineer finds that all items on the Final Approved Punch List are complete and no further work remains to be done, he/she will so advise the Commissioner and recommend the issuance of the determination of Final Acceptance. If the Resident Engineer determines that the work is not complete, he/she will notify the Contractor of those items that must be completed or corrected before the determination of Final Acceptance will be issued.

C. Final Acceptance: The Work will be accepted as final and complete as of the date of the Resident Engineer's inspection if, upon such inspection, the Resident Engineer finds that all items on the Punch List are complete and no further Work remains to be done. The Commissioner will then issue a written determination of Final Acceptance.

1.7 WARRANTIES:

A. The items of materials and/or equipment for which manufacturer warranties are required are listed in Schedule B of the Addendum. For each item of material and/or equipment listed in Schedule B, the Contractor shall obtain a written warranty from the manufacturer. Such warranty shall provide that the material or equipment is free from defects for the period set forth in Schedule B and will be replaced or repaired within such specified period. The contractor shall deliver all required warranties to the Commissioner.

B. Unless indicated otherwise Warranties are to take effect on the date of Substantial Completion.

C. Submittal Time: Submit written Warranties on request of the Commissioner for designated portions of the Work where commencement of Warranties other than date of Substantial Completion is indicated.

D. Partial Occupancy: Submit properly executed Warranties to the Commissioner within 15 days of completion of designated portions of the Work that are completed and occupied or used by the City.

E. Organize the Warranty documents into an orderly sequence based on the Project Specification Divisions and Section Numbers.

1. Bind Warranties in heavy-duty, 3-ring, vinyl-covered, loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8-1/2-by-11-inch paper.
2. Identify each binder on the front and spine with the typed or printed title "WARRANTIES;" name and location of Project; Capitol Budget Project Number (FMS ID); and Contractor's and applicable subcontractor's name and address.
3. Provide heavy paper dividers with plastic-covered tabs for each separate Warranty. Mark tab to identify the product or installation.
4. Provide a typed description of each product or installation being warranted, including the name of the product, and the name, address, and telephone number of the Installer.

F. When warranted materials and/or equipment require operation and maintenance manuals, provide additional copies of each required Warranty in each required manual. Refer to Section 01 78 39, CONTRACT RECORD DOCUMENTS, for requirements of Operation and Maintenance Manuals.

PART II – PRODUCTS

2.1 MATERIALS:

A. Cleaning Agents: Use cleaning materials and agents recommended by manufacturer or fabricator of the surface to be cleaned. Do not use cleaning agents that are potentially hazardous to health or property or that might damage finished surfaces.

PART III – EXECUTION

3.1 FINAL CLEANING:

A. General: Provide final cleaning. Conduct cleaning and waste-removal operations to comply with local laws and ordinances and Federal and local environmental and antipollution regulations.

B. Cleaning: Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to condition expected in an average commercial building cleaning and maintenance program. Comply with manufacturer's written instructions.
1. Complete the following cleaning operations, as applicable, before requesting inspection for Final Acceptance of the Work for entire Project or for a portion of Project:
   a. Clean Project site, yard, and grounds, in areas disturbed by construction activities, including landscape development areas, of rubbish, waste material, litter, and other foreign substances.
   b. Sweep paved areas broom clean. Remove petrochemical spills, stains, and other foreign deposits.
   c. Rake grounds that are neither planted nor paved to a smooth, even-textured surface.
   d. Remove tools, construction equipment, machinery, and surplus material from Project site.
   e. Remove snow and ice to provide safe access to building.
   f. Clean exposed exterior and interior hard-surfaced finishes to a dirt-free condition, free of stains, films, and similar foreign substances. Avoid disturbing natural weathering of exterior surfaces. Restore reflective surfaces to their original condition.
   g. Remove debris and surface dust from limited access spaces, including roofs, plenums, shafts, trenches, equipment vaults, manholes, attics, and similar spaces.
   h. Sweep concrete floors broom clean in unoccupied spaces.
   i. Vacuum carpet and similar soft surfaces, removing debris and excess nap; shampoo if visible soil or stains remain.

j. Clean transparent materials, including mirrors and glass in doors and windows. Remove glazing compounds and other noticeable, vision-obscuring materials. Replace chipped or broken glass and other damaged transparent materials. Polish mirrors and glass, taking care not to scratch surfaces.

k. Remove labels that are not permanent.

l. Touch up and otherwise repair and restore marred, exposed finishes and surfaces. Replace finishes and surfaces that cannot be satisfactorily repaired or restored or that already show evidence of repair or restoration.

1) Do not paint over "UL" and similar labels, including mechanical and electrical nameplates.

m. Wipe surfaces of mechanical and electrical equipment and similar equipment. Remove excess lubrication, paint and mortar droppings, and other foreign substances.

n. Replace parts subject to unusual operating conditions.

o. Clean plumbing fixtures to a sanitary condition, free of stains, including stains resulting from water exposure.

p. Replace disposable air filters and clean permanent air filters. Clean exposed surfaces of diffusers, registers, and grills.

q. Clean ducts, blowers, and coils if units were operated without filters during construction.

r. Clean light fixtures, lamps, globes, and reflectors to function with full efficiency. Replace burned-out bulbs, and those noticeably dimmed by hours of use, and defective and noisy starters in fluorescent and mercury vapor fixtures to comply with requirements for new fixtures.

s. Leave Project clean and ready for occupancy.

t. Construction Waste Disposal: Comply with waste disposal requirements in Section 01 74 19, CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL.

C. Pest Control: Engage an experienced, licensed exterminator to make a final inspection and rid Project of rodents, insects, and other pests, as required in Section 01 50 00, TEMPORARY FACILITIES,SERVICES AND CONTROLS. Prepare and submit a Pest Control report to the Commissioner.

D. Comply with safety standards for cleaning. Do not burn waste materials. Do not bury debris or excess materials on City's property. Do not discharge volatile, harmful, or dangerous materials into drainage systems. Remove waste materials from Project site and dispose of lawfully.

3.2 REPAIR OF THE WORK:

A. Subject to the terms of the Contract the Contractor shall complete repair and restoration operations before requesting inspection for determination of Substantial Completion.

B. Contractor shall repair or remove and replace defective construction. Repairing includes replacing defective parts, refinishing damaged surfaces, touching up with matching materials, and properly adjusting operating equipment. Where damaged or worn items cannot be repaired or restored, provide replacements. Remove and replace operating components that cannot be repaired. Restore damaged construction and permanent facilities used during construction to specified condition.

1. Remove and replace chipped, scratched, and broken glass, reflective surfaces, and other damaged transparent materials.
2. Touch up and otherwise repair and restore marred or exposed finishes and surfaces. Replace finishes and surfaces that that already show evidence of repair or restoration.
   a. Do not paint over "UL" and other required labels and identification, including mechanical and electrical nameplates. Remove paint applied to required labels and identification.

3. Replace parts subject to operating conditions during construction that may impede operation or reduce longevity.
4. Replace burned-out bulbs, bulbs noticeably dimmed by hours of use, and defective and noisy starters in fluorescent and mercury vapor fixtures to comply with requirements for new fixtures.

END OF SECTION 01 77 00

SECTION 01 77 00

ATTACHMENT 'A'

The following list is a general sample of Substantial Completion requirements, including but not limited to:

1. Prepare and submit a list to the Resident Engineer, of incomplete items, the value of incomplete construction, and reasons the work is not complete.
2. Obtain and submit any necessary releases enabling the City unrestricted use of the project and access to services and utilities.
3. Regulatory Approvals: Submit all required documentation from applicable Governing Authorities, including, but not limited to, Department of Buildings (DoB); Department of Transportation (DoT); Department of Environmental Protection (DEP); Fire Department (FDNY); etc. Documentation to include, but not limited to, the following:
   a. Building Permits, Applications and Sign-offs.
   b. Permits and Sign-off for construction fences; sidewalk bridges; scaffolds, cranes and derricks; utilities; etc.
   c. Certificates of Inspections and Sign-offs.
   d. Required Certificates and Use Permits.
   e. Certificate of Occupancy (C.O.), Temporary Certificate of Occupancy (T.C.O.) or Letter of Completion as applicable.
4. Submit specific warranties required by the specifications, final certifications, and similar documents.
5. Prepare and submit Record Documents as described in Section 01 78 39, CONTRACT RECORD DOCUMENTS, including but not limited to; approved documentation from Governing Authorities; as-built record drawings and specifications; product data; operation and maintenance manuals; Final Completion construction photographs; damage or settlement surveys; final property surveys; and similar final record information. The Resident Engineer will review the submission and provide appropriate comments. If comments are significant the initial submission will be returned to the Contractor for correction and re-submission incorporating the comments prior to the Final Inspection.
6. Record Waste Management Progress Report: Submit C&D Waste Management logs, with legible copies of weight tickets and receipts required in accordance with Section 01 74 19, CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL.
7. If applicable submit LEED Letter Template in accordance with the requirements of Section 01 81 13.03, SUSTAINABLE DESIGN REQUIREMENTS FOR LEED v3 BUILDINGS or Section 01 81 13.04 SUSTAINABLE DESIGN REQUIREMENTS FOR LEED v4 BUILDINGS.
8. Schedule applicable Demonstration and Orientation required in other Sections of the Project Specifications and as described in Section 01 79 00, DEMONSTRATION AND OWNER'S PRE-ACCEPTANCE ORIENTATION.
9. Deliver tools, spare parts, extra materials, and similar items to location designated by Resident Engineer. Label with manufacturer's name and model number where applicable.
10. Make final changeover of permanent locks and deliver keys to the Resident Engineer. Advise Commissioner of changeover in security provisions.
11. Complete startup testing of systems as applicable.
12. Submit approved test/adjust/balance records.
13. Terminate and remove temporary facilities from Project site, along with mockups, construction tools, and similar elements as directed by the Resident Engineer.
14. If applicable complete Commissioning requirements as defined in Section 01 91 13, GENERAL COMMISSIONING REQUIREMENTS For MEP Systems and/ or Section 01 91 15, BUILDING ENCLOSURE COMMISSIONNING REQUIREMENTS.
15. Complete final cleaning requirements, including touchup painting.
16. Touch up and otherwise repair and restore marred exposed finishes to eliminate visual defects.

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SECTION 01 78 39
CONTRACT RECORD DOCUMENTS

PART 1 – GENERAL

1.1 RELATED DOCUMENTS:

A. The following documents apply to all required work for the Project: (1) the Contract Drawings, (2) the Specifications, (3) the General Conditions, (4) the Addendum, and (5) the Contract [City of New York Standard Construction Contract].

1.2 SUMMARY:

A. This Section includes administrative and general procedural requirements for Contract Record Documents, including:
   1. As-built Contract Record Drawings.
   2. As-built marked-up copies of Record Specifications, addenda and Change Orders.
   3. As-built marked-up Product Data
   4. Record Samples
   5. Construction Record Photographs
   6. Operating and Maintenance Manuals
   7. Final Site Survey
   8. Guarantees and Warranties
   9. Waste Disposal Documentation
   10. LEED Materials and Matrix
   11. Miscellaneous Record Submittals

B. The Department of Design and Construction, at the start of construction (kick-off meeting), will furnish to the Contractor at no cost a complete set of Contract Drawings Mylars (reproducible) pertaining to the work to be performed under the Contract. It is the responsibility of the Contractor to modify the Contract Drawings to indicate all changes and corrections, if any, occurring in the work as actually installed. The Contractor is required to furnish all other Mylar (reproducible) drawings, if necessary, such as Addenda Drawings and Supplementary Drawings as may be necessary to indicate all work in detail as actually completed. All professional seals must be blocked out. Title box complete with Project title and Design Consultants' names will remain.

C. Maintenance of Documents and Samples: The Contractor shall maintain, during the progress of the work, an accurate record of the work as actually installed, on Contract Record Drawings, on Mylar (reproducible), in ink. Store record documents and samples in the field office apart from the Contract Documents used for construction. Do not use Project Record Documents for construction purposes. Maintain record documents in good order and in a clean, dry, legible condition. Make documents and samples available at all times for the Resident Engineer's inspections.

   1. The Contractor's attention is particularly directed to the necessity of keeping accurate records of all subsurface and concealed work, so that the Contract Record Drawings contain this information in exact detail and location. Contract Record Drawings shall also show all connections, valves, gates, switches, cut-outs and similar operating equipment.

   2. For projects designated to achieve a LEED rating the Contractor shall receive a copy of the Project's LEED scorecard for the purpose of monitoring compliance with the target objectives and to facilitate

coordination with the LEED Consultant. The Contractor shall receive periodic updates of this scorecard and is required to submit the final version of the Scorecard at Substantial Completion with other Project Record Documents.

1.3 RELATED SECTIONS: include without limitation the following:

A.	Section 01 10 00	SUMMARY
B.	Section 01 32 00	CONSTRUCTION PROGRESS DOCUMENTATION
C.	Section 01 32 33	PHOTOGRAPHIC DOCUMENTATION
D.	Section 01 33 00	SUBMITTAL PROCEDURES
E.	Section 01 77 00	PROJECT CLOSEOUT PROCEDURES

1.4 DEFINITIONS:

A. Refer to Article 2 of the Contract for definition of terms, words and expressions used in the General Conditions not otherwise defined herein.

B. Design Consultant: "Design Consultant" shall mean the entity responsible for providing design services for the Project, including without limitation, preparing the construction documents (drawings and specifications) and providing services in connection with such documents during construction. The entity serving as the "Design Consultant" may be a corporation, firm, partnership, joint venture, individual or combination thereof. Such entity may be either an employee(s) of the City or an entity engaged by the City to provide such services.

1.5 SUBMITTALS:

A. As-Built Contract Record Drawings: Comply with the following:

1. Progress Submission: As directed by the Resident Engineer, submit progress As-Built Contract Record Drawings at the 50% Construction Completion stage.

2. Final Submission: Before substantial completion payment, the Contractor shall furnish to the Commissioner one (I) complete set of marked-up Mylar (reproducible) As-Built Contract Record Drawings, in ink indicating all of the work and locations as actually installed, plus one (1) set of paper prints which will be furnished to the sponsoring agency by DDC.

3. As-Built Contract Record Drawings shall be of the same size as that of the Contract Drawings, with a one (1) inch margin on three (3) sides and a two (2) inch margin on the left side for binding.

4. Each As-Built Contract Record Drawing shall bear the legend "AS-BUILT CONTRACT RECORD DRAWING" in heavy block lettering, one half (I/2) inch high, and contain the following data:

AS-BUILT CONTRACT RECORD DRAWING
Contractor's Name _____
Contractor's Address _____
Subcontractor's Name (where applicable) _____
Subcontractor's Address _____
Made by: Date _____
Checked by: Date _____

Commissioner's Representatives
(Resident Engineer) DDC
(Plumbing Inspector) DDC
(Heating & Ventilating Inspector) DDC
(Electrical Inspector) DDC

5. Record Drawing Title Sheet: The Contractor shall prepare a title sheet, the same size as the Contract Record Drawings, which shall contain the following:

   a. Heading:
      The City of New York
      Department of Design and Construction
      Division of Public Buildings
   b. Capital Budget Project Number (FMS ID)
   c. Name and Location of Project
   d. Contractor's Name and Address
   e. Subcontractor's Name and Address (where applicable)
   f. Record of changes (a caption description of work affected, and the date and number of Change Order or other authorization)
   g. List of Record Drawings

B. Record Specifications, Addenda and Change Order: Submit to the Commissioner two (2) copies each of marked-up Record Specifications, Addenda and Change Orders.

C. Record Product Data: Submit to the Commissioner two (2) sets of Record Product Data.

D. Record Construction Photographs: Submit to the Commissioner final as-built construction photographs and negatives of the completed work as described in Section 01 32 33, PHOTOGRAPHIC DOCUMENTATION.

E. Operating and Maintenance Manuals:

1. Submit three (3) copies each of preliminary manuals to the Resident Engineer for review and approval. The Contractor shall make such corrections, changes and/or additions to the manual until deemed satisfactory by the Resident Engineer. Deliver three (3) copies of the final approved manuals to the Resident Engineer for distribution.

2. Commissioning: Comply with the requirements of Section 01 91 13, GENERAL COMMISSIONING REQUIREMENTS, as well as the requirements set forth in sections of the Project Specifications, for projects designated for Commissioning. Submit four (4) copies each of data designated to be included in the Commissioning Operation and Maintenance Manual to the Resident Engineer. The Resident Engineer will forward such data to the Commissioning Authority/Agent (CxA) for review and comment. The Contractor shall make such corrections, changes and/or additions to the data until deemed satisfactory and deliver four (4) copies of the final data to the Resident Engineer for use by the Commissioning Authority/Agent (CxA) to prepare the Commissioning Operation and Maintenance Manual.

   a. Non-Commissioning Data: All remaining data not designated for Commissioning and required as part of Maintenance and Operation Manual shall be prepared and assembled in accordance with the requirements of this section for Operating and Maintenance Manuals.

F. Final Site Survey: Submit Final Site Survey as described in Section 01 73 00, EXECUTION, in quantities requested by the Commissioner, signed and sealed by a Land Surveyor licensed in the State of New York.

G. Guarantees and Warranties.

H. Waste Disposal Documents and Miscellaneous Record Documents.

PART II – PRODUCTS

2.1 CONTRACT RECORD DRAWINGS:

A. Record Prints: The Contractor shall maintain one set of blue- or black-line white prints as applicable of the Contract Drawings and Shop Drawings. If applicable, the Record Contract Drawings and Shop Drawings shall incorporate the arrangement of the work based on the accepted Master Coordination Drawing(s) as described in Section 01 33 00, SUBMITTAL PROCEDURES.

1. Preparation: The Contractor shall mark Record Prints to show the actual installation where installation varies from that shown originally. Require individual or entity who obtained record data, whether individual or entity is Installer, subcontractor, or similar entity, to prepare the marked-up Record Prints.
   a. Give particular attention to information on concealed elements that would be difficult to identify or measure and record later.
   b. Accurately record information in an understandable drawing technique.
   c. Record data as soon as possible after obtaining it. Record and check the markup before enclosing concealed installations.
2. Change Orders: All changes from Contract Drawings shall be distinctly encircled and identified by Change Order number correlating to changes listed on the "Title Sheet." The Contractor shall show within the encircled areas the work as actually installed.

B. Content: Types of items requiring marking include, but are not limited to, the following:

1. Dimensional changes to Drawings.
2. Revisions to details shown on Drawings.
3. Depths of foundations below first floor.
4. Locations and depths of underground utilities.
5. Revisions to routing of piping and conduits.
6. Revisions to electrical circuitry.
7. Actual equipment locations.
8. Duct size and routing.
9. Locations of concealed internal utilities.
10. Changes made by Change Order
11. Changes made following Commissioner's written orders.
12. Details not on the original Contract Drawings.
13. Field records for variable and concealed conditions.
14. Record information on the Work that is shown only schematically.

C. Progress Record Mylar's (reproducible): As directed by the Resident Engineer at 50% construction completion, review marked-up Record Prints with the Resident Engineer and the Design Consulting. When directed by the Resident Engineer transfer progress mark-ups to a full set of Mylar's (reproducible) and submit one blue line or black line record copy to the Resident Engineer. The marked-up Mylar's (reproducible) shall be retained by the Contractor for completion of mark-up and final submission.

D. Final Contract Record Mylar's (reproducible): Immediately before final inspection for Certificate of Substantial Completion, review marked-up Record Prints with the Resident Engineer and the Design Consulting. When authorized, complete mark-up of a full set of corrected Mylar's (reproducible) of the Contract Drawings.

1. Incorporate changes and additional information previously marked on Record Prints. Erase, redraw, and add details and notations where applicable.
2. Refer instances of uncertainty to Resident Engineer for resolution.
3. Print the As-Built Contract Drawings and Shop Drawings for use as Record Transparencies as described in Sub-Section 1.5.

2.2 RECORD SPECIFICATIONS, ADDENDA AND CHANGE ORDERS:

A. Preparation: Mark Specifications to indicate the actual product installation where installation varies from that indicated in Specifications, addenda, and contract modifications.

1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
2. Mark copy with the proprietary name and model number of products, materials, and equipment furnished, including substitutions and product options selected.
3. Record the name of manufacturer, supplier, Installer, and other information necessary to provide a record of selections made
4. For each principal product, indicate whether Record Product Data has been submitted in operation and maintenance manuals instead of submitted as Record Product Data.
5. Note related Change Orders and Record Drawings where applicable.
6. Upon completion of mark-up, submit two (2) complete copies of the marked-up Record Specifications to the Commissioner.

2.3 RECORD PRODUCT DATA:

A. Preparation: Mark Product Data to indicate the actual product installation where installation varies substantially from that indicated in Product Data submittal.

1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
2. Include significant changes in the product delivered to Project site and changes in manufacturer's written instructions for installation.
3. If possible, a Change Order proposal should include resubmitting updated Product Data. This eliminates the need to mark up the previous submittal.
4. Note related Change Orders and Record Drawings where applicable.
5. Upon completion of mark-up submit to the Commissioner two (2) sets of the marked-up Record Product Data.
6. Where Record Product Data is required as part of Maintenance Manuals, submit marked-up Product Data as an insert in the manual instead of submittal as record Product Data.

2.4 RECORD SAMPLE SUBMITTAL:

A. Prior to the date of Substantial Completion, the Contractor shall meet with the Resident Engineer at the site to determine which of the Samples maintained during the construction period shall be transmitted to the Commissioner for record purposes.

B. Comply with the Resident Engineer's instructions for packaging, identification marking and delivery to DDC. Dispose of other samples as specified for disposal of surplus and waste material.

2.5 OPERATING AND MAINTENANCE MANUALS:

A. The Contractor shall provide preliminary and final versions of Operating and Maintenance Manuals required for those systems, equipment and materials listed in other Sections of the Project Specifications.

B. Format: Prepare and assemble Operation and Maintenance Manuals in heavy-duty, 3-ring, hardback loose leaf binders in the form of an instructional manual. All binders for each discipline shall be the same color. When multiple binders are used, correlate data into related consistent groupings. Binder front shall containing permanently attached labels displaying the following:

1. Heading:
   The City of New York
   Department of Design and Construction
   Division of Public Buildings
2. Capital Budget Project Number (FMS ID)
3. Name and Location of Project
4. Contractor's Name and Address
5. Subcontractor's Name and Address (where applicable)
6. Dates of the work covered by the contents of the Project Manual.
7. Binder spine shall display Project Number (FMS ID) and date of completion.

C. Organization: Include a section in the directory for each of the following:

1. List of documents
2. List of systems
3. List of equipment
4. Table of contents

D. Each manual shall contain the following materials, in the order listed:

1. Title page
2. Table of contents
3. Manual contents

E. Arrange contents alphabetically by system, subsystem, and equipment and sequence of Table of Contents of the Project Manual. Cross-reference Specification Section numbers. Provide tabbed flyleaf for each separate product, equipment and/or system/subsystem with typed description of product and major component parts of equipment.

F. Safety warnings or cautions shall be visibly highlighted within each maintenance procedure. Use of such highlights shall be limited to only critical items and shall not be used in an excessive manner which would reduce their effectiveness.

G. For each product or system, list names, addresses and telephone numbers of Subcontractors and Suppliers, including local source of supplies and replacement parts. Vendors and Supplier listings are to include names, addresses and telephone numbers, including nearest field service telephone numbers.

H. Where contents of the manual include any manufacturer's catalog pages, clearly indicate the precise items and options included in the installation and delete all manufacturers' data regarding products not included in the installation.

I. All material within manuals shall be new. Copies used for prior submittals or used in construction shall not be used.

J. Submit preliminary and final manual editions to the Commissioner according to the approved progress schedule.

K. Manuals shall present all technical material to the greatest extent possible, with respect to text, tabular matter and illustrations. Illustrations shall preferably consist of line drawings. All applicable drawings shall be included. If available, color photograph prints may be included.

L. Preliminary manual editions shall be as technically complete as the final manual edition. All illustrations shall be in final forms.

M. Final manual editions shall be technically accurate and complete and shall represent all "as-built" systems, pieces of equipment, or materials, which have been accepted by the Commissioner. All

illustrations, text and tabular material shall be in final form. All shop drawings shall be included as specified in individual Specification Sections.

N. Building products, applied materials, and finishes: Include product data, with catalog number, size, composition, and color texture designations. Where applicable, provide information for re-ordering custom manufactured products.

O. Instructions for care and maintenance: Include manufacturers' recommendations for cleaning agents and methods, and recommended schedule for cleaning and maintenance.

P. Moisture Protection and Weather Exposed Products: Include product data listing applicable reference standards, chemical compositions, and details of installation. Provide recommendations for inspections, maintenance, and repair.

Q. Additional Requirements: Specified in individual Specification Sections.

2.6 DEMONSTRATION AND ORIENTATION DVD:

A. The Contractor shall submit final version of applicable Demonstration and Training DVD recordings in compliance with Section 01 79 00, DEMONSTRATION AND OWNER'S PRE-ACCEPTANCE ORIENTATION.

2.7 GUARANTEES AND WARRANTIES:

A. SCHEDULE B – Requirements for guarantees and warranties for the Project are set forth in Schedule B, which is included as part of the Addendum.

B. FORM – For all guarantee requirements set forth in Schedule B, the Contractor shall provide a written guaranty, in the form set forth herein.

C. Submit fully executed and signed manufacturers' Warranties as listed in the Project Specifications and outlined in Schedule B of the Addendum. Refer to Section 01 77 00, CLOSEOUT PROCEDURES for submittal requirements.

GUARANTY

DDC PROJECT # _____

PROJECT DESCRIPTION _____

_____

CONTRACT # _____

SPECIFICATION SECTION # AND TITLE _____

_____

GUARANTY TO BE IN EFFECT FROM _____

TO _____

The Contractor hereby guarantees that the work specified under the above section of the aforesaid Contract will be free from defects of material and/or workmanship, for the period indicated above.

The Contractor also guarantees that it will promptly repair, restore, rebuild or replace whichever may be deemed necessary by the City, any or all defective material or workmanship of the aforementioned section, that may appear within the guaranty period and any finished work to which damage may occur because of such defects, to the satisfaction of the City and without any cost or expense to the City.

The Contractor hereby agrees to pay to the City the cost of the repairs or replacements should the City make the same because of the failure of the Contractor to do so.

Contractor: _____

By: _____
Signature of Partner or Corporate Officer

Print Name: _____

Subscribed and sworn to before me this
day of _____ , year _____

_____
Notary Public

2.8 WASTE DISPOSAL DOCUMENTATION:

A. Certify and deliver to the Commissioner all documentation including reports, receipts, certificates, records etc. for the collection, handling, storage, classification, testing, transportation, recycling and/or disposal of all Non-Hazardous Construction Waste as required by Section 01 74 19, CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL, and Hazardous Waste as required by other Project Specification Sections. Certify compliance with all applicable governing laws, codes, rules and regulations.

2.9 MISCELLANEOUS RECORD DOCUMENTS:

A. Refer to other Project Specification Sections for miscellaneous record-keeping requirements and submittals in connection with various construction activities. Prior to Final Acceptance, complete miscellaneous records and place in good order, properly identified and bound or otherwise organized to allow for use and reference.

B. Submit three (3) copies of each document to the Commissioner or as otherwise directed by the Commissioner.

PART III – EXECUTION

3.1 RECORDING AND MAINTENANCE:

A. Recording: Maintain one copy of each submittal during the construction period for Contract Record Document purposes. Post changes and modifications to Project Record Documents as they occur; do not wait until the end of Project.

B. Maintenance of Record Documents and Samples: Store Record Documents and Samples in the field office apart from the Contract Documents used for construction. Do not use Contract Record Documents for construction purposes. Maintain Record Documents in good order and in a clean, dry, legible condition, protected from deterioration and loss. Provide access to the Contract Record Documents for the Resident Engineer's reference during normal working hours.

END OF SECTION 01 78 39

(No Text on This Page)

SECTION 01 79 00
DEMONSTRATION AND OWNER'S PRE-ACCEPTANCE ORIENTATION

REFER TO THE ADDENDUM FOR APPLICABILITY OF THIS SECTION 01 79 00

PART 1 – GENERAL

1.1 RELATED DOCUMENTS:

A. The following documents apply to all required work for the Project: (1) the Contract Drawings, (2) the Specifications, (3) the General Conditions, (4) the Addendum, and (5) the Contract [City of New York Standard Construction Contract].

1.2 SUMMARY:

A. This Section includes administrative and procedural requirements, when set forth in sections of the Project Specifications, for instructing facility's personnel, including the following:

1. Demonstration of operation of systems, subsystems, and equipment.
2. Owner's Pre-Acceptance Orientation in operation and maintenance of systems, subsystems, and equipment.
3. Demonstration and Orientation video recordings.

B. The Contractor shall provide the services of equipment manufacturers orientation specialists experienced in the type of equipment to be demonstrated.

C. Separate Orientation sessions shall be conducted for mechanical operations and maintenance personnel and for electronic and electrical maintenance personnel.

D. Commissioning: Refer to the Addendum to identify whether this project is to be Commissioned. For Commissioned projects the Contractor shall provide Demonstration and Orientation as described in this section and cooperate with the Commissioning Authority/Agent (CxA) to implement Commissioning requirements as described in Section 01 91 13, GENERAL COMMISSIONING REQUIREMENTS For MEP Systems, and/ or Section 01 91 15 BUILDING ENCLOSURE COMMISSIONNING REQUIREMENTS.

1.3 RELATED SECTIONS: include without limitation the following:

A. Section 01 10 00 SUMMARY
B. Section 01 33 00 SUBMITTAL PROCEDURES
C. Section 01 77 00 CLOSEOUT PROCEDURES
D. Section 01 78 39 CONTRACT RECORD DOCUMENTS
E. Section 01 91 13 GENERAL COMMISSIONING REQUIREMENTS FOR MEP SYSTEMS
F. Section 01 91 15 BUILDING ENCLOSURE COMMISSIONNING REQUIREMENTS
G. Specific requirements for demonstration and orientation indicated in other sections of the Project Specifications

1.4 DEFINITIONS:

A. Refer to Article 2 of the Contract for definition of terms, words and expressions used in the General Conditions not otherwise defined herein.

B. Design Consultant: "Design Consultant" shall mean the entity responsible for providing design services for the Project, including without limitation, preparing the construction documents (drawings and specifications) and providing services in connection with such documents during construction. The entity serving as the "Design Consultant" may be a corporation, firm, partnership, joint venture, individual or combination thereof. Such entity may be either an employee(s) of the City or an entity engaged by the City to provide such services.

1.5 SUBMITTALS:

A. Instruction Program: Submit three (3) copies of outline of instructional program for demonstration and orientation, including a schedule of proposed dates, times, length of instruction time, and instructors' names for each orientation module to the Commissioner for approval no less than thirty (30) days prior to the date the proposed orientation is to take place. Include learning objectives and outline for each orientation module.

1. At completion of orientation, submit three (3) complete training manual(s) and three (3) applicable video recording(s) to the Commissioner for the facility's and City's use.

B. Qualification Data: For facilitator, instructor and Videographer.

C. Attendance Record: For each orientation module, submit list of participants and length of instruction time.

D. Evaluations: For each participant and for each orientation module, submit results and documentation of performance-based test.

E. Submit all final orientation material to the Resident Engineer a minimum of fourteen (14) days prior to the scheduled orientation.

F. Demonstration and Orientation Recordings:

1. All Projects:

a. The Contractor shall submit to the Commissioner three (3) copies of Demonstration and Orientation Video recordings within seven (7) days of end of each orientation module.

b. Identification: On each copy, provide an applied label with the following information:

1) Project Contract I.D. Number
2) Project Contract Name
3) Name of Contractor
4) Name of Subcontractor as applicable
5) Name of Design Consultant
6) Name of Construction Manager as applicable
7) Date recorded.
8) Description of vantage point, indicating location, direction (by compass point), and elevation or story of construction.
9) Table of Contents including list of systems covered.

c. Transcript: Prepared on 8-1/2-by-11-inch paper, punched and bound in heavy-duty, 3-ring, vinyl-covered binders. Mark appropriate identification on front and spine of each binder. Include a cover sheet with same label information as the corresponding DVD recording. Include name of Project and date of recording on each page.

d. Commissioned Projects: The Contractor shall submit one (1) additional copy of the Demonstration and Orientation video recording to the Commissioning Agent through the Resident Engineer who will include the approved recording in the Commissioning Report.

1.6 QUALITY ASSURANCE:

A. Facilitator Qualifications: A firm or individual experienced in orientation or educating maintenance personnel in an orientation program similar in content and extent to that indicated for this Project.

B. Instructor Qualifications: A factory-authorized service representative, complying with requirements in Section 01 40 00, QUALITY REQUIREMENTS, experienced in operation and maintenance procedures and orientation.

C. Videographer Qualifications: A professional Videographer who has experience with orientation and construction projects.

D. Pre-instruction Conference: Schedule with the Resident Engineer a conference at Project site in accordance with Section 01 31 00, PROJECT MANAGEMENT AND COORDINATION. Review methods and procedures related to demonstration and orientation including, but not limited to, the following:

1. Inspect and discuss locations and other facilities required for instruction.
2. Review and finalize instruction schedule and verify availability of educational materials, instructors' personnel, audiovisual equipment, and facilities needed to avoid delays.
3. Review required content of instruction.
4. For instruction that must occur outside, review weather and forecasted weather conditions and procedures to follow if conditions are unfavorable.

1.7 COORDINATION:

A. Coordinate instruction schedule with the Resident Engineer and facility's operations. Adjust schedule as required to minimize disrupting facility's operations.

B. Coordinate instructors, including providing notification of dates, times, length of instruction time, and course content.

C. Coordinate content of orientation modules with content of approved emergency, operation, and maintenance manuals. Do not submit instruction program until operation and maintenance data has been reviewed and approved by the Commissioner.

PART II – PRODUCTS

2.1 INSTRUCTION PROGRAM:

A. Program Structure: Develop an instruction program that includes individual orientation modules for each system and equipment not part of a system, as specified and required by individual Specification Sections.

B. Orientation Modules: Develop a learning objective and teaching outline for each module. Include a description of specific skills and knowledge that participant is expected to master. For each module, include instruction for the following:

1. Basis of System Design, Operational Requirements, and Criteria: Include the following:
   a. System, subsystem, and equipment descriptions.
   b. Performance and design criteria if Contractor is delegated design responsibility.

c. Operating standards.
d. Regulatory requirements.
e. Equipment function including auxiliary equipment and systems.
f. Operating characteristics.
g. Limiting conditions.
h. Performance curves.

2. Documentation: Review the following items in detail:
   a. Emergency manuals.
   b. Operations manuals.
   c. Maintenance manuals.
   d. Project Record Documents.
   e. Identification systems.
   f. Warranties

3. Emergencies: Include the following, as applicable:
   a. Instructions on meaning of warnings, trouble indications, and error messages.
   b. Instructions on stopping.
   c. Shutdown instructions for each type of emergency.
   d. Operating instructions for conditions outside of normal operating limits.
   e. Sequences for electric or electronic systems.
   f. Special operating instructions and procedures.

4. Operations: Include the following, as applicable:
   a. Startup procedures.
   b. Equipment or system break-in procedures.
   c. Routine and normal operating instructions.
   d. Regulation and control procedures.
   e. Control sequences.
   f. Safety procedures.
   g. Instructions on stopping.
   h. Normal shutdown instructions.
   i. Operating procedures for emergencies.
   j. Operating procedures for system, subsystem, or equipment failure.
   k. Seasonal and weekend operating instructions.
   l. Required sequences for electric or electronic systems.
   m. Special operating instructions and procedures.

5. Adjustments: Include the following:
   a. Alignments.
   b. Checking adjustments.
   c. Noise and vibration adjustments.
   d. Economy and efficiency adjustments.

6. Troubleshooting: Include the following:
   a. Diagnostic instructions.
   b. Test and inspection procedures.

7. Maintenance: Include the following:
   a. Inspection procedures.
   b. Types of cleaning agents to be used and methods of cleaning.
   c. List of cleaning agents and methods of cleaning detrimental to product.

d. Procedures for routine cleaning
e. Procedures for preventive maintenance.
f. Procedures for routine maintenance.
g. Instruction on use of special tools.
h. Housekeeping practices

8. Repairs: Include the following:
   a. Diagnosis instructions.
   b. Repair instructions.
   c. Disassembly; component removal, repair, and replacement; and reassembly instructions.
   d. Instructions for identifying parts and components.
   e. Review of spare parts needed for operation and maintenance.

PART III – EXECUTION

3.1 INSTRUCTION:

A. Facilitator: Engage a qualified facilitator to prepare instruction program and orientation modules, to coordinate instructors, and to coordinate between Contractor and the Resident Engineer for the number of participants, instruction times, and location.

B. The Contractor shall engage qualified instructors to instruct facility's personnel to adjust, operate, and maintain systems, subsystems, and equipment not part of a system.

C. Scheduling: Schedule instruction with the Resident Engineer at mutually agreed times. For equipment that requires seasonal operation, provide similar instruction at start of each season.

   1. Schedule orientation with the Resident Engineer with at least fourteen (14) days' advance notice.

D. Evaluation: At conclusion of each orientation module, assess and document each participant's mastery of module(s) by use of an oral a written or a demonstration performance-based test.

E. Cleanup: Collect and remove used and leftover educational materials from project site. Remove instructional equipment. Restore systems and equipment to condition existing before initial orientation use.

3.2 DEMONSTRATION AND ORIENTATION VIDEO RECORDINGS:

A. All projects:
   1. The Contractor shall engage a qualified commercial Videographer to video record demonstration and orientation sessions. Record each orientation module separately. Include classroom instructions and demonstrations, board diagrams, and other visual aids, but not student practice.
   2. At beginning of each orientation module, record each chart containing learning objective and lesson outline.
   3. All recordings must be close captioned.
   4. Recording Format: Provide high-quality video recording on USB drive or other electronic media requested by the Commissioner.
   5. Recording: Mount camera on tripod before starting recording, unless otherwise necessary to show area of demonstration and orientation. Display continuous running time.

6. Narration: Describe scenes on the recording by audio narration by microphone while recording or by dubbing audio narration off-site after. Include description of items being viewed. Describe vantage point, indicating location, direction (by compass point), and elevation or story of construction.
7. Transcript: Provide a typewritten transcript of the narration. Display images and running time captured from opposite the corresponding narration segment.

B. Commissioned Projects:

Refer to the Addendum to determine if the project is to be Commissioned.

1. The Commissioning Authority/Agent (CxA) under separate contract with the City of New York will assess and comment on the adequacy of the Orientation Instruction sessions by reviewing the Orientation and Instruction program and agenda provided by the Contractor. The provider of the Orientation program will video record the sessions and provide a copy to the CxA for final review and comments. If necessary, Contractor shall edit the recording per CxA comments.

END OF SECTION 01 79 00

SECTION 01 81 13.03
SUSTAINABLE DESIGN REQUIREMENTS FOR LEED v3 BUILDINGS

REFER TO THE ADDENDUM FOR APPLICABILITY OF THIS SECTION 01 81 13.03

PART I – GENERAL

1.1 RELATED DOCUMENTS:

A. The following documents apply to all required work for the Project: (1) the Contract Drawings, (2) the Specifications, (3) the General Conditions, (4) the Addendum, and (5) the Contract [City of New York Standard Construction Contract].

1.2 SUMMARY:

A. LEED BUILDING - GENERAL REQUIREMENTS:

The City of New York is committed to implementing good environmental practices and procedures which include achieving a LEED™ Green Building rating. Specific project requirements related to this goal are listed in the applicable paragraphs of this section of the General Conditions. The Contractor shall ensure that these requirements as defined in the sections below and in related sections of the Contract Documents, are implemented to the fullest extent. Substitutions, or other changes to the work proposed by the Contractor or their Subcontractors, shall not be allowed if such changes compromise the stated LEED BUILDING criteria.

B. This Section includes:

1. Definitions
2. LEED Provisions
3. LEED Building Submittals
4. LEED Building Submittal Requirements
5. LEED Action Plan

1.3 RELATED SECTIONS: Include without limitation the following:

A.	Section 01 74 19	CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL
B.	Section 01 81 13.13	VOLATILE ORGANIC COMPOUND (VOC) LIMITS FOR ADHESIVES, SEALANTS, PAINTS AND COATINGS FOR LEED v3 BUILDINGS
C.	Section 01 81 19	INDOOR AIR QUALITY REQUIREMENTS FOR LEED BUILDINGS
D.	Section 01 91 13	GENERAL COMMISSIONING REQUIREMENTS FOR MEP SYSTEMS
E.	Section 01 91 15	GENERAL COMMISSIONING REQUIREMENTS FOR BUILDING ENCLOSURE

1.4 DEFINITIONS:

A. Refer to Article 2 of the Contract for definition of terms, words and expressions used in the General Conditions not otherwise defined herein.

B. Agrifiber Products: Products derived from recovered agricultural waste fiber from sources such as cereal straw, sugarcane bagasse, sunflower husk, walnut shells, coconut husks, and agricultural prunings, processed and mixed with resins to produce panels with characteristics similar to composite wood.

C. Composite Wood: Products composed of wood or plant particles or fibers bonded by a synthetic resin or binder to produce panels such as plywood, particleboard, and medium density fiberboard (MDF). Does not include hardboard, structural panels, glued laminated timber, prefabricated wood I-joists, or finger-jointed lumber.

D. Design Consultant: "Design Consultant" shall mean the entity responsible for providing design services for the Project, including without limitation, preparing the construction documents (drawings and specifications) and providing services in connection with such documents during construction. The entity serving as the "Design Consultant" may be a corporation, firm, partnership, joint venture, individual or combination thereof. Such entity may be either an employee(s) of the City or an entity engaged by the City to provide such services.

E. Forest Stewardship Council (FSC) Certified Wood: Wood-based materials and products certified in accordance with the Forest Stewardship Council's principles and criteria.

F. LEED: The Leadership in Energy & Environmental Design rating system developed by the United States Green Building Council.

G. Rapidly Renewable Materials: Materials made from agricultural products that are typically harvested within a ten-year or shorter cycle. Rapidly renewable materials include products made from bamboo, cotton, flax, jute, straw, sunflower seed hulls, vegetable oils, or wool.

H. Regionally Manufactured Materials: Materials that are manufactured within a radius of 500 miles from the Project location. Manufacturing refers to the final assembly of components into the building product that is installed at the Project site.

I. Regionally Extracted, Harvested, or Recovered Materials: Materials which are extracted, harvested, or recovered and manufactured within a radius of 500 miles from the Project site.

J. Recycled Content: The percentage by weight of constituents that have been recovered or otherwise diverted from the solid waste stream, either during the manufacturing process (pre-consumer), or after consumer use (post-consumer).
   1. Spills and scraps from the original manufacturing process that are combined with other constituents after a minimal amount of reprocessing for use in further production of the same product are not recycled materials.
   2. Discarded materials from one manufacturing process that are used as constituents in another manufacturing process are pre-consumer recycled materials.
   3. "Pre-consumer" may also be referred to as "post-industrial".

K. Solar Reflectance Index (SRI): A measure of a material's ability to reflect solar heat, as shown by a small temperature rise. It is defined so that a standard black (reflectance 0.05, emittance 0.90) is equal to 0, and a standard white (reflectance 0.80, emittance of 0.90) is equal to 100.

L. Volatile Organic Compound (VOC): Any compound of carbon (excluding carbon monoxide, carbon dioxide, carbonic acid, metallic carbides or carbonates, and ammonium carbonate) which vaporizes (becomes a gas) and participates in atmospheric photochemical reactions, as specified in Part 51.00 of Chapter 40 of the U.S. Code of Federal Regulations, at normal room temperatures. For the purposes of this specification, formaldehyde and acetaldehyde are considered to be VOCs.

1.5 LEED PROVISIONS:

A. Refer to the Addendum for the LEED rating to be achieved for this project. The provisions to achieve this LEED rating are integrated within the project construction documents and specifications. The Contractor is specifically directed to the "LEED BUILDING Performance Criteria" and "LEED BUILDING Submittals" sections within the contract specification. Additional LEED requirements are met through aspects of the project design, including material and equipment selections, which may not be specifically identified as LEED BUILDING requirements. Compliance with the requirements needed to obtain LEED prerequisites and credits will be used as one criterion to evaluate substitution requests.

1.6 LEED BUILDING SUBMITTALS:

A. Scope: LEED BUILDING submittals are required for all installed materials included in General Construction work. LEED BUILDING Submittals are only required for field-applied adhesives, sealants, paints and coatings included in Plumbing, Mechanical and Electrical work. Submit all required LEED BUILDING submittals in accordance with Section 01 33 00, SUBMITTAL PROCEDURES.

B. Applicability: The extent of the LEED BUILDING Submittals varies depending on the specification section. Applicable LEED BUILDING Submittals are listed under the "LEED BUILDING Submittals" heading in each specification section. The detailed requirements for the LEED BUILDING Submittals are defined in Item C below.

C. Detailed Requirements: Sub-Sections 1.6 C.1through 1.6 C.3 below defines the information and documents to be provided for each type of LEED BUILDING Submittal as identified in the LEED Submittal Requirements of each specification section:

1. ENVIRONMENTAL BUILDING MATERIALS CERTIFICATION FORM (EBMCF)[GHI]: Information to be supplied for this form (blank sample copy attached at end of this Section to be modified as appropriate to the project) shall include some or all of the following items, as identified in the LEED Submittal Requirements of each specification section:

   a. Cost breakdowns for the materials included in the contractor or sub-contractor's scope of work. Cost reporting shall include itemized material costs (excluding the contractor's labor, equipment, overhead and profit).
   b. The percentages (by weight) of post-consumer and/or post-industrial recycled content in the supplied product(s).
      1. For each product with recycled content, also indicate the total recycled content value (1/2 x pre-consumer percentage x product value + 1 x post-consumer percentage x product value = total recycled content value).
      2. See additional requirements for concrete below.
   c. Identification (Yes/No) of materials manufactured within 500 miles of the project site AND containing raw materials harvested or extracted within 500 miles of the project site.
      1) Indicate the percentage by weight, relative to the total weight of the product that meets these criteria.
      2) Indicate the point of harvest/extraction/recovery of regional raw materials, the point of final assembly of regional manufactured products, and the distance from each point to the project site.
   d. Volatile Organic Compound (VOC) content of all field-applied adhesives, sealants, paints, and coatings, listed in grams/liter or lbs./gallon, less water.
      1) For detailed requirements refer to Section 01 81 13.13 VOC LIMITS FOR ADHESIVES, SEALANTS, PAINTS AND COATINGS.
   e. The amount of "Forest Stewardship Council (FSC) Certified" wood products if used in the Project.
      1) Record only new FSC-certified wood products. Do not record reclaimed, salvaged, or recycled FSC-certified wood products.

2) Reclaimed, salvaged, or recycled FSC-certified wood may be recorded as post-consumer recycled content.

f. The amount of Rapidly Renewable materials if used in the Project.
   1) Indicate the type of rapidly renewable material used, and the percentage by weight, relative to the total weight of the product, that consists of rapidly renewable material.

g. The percentage (by weight), relative to the total weight of cementitious materials, of supplementary cementitious materials or pozzolans such as fly ash used in each concrete mix used in the Project.
   1) For each concrete mix, provide a complete breakdown of all components, by weight and by cost.

h. Identification (Yes/No) of composite wood or agrifiber products used in the project that are free of added urea-added formaldehyde resins.

i. Identification (Yes/No) of flooring products used in the project that have Carpet and Rug Institute (CRI) Green Label or Green Label Plus certification, or Resilient Floor Covering Institute FloorScore certification.
   1) Untreated solid wood flooring, and mineral-based flooring products such as tile, masonry, terrazzo, and cut stone that have no organic-based coatings or sealants, are excluded from this requirement.

j. The EBMCF shall record the above information only for those materials or products permanently installed in the project. The EBMCF shall record VOC content, composite and agrifiber products, and CRI or FloorScore ratings only for those materials or products permanently installed within the weather barrier of the LEED building.

2. EBMCF BACK-UP DOCUMENTATION: These documents are used to validate the information provided on the EBMCF (except cost data). For each material listed on the EBMCF, provide documentation to certify the material's LEED BUILDING attributes, as applicable:

   a. RECYCLED CONTENT: Provide published product literature or letter of certification on the manufacturer's letterhead certifying the amounts of post-consumer and/or post-industrial content.

   b. REGIONAL MANUFACTURING **AND** REGIONAL RAW MATERIALS (WITHIN 500 MILES): Provide published product literature or letter of certification on the manufacturer's letterhead indicating the city/state where the manufacturing plant is located, where each of the raw materials in the product were extracted, harvested or recovered and the distance in miles from the project site.
      1) If only some of the raw materials for a particular product or assembly originate within 500 miles of the project site, provide the percentage (by weight) that these materials comprise in the complete product.

   c. VOC CONTENT: Provide Material Safety Data Sheets (MSDS) certifying the Volatile Organic Compound (VOC) content of the adhesive, sealant, paint, or coating products. VOC content is to be reported in grams/liter or lbs./gallon, less water. If the MSDS does not show the product's VOC content, this information must be provided through other published product literature from the manufacturer, or stated in a letter of certification from the product manufacturer on the manufacturer's letterhead.

   d. RAPIDLY RENEWABLE MATERIALS: If used in the project, provide published literature or letter of certification on the manufacturer's letterhead certifying the percentage of each product that is rapidly renewable (by weight).

3. PRODUCT CUT SHEETS: Provide product cut sheets with the Contractor's or sub-contractor's stamp, confirming that the submitted products are the products installed in the Project.

4. CRI GREEN LABEL PLUS CERTIFICATION: For carpets and carpet cushions, provide published product literature or letter from the manufacturer (on the manufacturer's letterhead) verifying that the products comply with the "Green Label Plus" IAQ testing program of the Carpet and Rug Institute of Dalton, GA.

5. CERTIFICATION OF COMPOSITE WOOD OR AGRIFIBER RESINS: For all composite wood, engineered wood and agrifiber products (including plywood, particleboard, and medium density fiberboard), provide published product literature or letter from the manufacturer (on the manufacturer's letterhead) verifying that that the products do not contain added urea-formaldehyde resins.

6. CERTIFICATION OF COMPOSITE WOOD OR AGRIFIBER LAMINATING ADHESIVES: For all laminating adhesives used with composite wood, engineered wood and agrifiber products (e.g., adhesives used to laminate wood veneers to an engineered wood substrate), provide published product literature or letter from the manufacturer (on the manufacturer's letterhead) verifying that the adhesive products do not contain urea-formaldehyde.

7. FSC-CERTIFIED WOOD:
   a. If used in the project, provide chain of custody documents and copies of invoices regarding wood products, including whether or not such wood product is FSC-certified.
   b. If used in the project, for assemblies, provide the percentage (by cost and by weight) of the assembly that is FSC-certified wood.
   c. If used in the project, for assemblies, provide published product literature or letter from the manufacturer(on the manufacturer's letterhead) verifying the percentage that is FSC-certified wood.

8. GREEN SEAL COMPLIANCE: Provide published product literature or letter from the manufacturer (on the manufacturer's letterhead) verifying that the following product types comply with the VOC limits and chemical component restrictions developed by the Green Seal organization of Washington, DC:

   a. Interior Architectural Paints and Coatings: refer to Green Seal standard GS-11 (1st edition, May 1993)
   b. Anti-corrosive and Anti-rust paints: refer to Green Seal standard GC-03 (2nd Edition, January 1997)
   c. Aerosol Adhesives: refer to Green Seal standard GS-36 (1st edition, October 2000)

9. HIGH ALBEDO PAVING AND WALKWAY MATERIALS: For paving and walkway materials made from concrete or brick provide published product literature or letter from the manufacturer (on the manufacturer's letterhead) verifying a minimum Solar Reflectance Index (SRI) value of 29. SRI values shall be calculated according to ASTM E 1980. Reflectance shall be measured according to ASTM E 903, ASTM E 1918, or ASTM C 1549. Emittance shall be measured according to ASTM E 408 or ASTM C 1371.

10. HIGH ALBEDO ROOFING MATERIALS: For exposed roofing membranes, pavers, and ballast products, provide published product literature or letter from the manufacturer (on the manufacturer's letterhead) verifying the following minimum Solar Reflectance Index (SRI) values:

    a. 78 for low-sloped roofing applications (slope ≤ 2:12)
    b. 29 for steep-sloped roofing applications (slope > 2:12)

    SRI values shall be calculated according to ASTM E 1980. Reflectance shall be measured according to ASTM E 903, ASTM E 1918, or ASTM C 1549. Emittance shall be measured according to ASTM E 408 or ASTM C 1371.
    Vegetated roof surfaces are exempt from the SRI criteria.

11. LOW MERCURY LAMPS: For all fluorescent, compact fluorescent, and HID lamps installed in the project, provide published product literature or letter from the manufacturer (on the manufacturer's letterhead) verifying:

    a. The mercury content or content range per lamp in milligrams or picograms;
    b. The design light output per lamp (light at 40% of a lamp's useful life) in lumens; and
    c. The rated average life of the lamp in hours.

In addition, provide the total number of each lamp type installed in the project.

12. FLOORSCORE CERTIFICATION: For all hard surface flooring, including vinyl, linoleum, laminate flooring, wood flooring, ceramic flooring, rubber flooring, and wall base, provide published product literature or letter from the manufacturer (on the manufacturer's letterhead) verifying that the products comply with the current FloorScore standard requirements.

13. CONCRETE: Provide concrete mix design for each mix, designated by a distinct identifying code or number and signed by a Professional Engineer licensed in the state in which the concrete manufacturer or supplier is located.

14. INTERIOR LIGHTING FIXTURES: For each lighting fixture type installed within the building's weather barrier, provide manufacturer's cut sheets indicating the following:

    a. Fixture power in watts.
    b. Initial lamp lumens.
    c. Photometric distribution data.
    d. Dimming capability, in range of percentages.

15. EXTERIOR LIGHTING FIXTURES: For each lighting fixture type installed on site, provide manufacturer's cut sheets indicating the following:

    a. Fixture power in watts.
    b. Initial lamp lumens.
    c. Photometric distribution data.
    d. Range of field adjustability, if any.
    e. Warranty of suitability for exterior use.

16. ALTERNATIVE TRANSPORTATION: Provide manufacturer's cut sheets and/or shop drawings for the following items installed on site:

    a. Bike racks, including total number of bicycle slots provided.
    b. Signage indicating parking spaces reserved for electric or low-emitting vehicles and for carpools/vanpools, including total number of signs.

17. WATER CONSERVING FIXTURES: For all water consuming plumbing fixtures and fittings, provide manufacturer's cut sheets showing maximum flow rates and/or flush rates.

18. ENERGY SAVING APPLIANCES: Provide manufacturer's cut sheets and published product literature or letter from the manufacturer (on the manufacturer's letterhead) verifying the product's rating under the U.S. EPA/DOE Energy Star program, for all of the following:

    a. Appliances (i.e., refrigerators, dishwashers, microwave ovens, televisions, clothes washers, clothes dryers, chilled water dispensers).
    b. Office equipment (i.e., copy machines, fax machines, plotters/printers, scanners, binding and publishing equipment).
    c. Electronics (i.e., servers, desktop computers, computer monitor displays, laptop computers, network equipment).
    d. Commercial food service equipment

19. GLAZING: For glazing in any windows, doors, storefront and window wall systems, curtainwall systems, skylights, and partitions, provide manufacturer's cut sheets indicating the following:

    a. Glazed area.
    b. Visible light transmittance.
    c. Solar heat gain coefficient.
    d. Fenestration assembly u-factor.

20. VENTILATION: Provide manufacturer's cut sheets for the following:
    a. Carbon dioxide monitoring systems, if any, installed to measure outside air delivery.
    b. Air filters: for detailed requirements refer to Section 01 81 19 INDOOR AIR QUALITY REQUIREMENTS.
21. REFRIGERATION: For all refrigeration equipment, provide manufacturer's cut sheets indicating the following:
    a. Equipment type.
    b. Equipment life. Default values specified by the 2007 ASHRAE Applications Handbook will be used unless otherwise demonstrated by the manufacturer's guarantee and an equivalent long-term service contract.
    c. Refrigerant type.
    d. Refrigerant charge in pounds of refrigerant per ton of gross cooling capacity.
    e. Tested refrigerant leakage rate, in percent per year. A default rate of 2% will be used unless otherwise demonstrated by test data.
    f. Tested end-of-life refrigerant loss, in percent. A default rate of 10% will be used unless otherwise demonstrated by test data.

1.7 LEED BUILDING SUBMITTAL REQUIREMENTS:

A. The LEED BUILDING Submittal information shall be assembled into one package per contract specification section(s) (or per subcontractor), and submitted in accordance with Section 01 33 00, SUBMITTAL PROCEDURES. Incomplete or inaccurate LEED BUILDING submittals may be used as the basis for the rejection of products or assemblies. Incomplete or inaccurate LEED BUILDING Submittals may be used as the basis for rejecting the submitted products or assemblies.

1.8 LEED ACTION PLANS:

A. Construction Waste Management Plan- Refer to Section 01 74 19, Construction Waste Management and Disposal for detailed submittal requirements.

B. Construction IAQ Management Plan- Refer to Section 01 81 19, Indoor Air Quality Requirements for LEED Buildings, for detailed submittal requirements.

C. Erosion and Sedimentation Control Plan:
    1. The Plan shall be in accordance with the New York State Department of Environmental Conservation (NYSDEC) or the 2003 EPA Construction General Permit, whichever is more stringent.
    2. The Plan shall be submitted in accordance with Section 01 33 00, SUBMITTAL PROCEEDURES.
    3. Detailed requirements: ESC Plan
        a. Include the Stormwater Pollution Prevention Plan, if required.
        b. Identify the party responsible for Plan monitoring and documentation. The party must be regularly on site.
        c. Describe all site work that will be implemented on the project.
        d. Provide site plan with location of ESC measures, including, but not limited to, stormwater quantity controls, stormwater quality controls, stabilized construction entrances, washdown areas, and inlet/catch basin protection.
        e. Describe the inspection and maintenance of the ESC measures. Provide a construction schedule indicating weekly site review.
        f. Describe reporting and documentation measures.
    4. Detailed requirements: ESC Measures

5. Submittal requirements: ESC Tracking Log
   a. Note date of major rain events, describe damage, describe any repairs or maintenance performed, and note responsible party.
   b. Note date and findings of weekly site review, describe any repairs or maintenance performed, and note responsible party.
   c. Submit monthly.
6. Implementation
   a. The Contractor shall implement the ESC Plan, coordinate the Plan with all affected trades, and designate one individual as the Erosion and Sedimentation Control Representative, who will be responsible for communicating the progress of the Plan with the Commissioner on a regular basis, and for assembling the required LEED documentation.
   b. The Contractor shall be responsible for the provision, maintenance, and repair of all ESC measures.
   c. Demonstration. The Contractor shall provide on-site instruction of proper construction practices required to prevent erosion and sedimentation.
   d. Meetings. Urgent or ongoing ESC issues shall be discussed at weekly on-site job meetings.

1.9 QUALITY ASSURANCE:

A. The Contractor shall implement all LEED Action Plans, coordinate the Plans and LEED Building Submittals with all affected trades, and designate one individual as the Sustainable Construction Representative at no additional cost to the City of New York, who will be responsible for communicating the progress of LEED activities with the Commissioner on a regular basis, and for assembling the required LEED documentation.

B. Responsibilities of Contractor's Subcontractors: The Contractor shall be responsible for his/her subcontractors complying with the LEED Action Plans and for providing required LEED documentation as required for the project.

C. Distribution and Compilation: The Contractor shall be responsible for distributing the EBMCF and any other forms or templates required for the subcontractors to record LEED documentation. The Contractor shall also be responsible for collecting and compiling EBMCF information into packages as described in Section 01 33 00 SUBMITTAL PROCEDURES.

D. Meetings: Sustainable design and construction issues shall be discussed at the following meetings:
   1. Demolition kick-off meeting
   2. Construction kick-off meeting
   3. Construction kick-off meeting for LEED (independent meeting)
   4. Weekly job-site progress and coordination meetings
   5. Closeout meeting

PART II – PRODUCTS (Not Used)

PART III – EXECUTION (Not Used)

END OF SECTION 01 81 13.03

Department of Design and Construction

ENVIRONMENTAL BUILDING MATERIALS CERTIFICATION FORM

Contractor Name: _____
Contractor Contact: _____
Telephone Number: _____

Project Name: _____
Project I.D.: _____

Product/Manufacturer	Material Cost[1]	Recycled Content			Regional[4]			Rapidly Renewable[7]		VOC content[8]		Flooring[9]	Wood	
		Pre-Consumer (% by wt)[2]	Post-Consumer (% by wt)[3]	Total % (½ Pre + Post)	Location & Distance to Extraction[5]	Location & Distance to Manufacture[6]	Extracted & Manuf. (% by wt)	Material	% by wt	*VOC content listed	*VOC content allowed	*Green Label or FloorScore	*Added urea formaldehyde (Yes/No) [10]	FSC Certified[11] (% by wt)

[1] **Material Cost:** As it appears on the manufacturer's or distributor's invoice to the contractor or subcontractor. Does not include labor or equipment costs associated with installation.

[2] **Pre-Consumer Recycled Content:** Industrial/manufacturing waste material (e.g., fly-ash and synthetic gypsum, both waste products from coal burning electricity plants) diverted from landfill and incorporated into a finished product. Scrap raw materials that can be reused in the same manufacturing process from which they are recovered are not considered Pre-Consumer Recycled Content.

[3] **Post-Consumer Recycled Content:** Material or product that has served its intended consumer use (e.g., an empty plastic bottle) and has been diverted from landfill and incorporated into a finished product.

[4] **Regional:** Refers to a material/product that is BOTH extracted AND manufactured within 500 miles of the Project site. Record this information ONLY for materials/products meeting BOTH of these criteria.

[5] **Extraction:** Refers to the location from which the raw resources used in a building product are extracted, harvested, or recovered.

[6] **Manufacture:** Refers to the location of the final assembly of components into a building product that is furnished and installed by the Contractor.

[7] **Rapidly Renewable:** Refers to materials/products derived from agricultural products that are typically harvested within a ten-year or shorter cycle.

[8] **VOC Content:** The quantity of volatile organic compounds contained in adhesives, sealants. paints and architectural coatings. Reported in grams/liter or lbs/gallon, less water.

[9] **Flooring:** For carpet, indicate Carpet and Rug Institute (CRI) Green Label Plus certification. For carpet cushion, indicate CRI Green Label certification. For all flooring except unfinished/untreated wood and mineral-based flooring (tile, masonry, terrazzo, cut stone) without organic-based coatings or sealants, indicate Resilient Floor Covering Institute FloorScore rating. VOC limits for adhesives, sealants, etc. still apply.

[10] **Added Urea Formaldehyde:** Applies to composite wood and agrifiber products only (plywood, particleboard, MDF, OSB, wheatboard; strawboard). Resins or binders with added urea formaldehyde are prohibited.

[11] **FSC Certified:** Certification from the Forest Stewardship Council. This column is only applicable to wood products.

* Applies only to materials/products installed within the weather barrier.

Contractor Certification:

I, _____ a duly authorized representative of _____ (the Contractor) hereby certify that the material information contained herein is an accurate representation of the material qualifications to be provided by the Contractor as components of the final building construction. Furthermore, I understand that any change in such qualifications during the purchasing period will require prior written approval from the Commissioner.

Signature of Authorized Representative: _____ Date: _____

(No Text on This Page)

SECTION 01 81 13.04
SUSTAINABLE DESIGN REQUIREMENTS FOR LEED v4 BUILDINGS

REFER TO THE ADDENDUM FOR APPLICABILITY OF THIS SECTION 01 81 13.04

PART I – GENERAL

1.1 RELATED DOCUMENTS:

A. The following documents apply to all required work for the Project: (1) the Contract Drawings, (2) the Specifications, (3) the General Conditions, (4) the Addendum, and (5) the Contract [City of New York Standard Construction Contract].

1.2 SUMMARY:

A. LEED BUILDING - GENERAL REQUIREMENTS:

The City of New York is committed to implementing good environmental practices and procedures which include achieving a LEED™ Green Building rating. Specific Project requirements related to this goal are listed in the applicable paragraphs of this section of the General Conditions. The Contractor shall ensure that these requirements as defined in the sections below and in related sections of the Contract Documents, are implemented to the fullest extent. Substitutions, or other changes to the work proposed by the Contractor or their Subcontractors, shall not be allowed if such changes compromise the stated LEED BUILDING criteria.

B. This Section includes:

1. Definitions
2. LEED Provisions
3. LEED Building Submittals
4. LEED Building Submittal Requirements
5. LEED Action Plan
6. VOC Requirements for Interior Adhesives and Sealants
7. VOC Requirements for Interior Paints and Coatings
8. Low-Emitting Materials, Flooring
9. Low-Emitting Materials, Composite Wood
10. Low-Emitting Materials, Ceilings, Walls, Thermals and Acoustic Insulation
11. Low-Emitting Materials, Furniture
12. Low-Emitting Materials, Exterior Applied Products
13. Low-Emitting Materials, Additional Low-Emitting Requirements

C. This Section includes requirements for Volatile Organic Compound (VOC) emissions and content in specific materials used within the Project.

D. All sections in the Project Specifications with adhesives, sealant or sealant primer applications, paints, coatings, flooring, composite wood, ceilings, walls, thermal and acoustic insulation, furniture, and for healthcare and schools, exterior applied products, shall follow all requirements of this section. In the event of any conflict or inconsistency between this section and the Specifications regarding adhesives, sealant or sealant applications, paints, coatings, flooring, composite wood, ceilings, walls, thermal and acoustic insulation, furniture, and for healthcare and schools, exterior applied products, the requirements set forth in this Section shall prevail.

1.3 RELATED SECTIONS: Include without limitation the following:

A.	Section 01 74 19	CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL
B.	Section 01 81 19	INDOOR AIR QUALITY REQUIREMENTS FOR LEED BUILDINGS
C.	Section 01 91 13	GENERAL COMMISSIONING REQUIREMENTS FOR MEP SYSTEMS
D.	Section 01 91 15	GENERAL COMMISSIONING REQUIREMENTS FOR BUILDING ENCLOSURE

1.4 DEFINITIONS:

A. Refer to Article 2 of the Contract for definition of terms, words and expressions used in the General Conditions not otherwise defined herein.

B. Adhesive: Any substance used to bond one surface to another by attachment. Includes adhesive primers and adhesive bonding primers.

C. Aerosol Adhesive: Any adhesive packaged as an aerosol with a spray mechanism permanently housed in a non-refillable can designed for hand-held application without the need for ancillary equipment.

D. Agrifiber Products: Products derived from recovered agricultural waste fiber from sources such as cereal straw, sugarcane bagasse, sunflower husk, walnut shells, coconut husks and agricultural prunings, processed and mixed with resins to produce panels with characteristics similar to composite wood.

E. Bio-based materials: Composed in whole or in significant part of biological products, renewable agricultural materials or forestry materials, and must meet the Sustainable Agriculture Network's Sustainable Agriculture Standard. Bio-based raw materials must be tested using ASTM Test Method D6866 and be legally harvested, as defined by the exporting and receiving country. Exclude hide products, such as leather and other animal skin material.

F. Building Exterior: A structure's primary and secondary weatherproofing system, including waterproofing membranes and air- and water-resistant barrier materials, and all building elements outside that system.

G. Building Interior: Everything inside a structure's weatherproofing membrane.

H. Carcinogen: A chemical listed as a known, probable, reasonably anticipated, or possible human carcinogen by the International Agency for Research on Cancer (IARC) (Groups 1, 2A, and 2B), the National Toxicology Program (NTP) (Groups 1 and 2), the U.S. Environmental Protection Agency (EPA) Integrated Risk Information System (IRIS) (weight-of-evidence classifications A, B1, B2, and C, carcinogenic, likely to be carcinogenic, and suggestive evidence of carcinogenicity or carcinogen potential), or the Occupational Safety and Health Administration (OSHA).

I. Certified Wood: See Forest Stewardship Council (FSC) Certified Wood.

J. Clear Wood Finish: Clear/semi-transparent coating applied to wood substrates to provide a transparent or translucent solid film.

K. Coating: Liquid, liquefiable or mastic composition that is converted to a solid adherent film after application to a substrate as a thin layer; and is used for decorating, protecting, identifying or to serve some functional purpose such as the filling or concealing of surface irregularities or the modification of light and heat radiation characteristics; and is intended for on-site application to interior or exterior surfaces of buildings. Does not include stains, clear finishes, recycled latex paint, specialty (industrial, marine or automotive) coatings or paint sold in aerosol cans.

L. Composite Wood: Products composed of wood or plant particles or fibers bonded by a synthetic resin or binder to produce panels such as plywood, particleboard, and medium density fiberboard (MDF). Does not include hardboard, structural panels, glued laminated timber, prefabricated wood I-joists or finger-jointed lumber.

M. Cradle-to-Gate Assessment: Analysis of a product's partial life cycle, from resource extraction to the factory gate, before it is transported for distribution and sale.

N. Design Consultant: "Design Consultant" shall mean the entity responsible for providing design services for the Project, including without limitation, preparing the construction documents (drawings and specifications) and providing services in connection with such documents during construction. The entity serving as the "Design Consultant" may be a corporation, firm, partnership, joint venture, individual or combination thereof. Such entity may be either an employee(s) of the City or an entity engaged by the City to provide such services.

O. Enclosure: The exterior plus semi-exterior portions of the building. Exterior consists of the elements of a building that separate conditioned spaces from the outside (i.e., the wall assembly). Semi-exterior consists of the elements of a building that separate conditioned space from unconditioned space or that encloses semi-heated space through which thermal energy may be transferred to or from the exterior or conditioned or unconditioned spaces (e.g., attic, crawl space, basement).

P. Environmental Product Declaration (EPD): A statement that the item meets the environmental requirements of, ISO 14025, 14040 and EN 15804, or ISO 21930 and have at least a cradle-to-gate scope.

Q. Extended Producer Responsibility: A waste management strategy, also known as closed-loop program or product take-back, where the manufacturer's responsibility for a product is extended to the post-consumer stage of the product's life-cycle.

R. Floor Coating: Opaque coating applied to flooring. Excludes industrial maintenance coatings.

S. Forest Stewardship Council (FSC) Certified Wood: Wood-based materials and products certified in accordance with the Forest Stewardship Council's principles and criteria.

T. Hazardous Air Pollutant: Any compound listed by the U.S. EPA in the Clean Air Act Section 112(b)(1) as a hazardous air pollutant.

U. Inherently Non-Emitting Materials: Products that are inherently non-emitting sources of VOCs, including stone, ceramic, powder-coated metals, plated or anodized metals, lass, concrete, clay brick, unfinished solid wood, untreated solid wood. These materials are considered compliant without VOC testing if they do not include integral organic-based surface coatings, binders or sealants.

V. Lacquer: Clear/semi-transparent coating formulated with cellulosic or synthetic resins to dry by evaporation without chemical reaction and provide a solid, protective film.

W. LEED: The Leadership in Energy & Environmental Design rating system developed by the United States Green Building Council (USGBC).

X. Life-Cycle Assessment: An evaluation of the environmental effects of a product from cradle to grave, as defined by ISO 14040-2006 and ISO 14044-2006.

Y. Mutagen: A chemical that meets the criteria for category 1, chemicals known to induce heritable mutations or to be regarding as if they induce heritable mutations in the germ cells of humans, under the Harmonized

System for the Classification of Chemicals Which Cause Mutations in Germ Cells (United Nations Economic Commission for Europe, Globally Harmonized System of Classification and Labeling of Chemicals).

Z. Ozone-Depleting Compounds: A compound with an ozone-depletion potential greater than 0.1 (CFC 11=1) according to the U.S. EPA list of Class I and Class II Ozone-Depleting Substances.

AA. Paint: A pigmented coating. For the purposes of this specification, paint primers are considered to be paints.
   a. Flat Coating or Paint: Has a gloss of less than 15 (using an 85-degree meter) or less than 5 (using a 60-degree meter).
   b. Non-Flat Coating or Paint: Has a gloss of greater than or equal to 15 (using an 85-degree meter) or greater than or equal to 5 (using a 60-degree meter).
   c. Non-Flat High-Gloss Coating or Paint: Has a gloss of greater than or equal to 70 (using a 60-degree meter).
   d. Anti-Corrosive / Rust Preventative Paint: Coating formulated and recommended for use in preventing the corrosion of ferrous metal substrates.

BB. Permanently Installed Building Product: See Product.

CC. Primer: Coating that is formulated and recommended for one or more of the following purposes: to provide a firm bond between the substrate and a subsequent coating; to prevent a subsequent coating from being absorbed into the substrate; to prevent harm to a subsequent coating from materials in the substrate; or to provide a smooth surface for application of a subsequent coating.

DD. Product: An item that arrives on the Project site either as a finished element ready for installation or as a component to another item assembled on-site. The product unit is defined by the functional requirement for use in the Project; this includes the physical components and services needed to serve the intended function of the permanently installed building product. Similar products within a specification shall each contribute as a separate product.

EE. Product-Specific Declaration: Products with a publicly available, critically reviewed life-cycle assessment conforming to ISO 14044 that have at least a cradle-to-gate scope.

FF. Recycled Content: The percentage by weight of constituents that have been recovered or otherwise diverted from the solid waste stream, either during the manufacturing process (pre-consumer) or after consumer use (post-consumer). Recycled content claims for products must conform to the definition in ISO 14021-1999, Environmental Labels and Declarations, Self-Declared Environmental Claims (Type II Environmental Labeling).
   a. Spills and scraps from the original manufacturing process that are combined with other constituents after a minimal amount of reprocessing for use in further production of the same product are not recycled materials.
   b. Discarded materials from one manufacturing process that are used as constituents in another manufacturing process are pre-consumer recycled materials.
   c. "Pre-consumer" may also be referred to as "post-industrial".

GG. Regionally Manufactured Materials: Materials that are manufactured, distributed and purchased within a radius of 100 miles from the Project location. Manufacturing refers to all points of manufacture for an assembly of components.

HH. Regionally Extracted, Harvested, or Recovered Materials: Materials which are extracted, harvested or recovered, manufactured, distributed and purchased within a radius of 100 miles from the Project site.

II. Reproductive Toxin: A chemical listed as a reproductive toxin (including developmental, female, and male toxins) by the State of California under the Safe Drinking Water and Toxic Enforcement Act of 1986 (California Code of Regulations, Title 22, Division 2, Subdivision 1, Chapter 3, Sections 1200, et. Seq.).

JJ. Sanding Sealer: Clear/semi-transparent coating formulated to seal bare wood. Can be abraded to create a smooth surface for subsequent coatings. Does not include sanding sealers that are lacquers (see Clear Wood Finish above).

KK. Sealant: Any material with adhesive properties, formulated primarily to fill, seal, or waterproof gaps or joints between surfaces. Includes sealant primers and caulks.

LL. Shellac: Clear or pigmented coating formulated solely with the resinous secretions of the lac beetle, thinned with alcohol and formulated to dry by evaporation without chemical reaction. Excludes floor applications.

MM. Solar Reflectance Index (SRI): A measure of a material's ability to reflect solar heat, as shown by a small temperature rise. It is defined so that a standard black (reflectance 0.05, emittance 0.90) is equal to 0, and a standard white (reflectance 0.80, emittance of 0.90) is equal to 100.

NN. Stain: Clear semi-transparent/opaque coating formulated to change the color but not conceal the grain pattern or texture of the substrate.

OO. Varnish: Clear/semi-transparent coating, excluding lacquers and shellacs, formulated to dry by chemical reaction on exposure to air. May contain small amounts of pigment.

PP. Volatile Aromatic Compound: Any hydrocarbon compound containing one or more 6-carbone benzene rings, and having an initial boiling point less than or equal to 280 degrees Celsius measured at standard conditions of temperature and pressure.

QQ. Volatile Organic Compound (VOC): Any compound of carbon (excluding carbon monoxide, carbon dioxide, carbonic acid, metallic carbides or carbonates and ammonium carbonate) which vaporizes (becomes a gas) and participates in atmospheric photochemical reactions, as specified in Part 51.00 of Chapter 40 of the U.S. Code of Federal Regulations, at normal room temperatures. For the purposes of this specification, formaldehyde and acetaldehyde are considered to be VOCs.Waterproofing Sealer: A coating that prevents the penetration of water into porous substrates.

1.5 LEED PROVISIONS:

A. Refer to the Addendum for the LEED rating to be achieved for this Project. The provisions to achieve this LEED rating are integrated within the Project construction documents and specifications. Additional LEED requirements are met through aspects of the Project design, including material and equipment selections, which may not be specifically identified as LEED Building requirements. Compliance with the requirements needed to obtain LEED prerequisites and credits will be used as one criterion to evaluate substitution requests.

1.6 LEED BUILDING SUBMITTALS:

A. Scope: LEED Building Submittals are required for all permanently installed materials included in General Construction work. For Plumbing, Mechanical and Electrical work, LEED Building Submittals are only required for field-applied adhesives, sealants, paints and coatings. Voluntary inclusion of system components such as piping, pipe insulation, ducts, conduits, plumbing fixtures, faucets and lamp housings shall be consistently applied to the Project's LEED credits. Submit all required LEED Building Submittals in accordance with Section 01 33 00 SUBMITTAL PROCEDURES.

B. Applicability: The extent of the LEED Building Submittals varies depending on the specification section. Applicable LEED Building Submittals are listed under the "LEED Building Submittals" heading in each specification section. The detailed requirements for the LEED Building Submittals are defined in Sub-Section 1.6 C below.

C. Detailed Requirements: Sub-Sections 1.6 C.1 through 1.6 C.18 below define the information and documents to be submitted for each type of LEED Building Submittal as identified in the LEED Building Submittals heading in each specification section:

1. LEED v4 Material and Resources (MR) Credits Calculator for Building Product Disclosure and Optimization (Disclosure and Optimization Calculator): With each submittal of a product permanently installed in the Project, the Contractor shall be responsible for the completion of the Disclosure and Optimization Calculator, which can be found on USGBC's website. The Contractor shall maintain an updated Disclosure and Optimization Calculator for all applicable products throughout the Project duration and submit the updated calculator on a monthly basis.

   a. The Disclosure and Optimization Calculator shall record the information outlined in Items b.-c. below for all permanently installed products, the information outlined in Item d. below for all permanently installed concrete mixes, and the information outlined in Items e.-i. below for all permanently installed products that have the content, disclosure or optimization characteristics described herein:
   b. Cost breakdowns for the materials included in the contractor or sub-contractor's scope of work. Cost reporting shall include itemized material costs (excluding the contractor's labor, equipment, overhead and profit).
   c. The percentages (by weight) of post-consumer and/or post-industrial recycled content in the supplied product(s).
      1) For each product with recycled content, also indicate the total recycled content value (1/2 x pre-consumer percentage x product value + 1 x post-consumer percentage x product value = total recycled content value).
      2) See additional requirements for concrete in section 1.6.C.1.d below.
   d. The percentage (by weight), relative to the total weight of cementitious materials, of supplementary cementitious materials or pozzolans such as fly ash used in each concrete mix used in the Project.
      1) For each concrete mix, submit a complete breakdown of all components, by weight and by cost.
   e. Identification (Yes/No) of materials manufactured, distributed and purchased within 100 miles of the Project site AND containing raw materials harvested or extracted within 100 miles of the Project site, if used in the Project, as well as the following information:
      1) Indicate the percentage by weight, relative to the total weight of the product that meets these criteria.
      2) Indicate the point of harvest/extraction/recovery of regional raw materials, the point of final assembly of regional manufactured products, and the distance from each point to the Project site.
   f. The percentage (by cost) of "Forest Stewardship Council (FSC) Certified" wood products, if used in the Project.
      1) Record all new wood products, indicating which are FSC-certified. Do not record reclaimed, salvaged, or recycled FSC-certified wood products.
      2) Reclaimed, salvaged, or recycled FSC-certified wood may be recorded as post-consumer recycled content.
   g. The number or percentage of products with Environmental Product Declarations (EPD), with fractional or multiplied values as indicated below. If a product used in the Project has an EPD Declaration, submit one of the following:
      1) EPD:

i. Product-Specific Declaration: Valued as one quarter (1/4) of a product
ii. Industry-Wide (Generic) EPD: Valued as one half (1/2) of a product
iii. Product-Specific Type III EPD: Valued as one whole product

2) Documentation of third-party certification of impact reduction below industry average for at least three of the following categories, valued at 100%:
i. Global warming potential (greenhouse gases), in CO_2e;
ii. Depletion of the stratospheric ozone layer, in kg CFC-11;
iii. Acidification of land and water sources, in moles H+ or kg SO_2;
iv. Eutrophication, in kg nitrogen or kg phosphate;
v. Formation of tropospheric ozone, in kg NOx or kg ethene; and depletion of nonrenewable energy resources, in MJ.

3) For 1) and 2) above, if a product is also sourced (extracted, manufactured, purchased) within 100 miles of the site, it is valued as two times the whole product.

4) For 1) and 2) above, structure and enclosure materials may not constitute more than 30% of the value of compliant building products.

h. The number or percentage of products for which Sourcing of Raw Materials has been documented, with fractional or multiplied values as indicated below. If a product used in the Project has documented Sourcing of Raw Materials, submit one of the following:
1) Corporate sustainability report (CSR). Submit one of the following:
i. Manufacturer's self-declared report: valued as half of a product
ii. Third-party verified CSR which include environmental impacts of extraction operations and activities associated with the manufacturer's product and the product's supply chain: valued as one whole product:
1. Global Reporting Initiative (GRI) Sustainability Report
2. Organisation for Economic Co-operation and Development (OECD) Guidelines for Multinational Enterprises
3. U.N. Global Compact: Communication of Progress
4. ISO 26000: 2010 Guidance on Social Responsibility
5. Other USGBC approved programs meeting the CSR criteria

2) Documentation of at least one of the responsible extraction criteria below:
i. Extended producer responsibility program, valued as half of a product
ii. Bio-based materials, valued as one whole product
iii. Certified Wood: Wood-based materials include all materials made from wood, including engineered wood products and wood-based panel products, valued as one whole product
iv. Material Reuse: Materials may be salvaged, refurbished, or reused, valued as one whole product.
v. Recycled content. The sum of post-consumer recycled content plus one-half the pre-consumer recycled content, based on cost, valued as one whole product.
vi. Other USGBC approved programs meeting leadership extraction criteria

3) For 1) and 2) above, if a product is also sourced (extracted, manufactured, purchased) within 100 miles of the site: valued as two times the whole product.

4) For 1) and 2) above, structure and enclosure materials may not constitute more than 30% of the value of compliant building products. Products meeting multiple criteria may only be counted once.

i. The number or percentage of products for which Material Ingredients have been disclosed, with fractional or multiplied values as indicated below. If a product used in the Project discloses its Material Ingredients, submit one of the following:

1) Chemical inventory of the product to at least 0.1% (1000 ppm), documented by one of the following:
   i. Manufacturer Inventory
   ii. Health Product Declarations (HPDs)
   iii. Cradle to Cradle (C2C) certifications
   iv. Declare product labels
   v. ANSI/BIFMA e3 Furniture Sustainability Standard (Furniture may be included, providing it is included consistently in all MR Credits.)

2) Documentation of compliance with one of the following material ingredient optimization criteria programs:
   i. GreenScreen benchmarks
   ii. Cradle to Cradle certifications
   iii. REACH optimizations
   iv. Other USGBC approved programs meeting building product optimization criteria

3) Documentation that the product is sourced from a manufacturer that meets all of the below supply chain optimization criteria:
   i. Manufacturer engages in validated and robust safety, health, hazard and risk programs which at a minimum document at least 99% (by weight) of the ingredients used to make the building product or building material
   ii. Manufacturer provides independent third party verification of the following conditions for their supply chain, at a minimum:
      1. Processes are in place to communicate and transparently prioritize chemical ingredients along the supply chain according to available hazard, exposure and use information to identify those that require more detailed evaluation
      2. Processes are in place to identify, document, and communicate information on health, safety and environmental characteristics of chemical ingredients
      3. Processes are in place to implement measures to manage the health, safety and environmental hazard and risk of chemical ingredients
      4. Processes are in place to optimize health, safety and environmental impacts when designing and improving chemical ingredients
      5. Processes are in place to communicate, receive and evaluate chemical ingredient safety and stewardship information along the supply chain
      6. Safety and stewardship information about the chemical ingredients is publicly available from all points along the supply chain

4) For 2) and 3) above, if a product is also sourced (extracted, manufactured, purchased) within 100 miles of the site: valued as two times the whole product. Products compliant with both 2) and 3) may only be counted once.

5) For 1), 2), and 3) above, structure and enclosure materials may not constitute more than 30% of the value of compliant building products.

2. LEED v4 Indoor Environmental Quality Credit Low-Emitting Materials Calculator (EQ Calculator). With each relevant product submittal, the Contractor shall be responsible for the completion of the EQ Calculator, which can be found on USGBC's website. The Contractor shall maintain an updated EQ Calculator throughout the Project duration for all applicable products and submit the updated calculator on a monthly basis.

a. The EQ Calculator shall record information for all relevant products as outlined below. Include the following documentation. Detailed requirements are listed in b. – j. below.
   1) VOC content of all field-applied interior adhesives, sealants, paints, and coatings, listed in grams/liter or lbs./gallon, less water.
   2) General Emissions Evaluation for more than 90 percent of all field-applied interior paints, coatings, adhesives, and sealants, by volume, and for 100 percent of all flooring, ceilings, walls, and thermal and acoustic insulation.
   3) Composite Wood Evaluation for all composite wood not covered by other categories.
   4) Furniture Evaluation for 90% of all furniture, by cost.
   5) For schools/healthcare only: Exterior-Applied Products Evaluation for 90% of all exterior applied materials, measured by volume. All batt insulation products shall contain no added formaldehyde.

b. VOC REQUIREMENTS, GENERAL: The following materials must meet the listed compliance requirements for emissions and content standards, for all applicable categories. All products shall comply with each applicable threshold requirement. Refer to LEED BD+C Reference Guide, EQ Credit Low-Emitting Materials for additional guidance.

   1) General Emissions Requirements: Products must demonstrate they have been tested and determined compliant in accordance with California Department of Public Health (CDPH), Standard Method v1.1-2010, using the applicable exposure scenario, and stating the range of total VOCs (TVOC) after 14 days measured as specified in the CDPH Standard Method v1.1 as follows:
      i. 0.5mg/m3 or less;
      ii. between 0.5 and 5.0 mg/m3; or,
      iii. 0.50 mg/m3 or more
   2) No product shall contain any ingredients that are carcinogens, mutagens, reproductive toxins, persistent bioacculmulative compounds, hazardous air pollutants, or ozone-depleting compounds. An exception shall be made for titanium dioxide and, for products that are pre-tinted by the manufacturer, carbon black, which shall be less than or equal to 1% by weight of the product.
   3) No product shall contain the following:
      i. methylene chloride
      ii. 1,1,1-trichloroethane
      iii. benzene
      iv. toluene
      v. ethylbenzene
      vi. vinyl chloride
      vii. naphthalene
      viii. 1,2-dichlorobenzene
      ix. di (2-ethylhexyl) phthalate
      x. butyl benzyl phthalate
      xi. di-n-butyl phthalate
      xii. di-n-octyl phthalate
      xiii. diethyl phthalate
      xiv. dimethyl phthalate
      xv. isophorone
      xvi. antimony
      xvii. cadmium
      xviii. hexavalent chromium
      xix. lead
      xx. mercury
      xxi. formaldehyde

xxii. methyl ethyl ketone
xxiii. methyl isobutyl ketone
xxiv. acrolein
xxv. acrylonitrile

4) No product shall contain more than 1.0% by weight of sum total of volatile aromatic compounds.

c. VOC REQUIREMENTS FOR INTERIOR ADHESIVES AND SEALANTS:

1) For field applications that are inside the weatherproofing system, use adhesives and sealants that comply with the following limits for VOC content when calculated according to South Coast Air Quality Management District (SCAQMD) Rule #1168 requirements in effect on July 1, 2005, and rule amendment date January 7, 2005:

	Allowable VOC Content (g/L):
Architectural Applications:	
Indoor carpet adhesives	50
Carpet pad adhesives	50
Outdoor carpet adhesives	150
Wood flooring adhesives	100
Rubber floor adhesives	60
Subfloor adhesives	50
Ceramic tile adhesives	65
VCT and asphalt tile adhesives	50
Dry wall and panel adhesives	50
Cove base adhesives	50
Multipurpose construction adhesives	70
Structural glazing adhesives	100
Single ply roof membrane adhesives	250
Specialty Applications:	
PVC welding	510
CPVC welding	490
ABS welding	325
Plastic cement welding	250
Adhesive primer for plastic	550
Computer diskette manufacturing	350
Contact adhesive	80
Special purpose contact adhesive	250
Tire retread	100
Adhesive primer for traffic marking tape	150
Structural wood member adhesive	140
Sheet applied rubber lining operations specialty	850
Top and Trim adhesive	250
Substrate Specific Applications:	
Metal to metal substrate specific adhesives	30
Plastic foam substrate specific adhesives	50
Porous material (except wood) substrate specific adhesives	50
Wood substrate specific adhesives	30
Fiberglass substrate specific adhesives	80
Sealants:	
Architectural sealant	250

Marine deck sealant	760
Nonmember roof sealant	300
Roadway sealant	250
Single-ply roof membrane sealant	450
Other sealant	420
Sealant Primers:	
Architectural non-porous sealant primer	250
Architectural porous sealant primer	775
Modified bituminous sealant primer	500
Marine deck sealant primer	760
Other sealant primer	750
Other	
Other adhesives, adhesive bonding primers, adhesive primers or any other primers	250

2) For field applications that are inside the weatherproofing system, a minimum of 90 percent of adhesives and sealants, by volume, shall comply with the requirements of the CDPH "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

d. VOC REQUIREMENTS FOR INTERIOR PAINTS AND COATINGS:

1) For field applications that are inside the weatherproofing system, use paints and coatings that comply with the following limits for VOC content when calculated according to the California Air Resources Board (CARB) 2007, Suggested Control Measure (SCM) for Architectural Coatings, or the SCAQMD Rule #1113, effective June 3, 2011.

Product Type:	Allowable VOC Content (g/L):
Bond Breaker	350
Clear wood finishes - Varnish	275
Clear wood finishes – Sanding Sealer	275
Clear wood finishes - Lacquer	275
Colorant – Architectural Coatings, excluding IM coatings	50
Colorant – Solvent Based IM	600
Colorant - Waterborne IM	50
Concrete – Curing compounds	100
Concrete – Curing compounds for roadways & bridges	350
Concrete surface retarder	50
Driveway Sealer	50
Dry-fog coatings	50
Faux finishing coatings - Clear topcoat	100
Faux finishing coatings – Decorative Coatings	350
Faux finishing coatings - Glazes	350
Faux finishing coatings - Japan	350
Faux finishing coatings – Trowel applied coatings	50
Fire-proof coatings	150
Flats	50
Floor coatings	50

Form release compounds	100
Graphic arts (sign) coatings	150
Industrial maintenance coatings	100
Industrial maintenance coatings – High temperature IM coatings	420
Industrial maintenance coatings – Non-sacrificial anti-graffiti coatings	100
Industrial maintenance coatings – Zinc rich IM primers	100
Magnesite cement coatings	450
Mastic coatings	100
Metallic pigmented coatings	150
Multi-color coatings	250
Non-flat coatings	50
Pre-treatment wash primers	420
Primers, sealers and undercoaters	100
Reactive penetrating sealers	350
Recycled coatings	250
Roof coatings	50
Roof coatings, aluminum	100
Roof primers, bituminous	350
Rust preventative coatings	100
Stone consolidant	450
Sacrificial anti-graffiti coatings	50
Shellac- Clear	730
Shellac – Pigmented	550
Specialty primers	100
Stains	100
Stains, interior	250
Swimming pool coatings – repair	340
Swimming pool coatings – other	340
Traffic Coatings	100
Waterproofing sealers	100
Waterproofing concrete/masonry sealers	100
Wood preservatives	350
Low solids coatings	120

2) For field applications that are inside the weatherproofing system, 90 percent of paints and coatings shall comply with the requirements of the CDPH's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

e. LOW-EMITTING MATERIALS, FLOORING: Flooring shall comply with the requirements of the CDPH's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

f. LOW-EMITTING MATERIALS, COMPOSITE WOOD: Composite wood, agrifiber products, and adhesives shall be made using ultra-low-emitting formaldehyde (ULEF) resins as defined in the CARB's "Airborne Toxic Control Measure to Reduce Formaldehyde Emissions from Composite Wood Products" or shall be made with no added formaldehyde.

g. LOW-EMITTING MATERIALS, CEILINGS, WALLS, THERMAL, AND ACOUSTIC INSULATION: Ceilings, walls, and thermal and acoustic insulation shall comply with the

requirements of the CDPH's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

h. LOW-EMITTING MATERIALS, FURNITURE: At least 90 percent of furniture, measured by cost, shall be tested in accordance with ANSI/BIFMA Standard Method M7.1-2011; comply with ANSI/BIFMA e3-2011 Furniture Sustainability Standard, Sections 7.6.1 and 7.6.2, using either the concentration modeling approach or the emissions factor approach; and model the test results using the open plan, private office, or seating scenario in ANSI/BIFMA M7.1, as appropriate.

i. LOW-EMITTING MATERIALS, EXTERIOR APPLIED MATERIALS (HEALTHCARE/ SCHOOLS ONLY): At least 90 percent of exterior applied materials, measured by volume, shall comply with the requirements of the CDPH's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

1) The following materials are prohibited and do not count toward total percentage compliance:

a) Hot-mopped asphalt for roofing.

b) Coal tar sealants for parking lots and other paved surfaces.

j. LOW-EMITTING MATERIALS, ADDITIONAL LOW-EMITTING REQUIREMENTS: If the applicable regulation requires subtraction of exempt compounds, any content of intentionally added exempt compounds larger than 1% weight by mass (total exempt compounds) must be disclosed.

1) If a product cannot reasonably be tested as specified above, testing of VOC content must comply with ASTM D2369-10; ISO 11890, part 1; ASTM D6886-03; or ISO 11890-2.

2) Methylene chloride and perchloroethylene may not be intentionally added in adhesives, sealants, paints or coatings.

3. BACK-UP DOCUMENTATION: For each material listed in the Disclosure and Optimization Calculator or the EQ Calculator, provide and submit in accordance with Section 01 33 00 SUBMITTAL PROCEDURES, including but not limited to the documentation to certify the material's LEED Building attributes, as applicable:

a. RECYCLED CONTENT: Submit published product literature or letter of certification on the manufacturer's letterhead certifying the amounts of post-consumer and/or post-industrial content.

b. REGIONAL SOURCING (WITHIN 100 MILES): Submit published product literature or letter of certification on the manufacturer's letterhead indicating the city/state where the manufacturing plant is located, where each of the raw materials in the product were extracted, harvested or recovered, manufactured, distributed and the distance in miles from the Project site.

1) If only some of the raw materials for a particular product or assembly originate within 100 miles of the Project site, provide the percentage (by weight) that these materials comprise in the complete product.

c. BUILDING PRODUCT DISCLOSURE AND OPTIMIZATION: Submit published third-party or manufacturer's product literature or letter of certification, on the third-party or manufacturer's letterhead, certifying the documented disclosure and optimization information.

d. VOC EMISSIONS AND CONTENT: Submit Material Safety Data Sheets (MSDS), for all applicable products. Applicable products include, but are not limited to adhesives, sealants, carpets, paints and coatings, flooring, composite wood, ceilings, walls, thermal and acoustic insulation, furniture, and for healthcare and schools, exterior applied products. MSDS shall indicate the VOC emissions and content of products submitted. (If an MSDS does not include a product's VOC emissions and content, then product data sheets, manufacturer literature, or

a letter of certification from the manufacturer shall be submitted in addition to the MSDS to indicate the VOC emissions and content). Submit product third-party certificates and test reports, stating the testing methodology and the model, to include units that are consistent with those required. For wet-applied products, the manufacturer's documentation must state each product's classification and application according to the referenced standard's definition.

4. PRODUCT CUT SHEETS: Submit product cut sheets with the Contractor's or sub-contractor's stamp, confirming that the submitted products are the products installed in the Project.

5. FSC-CERTIFIED WOOD: If FSC-Certified Wood is used in the Project, submit:
   a. Copies of vendor's invoices itemizing all new wood purchases, showing the cost for each line item.
   b. For FSC-certified products, the vendor invoice shall list product's FSC content percent and its Chain-of-Custody (CoC) certification number.
   c. For FSC-certified products, submit the product and producer's CoC certificates.
   d. For FSC-certified products modified on-site, submit on-site installer's CoC certification.
   e. For assemblies, submit the percentage (by cost and by weight) of the assembly that is FSC-certified wood and published product literature or letter from the manufacturer (on the manufacturer's letterhead) verifying the percentage that is FSC-certified wood.

6. HIGH ALBEDO PAVING AND WALKWAY MATERIALS: For paving and walkway materials made from concrete or brick, submit published product literature or letter from the manufacturer (on the manufacturer's letterhead) verifying a minimum 3-year aged Solar Reflectance (SR) value of 0.28. If 3-year aged value information is not available, submit published product literature or letter verifying an initial SR value of at least 0.33 at installation.

7. HIGH ALBEDO ROOFING MATERIALS: For exposed roofing membranes, pavers, and ballast products, submit published product literature or letter from the manufacturer (on the manufacturer's letterhead) verifying the following minimum Solar Reflectance Index (SRI) values, calculated according to ASTM E 1980. Reflectance shall be measured according to ASTM E 903, ASTM E 1918, or ASTM C 1549. Emittance shall be measured according to ASTM E 408 or ASTM C 1371. Vegetated roof surfaces are exempt from the SRI criteria.

   a. 82 for initial SRI, or 64 for 3-year aged SRI for low-sloped roofing applications (slope ≤ 2:12)
   b. 39 for initial SRI or 32 for 3-year aged SRI for steep-sloped roofing applications (slope > 2:12)

8. LOW MERCURY LAMPS: For all fluorescent, compact fluorescent and HID lamps installed in the Project, submit the total number of each lamp type and submit published product literature or letter from the manufacturer (on the manufacturer's letterhead) verifying the following information. Preheat, T-9, T-10 and T-12 fluorescents or mercury vapor high-intensity discharge (HID) lamps shall not be installed in the Project. For healthcare projects only, probe-start metal halide HID lamps shall not be installed in any interior spaces.

   a. The mercury content or content range per lamp in milligrams or picograms, meeting the following criteria;

Lamp	Maximum Mercury Content (milligram)
T-8 fluorescent, eight-foot	10 mg
T-8 fluorescent, four-foot	3.5 mg
T-8 fluorescent, U-bent	6 mg
T-5 fluorescent, linear	2.5 mg
T-5 fluorescent, circular	9 mg
Compact fluorescent, nonintegral ballast	3.5 mg
Compact fluorescent, integral ballast	3.5 mg, ENERGY STAR qualified
High-pressure sodium, up to 400 watts	10 mg
High-pressure sodium, above 400 watts	32 mg

b. The design light output per lamp (light at 40% of a lamp's useful life) in lumens; and
c. The rated average life of the lamp in hours.

9. EXIT SIGNS: Illuminated exit signs shall not contain mercury, and shall use less than 5 watts of electricity.

10. CONCRETE: Submit concrete mix design for each mix, designated by a distinct identifying code or number and signed by a Professional Engineer licensed in the state of New York.

11. INTERIOR LIGHTING FIXTURES: For each lighting fixture type installed within the building's weather barrier, submit manufacturer's cut sheets indicating the following:

    a. Fixture power in watts.
    b. Initial lamp lumens.
    c. Photometric distribution data.
    d. Dimming capability, in range of percentages.

12. EXTERIOR LIGHTING FIXTURES: For each lighting fixture type installed on site, submit manufacturer's cut sheets indicating the following:

    a. Fixture power in watts.
    b. Initial lamp lumens.
    c. Photometric distribution data.
    d. Range of field adjustability, if any.
    e. Warranty of suitability for exterior use.

13. ALTERNATIVE TRANSPORTATION: Submit manufacturer's cut sheets and/or shop drawings for the following items installed on site:

    a. Bike racks, including total number of bicycle slots provided.
    b. Signage indicating parking spaces reserved for electric or low-emitting vehicles and for carpools/vanpools, including total number of signs.

14. WATER CONSERVING FIXTURES: For all water consuming plumbing fixtures and fittings, submit manufacturer's cut sheets showing maximum flow rates and/or flush rates.

15. ENERGY SAVING APPLIANCES: Submit manufacturer's cut sheets and published product literature or letter from the manufacturer (on the manufacturer's letterhead) verifying the product's rating under the U.S. EPA/DOE Energy Star program, for all of the following:

    a. Appliances (i.e., refrigerators, dishwashers, microwave ovens, televisions, clothes washers, clothes dryers, chilled water dispensers).
    b. Office equipment (i.e., copy machines, fax machines, plotters/printers, scanners, binding and publishing equipment).
    c. Electronics (i.e., servers, desktop computers, computer monitor displays, laptop computers, network equipment).
    d. Commercial food service equipment.

16. GLAZING: For glazing in any windows, doors, storefront and window wall systems, curtainwall systems, skylights, and partitions, submit manufacturer's cut sheets indicating the following:

    a. Glazed area.
    b. Visible light transmittance.
    c. Solar heat gain coefficient.
    d. Fenestration assembly u-factor.

17. VENTILATION: Submit manufacturer's cut sheets for the following:

    a. Carbon dioxide monitoring systems, if any, installed to measure outside air delivery.

b. Air filters: for detailed requirements refer to Section 01 81 19 INDOOR AIR QUALITY REQUIREMENTS FOR LEED BUILDINGS.

18. REFRIGERATION: For all refrigeration equipment, submit manufacturer's cut sheets indicating the following:

a. Equipment type.
b. Equipment life. Default values specified by the 2007 ASHRAE Applications Handbook will be used unless otherwise demonstrated by the manufacturer's guarantee and an equivalent long-term service contract.
c. Refrigerant type.
d. Refrigerant charge in pounds of refrigerant per ton of gross cooling capacity.
e. Tested refrigerant leakage rate, in percent per year. A default rate of 2% will be used unless otherwise demonstrated by test data.
f. Tested end-of-life refrigerant loss, in percent. A default rate of 10% will be used unless otherwise demonstrated by test data.

1.7 LEED BUILDING SUBMITTAL REQUIREMENTS:

A. The LEED Building Submittal information shall be assembled into one package per contract specification section(s) (or per subcontractor), and submitted in accordance with Section 01 33 00 SUBMITTAL PROCEDURES. Incomplete or inaccurate LEED Building Submittals may be used as the basis for the rejection of products or assemblies.

B. All final LEED Building Submittal information with back-up documentation shall be submitted within two (2) months of the Project's substantial completion. If in the Project's LEED review, the USGBC or their third party reviewer requires additional documentation as it relates to the LEED Building Submittals, the Contractor shall provide the requested documentation within two (2) weeks.

1.8 LEED ACTION PLANS:

A. Construction Waste Management Plan- Refer to Section 01 74 19 CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL for detailed requirements.

B. Construction IAQ Management Plan- Refer to Section 01 81 19 INDOOR AIR QUALITY REQUIREMENTS FOR LEED BUILDINGS for detailed requirements.

C. Erosion and Sedimentation Control (ESC) Plan:
1. The Plan shall be in accordance with the New York State Department of Environmental Conservation (NYSDEC)'s New York State Standards and Specifications for Erosion and Sediment Control (Blue Book) or the 2012 EPA Construction General Permit, whichever is more stringent.
2. The Plan shall be submitted in accordance with Section 01 33 00 SUBMITTAL PROCEDURES.
3. Detailed requirements: ESC Plan
   a. Include the Stormwater Pollution Prevention Plan, if required.
   b. Identify the party responsible for Plan monitoring and documentation. The party must be regularly on site.
   c. Describe all site work that will be implemented on the Project and include timing of implementation.
   d. Submit site plan with location of ESC measures, including, but not limited to, stormwater quantity controls, stormwater quality controls, stabilized construction entrances, washdown areas, inlet/catch basin protection and perimeter controls.

e. Establish and clearly delineate construction buffer zones to avoid soil compaction and other construction damage to greenfields.
f. Describe the inspection and maintenance protocols of the ESC measures. Submit a construction schedule indicating weekly site review.
g. Describe reporting and documentation measures.

4. Detailed requirements: ESC Tracking Log
   a. Note date of major rain events, describe damage, describe any repairs or maintenance of specific control measures performed, and note responsible party.
   b. Note date and findings of weekly site review, describe any repairs or maintenance performed, and note responsible party. Submit date-stamped photographs, inspection reports or other recording processes.
   c. Submit monthly.
5. Implementation
   a. Before Demolition and/or Construction begins, the Contractor shall implement the ESC Plan, coordinate the Plan with all affected trades, and designate one individual as the Erosion and Sedimentation Control Representative, who will be responsible for communicating the progress of the Plan with the Commissioner monthly, and for assembling the required LEED documentation.
   b. The Contractor shall be responsible for the provision, maintenance, and repair of all ESC measures. Any problems identified in site inspections shall be resolved in a timely manner.
   c. Demonstration. The Contractor shall provide on-site instruction of proper construction practices required to prevent erosion and sedimentation.
   d. All sub-contractors shall promptly notify the ESC Representative if damage to an ESC measure is observed.
   e. Meetings. Urgent or ongoing ESC issues shall be discussed at weekly on-site job meetings.
6. All projects, including zero lot line buildings and projects that cause minimal or even no exterior site disturbance, must have ESC Plan that meets requirements.
7. Contractor shall save such original documents for the life of the Project plus seven (7) years.

1.9 QUALITY ASSURANCE:

A. The Contractor shall implement all LEED Action Plans, coordinate the Plans and LEED Building Submittals with all affected trades, and designate one individual as the Sustainable Construction Representative at no additional cost to the City of New York, who will be responsible for communicating the progress of LEED activities with the Commissioner monthly, and for assembling the required LEED documentation. The Contractor shall facilitate measurements taken by authorized parties on site for LEED compliance verification purposes.

B. Responsibilities of Contractor's Subcontractors: The Contractor shall be responsible for his/her subcontractors complying with the LEED Action Plans and for providing required LEED documentation as required for the Project.

C. Distribution and Compilation: The Contractor shall be responsible for distributing the LEED v4 MR Credits Calculator for Building Product Disclosure and Optimization, the LEED v4 EQ Credit Low-Emitting Materials Calculator, and any other forms or templates required for the subcontractors to record LEED documentation. The Contractor shall also be responsible for collecting and compiling Building Product Disclosure and Optimization and Low-Emitting Materials information into packages as described in Section 01 33 00 SUBMITTAL PROCEDURES.

D. Meetings: Sustainable design and construction issues shall be discussed at the following meetings in accordance with Section 01 31 00 PROJECT MANAGEMENT AND COORDINATION:
   1. Demolition kick-off meeting
   2. Construction kick-off meeting
   3. Construction kick-off meeting for LEED (independent meeting)
   4. Weekly job-site progress and coordination meetings

5. Closeout meeting

1.10 REFERENCES:

A. New York State Standards and Specifications for Erosion and Sediment Control, amended November 2016: http://www.dec.ny.gov/docs/water_pdf/2016nysstanec.pdf

B. 2012 EPA Construction General Permit: https://www.epa.gov/npdes/epas-2012-construction-general-permit-cgp-and-related-documents

C. South Coast Air Quality Management District (SCAQMD), Rule 1168: www.aqmd.gov

D. South Coast Air Quality Management District (SCAQMD), Rule 1113: www.aqmd.gov

E. CDPH Standard Method v1.1-2010: www.cal-iaq.org

F. ISO 17025: www.iso.org

G. ISO Guide 65: www.iso.org

H. CARB 93120 ATCM: arb.ca.gov/toxics/compwood/compwood.htm

I. ANSI/BIFMA M7.1 Standard Test Method for Determining VOC Emissions from Office Furniture Systems, Components and Seating: bifma.org

J. ANSI/BIFMA e3-2011 Furniture Sustainability Standard: bifma.org

K. ISO 14021–1999, Environmental labels and declarations—Self Declared Claims (Type II Environmental Labeling): iso.org

L. ISO 14025–2006, Environmental labels and declarations (Type III Environmental

M. Declarations—Principles and Procedures): iso.org

N. ISO 14040–2006, Environmental management, Life cycle assessment principles, and frameworks: iso.org

O. ISO 14044–2006, Environmental management, Life cycle assessment requirements, and guidelines: iso.org

P. International Standard ISO 21930–2007 Sustainability in building construction—Environmental declaration of building products: iso.org

Q. Federal Trade Commission, Guides for the Use of Environmental Marketing Claims, 16 CFR 260.7 (e): ftc.gov/bcp/grnrule/guides980427.htm

R. Global Reporting Initiative (GRI) Sustainability Report: globalreporting.org/

S. Organisation for Economic Co-operation and Development (OECD) Guidelines for Multinational

T. Enterprises: oecd.org/daf/internationalinvestment/guidelinesformultinationalenterprises/

U. U.N. Global Compact, Communication of Progress: unglobalcompact.org/cop/

V. ISO 26000—2010 Guidance on Social Responsibility: iso.org/iso/home/standards/iso26000.htm

W. Forest Stewardship Council: ic.fsc.org

X. Sustainable Agriculture Network: sanstandards.org

Y. The Rainforest Alliance: rainforest-alliance.org/

Z. ASTM Test Method D6866: astm.org/Standards/D6866.htm

AA. Chemical Abstracts Service: cas.org/

BB. Health Product Declaration: hpdcollaborative.org/

CC. Cradle-to-Cradle CertifiedCM Product Standard: c2ccertified.org/product_certification

DD. Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH): echa.europa.eu/support/guidance-on-reach-and-clp-implementation

EE. GreenScreen: https://www.greenscreenchemicals.org/method/greenscreen-list-translator

PART II – PRODUCTS (Not Used)

PART III – EXECUTION (Not Used)

END OF SECTION 01 81 13.04

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SECTION 01 81 13.13
VOLATILE ORGANIC COMPOUND (VOC) LIMITS FOR ADHESIVES, SEALANTS, PAINTS AND COATINGS FOR LEED v3 BUILDINGS

REFER TO THE ADDENDUM FOR APPLICABILITY OF THIS SECTION 01 81 13.13

PART I – GENERAL

1.1 RELATED DOCUMENTS:

A. The following documents apply to all required work for the Project: (1) the Contract Drawings, (2) the Specifications, (3) the General Conditions, (4) the Addendum, and (5) the Contract [City of New York Standard Construction Contract].

1.2 SUMMARY:

A. This Section includes requirements for volatile organic compound (VOC) content in adhesives, sealants, paints and coatings used for the project.

B. All sections in the Project Specifications with adhesives, sealant or sealant primer applications, paints and coatings shall follow all requirements of this section. In the event of any conflict or inconsistency between this section and the Specifications regarding adhesives, sealant or sealant applications, paints and coatings, the requirements set forth in this Section shall prevail.

C. This Section includes:

1. General Requirements
2. References
3. VOC Requirements for Interior Adhesives
4. VOC Requirements for Interior Sealants
5. VOC requirements for Interior Paints
6. VOC requirements for Interior Coatings
7. Submittals

1.3 RELATED SECTIONS: Include without limitation the following:

A. Section 01 10 00 SUMMARY
B. Section 01 31 00 PROJECT MANAGEMENT AND COORDINATION
C. Section 01 32 00 CONSTRUCTION PROGRESS DOCUMENTATION
D. Section 01 33 00 SUBMITTAL PROCEDURES
E. Section 01 73 00 EXECUTION
F. Section 01 77 00 CLOSEOUT PROCEDURES
G. Section 01 78 39 CONTRACT RECORD DOCUMENTS
H. Section 01 81 13 SUSTAINABLE DESIGN REQUIREMENTS FOR LEED v3 BUILDINGS
I. Section 01 81 19 INDOOR AIR QUALITY FOR LEED BUILDINGS

1.4 DEFINITIONS:

A. ADHESIVE: Any substance used to bond one surface to another by attachment. Includes adhesive primers and adhesive bonding primers.
   1. Aerosol Adhesive: Any adhesive packaged as an aerosol with a spray mechanism permanently housed in a non-refillable can designed for hand-held application without the need for ancillary equipment.

B. CARCINOGEN: A chemical listed as a known, probable, reasonably anticipated, or possible human

carcinogen by the International Agency for Research on Cancer (IARC) (Groups 1, 2A, and 2B), the National Toxicology Program (NTP) (Groups 1 and 2), the U.S. Environmental Protection Agency (EPA) Integrated Risk Information System (IRIS) (weight-of-evidence classifications A, B1, B2, and C, carcinogenic, likely to be carcinogenic, and suggestive evidence of carcinogenicity or carcinogen potential), or the Occupational Safety and Health Administration (OSHA).

C. CLEAR WOOD FINISH: Clear/semi-transparent coating applied to wood substrates to provide a transparent or translucent solid film.
   1. Lacquer: Clear/semi-transparent coating formulated with cellulosic or synthetic resins to dry by evaporation without chemical reaction and provide a solid, protective film.
   2. Sanding Sealer: A sanding sealer that also meets the definition of a lacquer.
   3. Varnish: Clear/semi-transparent coating, excluding lacquers and shellacs, formulated to dry by chemical reaction on exposure to air. May contain small amounts of pigment.

D. COATING: Liquid, liquefiable, or mastic composition that is converted to a solid adherent film after application to a substrate as a thin layer; and is used for decorating, protecting, identifying or to serve some functional purpose such as the filling or concealing of surface irregularities or the modification of light and heat radiation characteristics; and is intended for on-site application to interior or exterior surfaces of buildings. Does not include stains, clear finishes, recycled latex paint, specialty (industrial, marine or automotive) coatings or paint sold in aerosol cans.

E. FLOOR COATING: Opaque coating applied to flooring. Excludes industrial maintenance coatings.

F. HAZARDOUS AIR POLLUTANT: Any compound listed by the U.S. EPA in the Clean Air Act Section 112(b)(1) as a hazardous air pollutant.

G. MUTAGEN: A chemical that meets the criteria for category 1, chemicals known to induce heritable mutations or to be regarding as if they induce heritable mutations in the germ cells of humans, under the Harmonized System for the Classification of Chemicals Which Cause Mutations in Germ Cells (United Nations Economic Commission for Europe, Globally Harmonized System of Classification and Labeling of Chemicals).

H. OZONE-DEPLETING COMPOUNDS: A compound with an ozone-depletion potential greater than 0.1 (CFC 11=1) according to the U.S. EPA list of Class I and Class II Ozone-Depleting Substances.

I. PAINT: A pigmented coating. For the purposes of this specification, paint primers are considered to be paints.
   1. Flat Coating or Paint: Has a gloss of less than 15 (using an 85-degree meter) or less than 5 (using a 60-degree meter).
   2. Non-Flat Coating or Paint: Has a gloss of greater than or equal to 15 (using an 85-degree meter) or greater than or equal to 5 (using a 60-degree meter).
   3. Non-Flat High-Gloss Coating or Paint: Has a gloss of greater than or equal to 70 (using a 60-degree meter).
   4. Anti-Corrosive / Rust Preventative Paint: Coating formulated and recommended for use in preventing the corrosion of ferrous metal substrates.

J. PRIMER: Coating that is formulated and recommended for one or more of the following purposes: to provide a firm bond between the substrate and a subsequent coating; to prevent a subsequent coating from being absorbed into the substrate; to prevent harm to a subsequent coating from materials in the substrate; or to provide a smooth surface for application of a subsequent coating.

K. REPRODUCTIVE TOXIN: A chemical listed as a reproductive toxin (including developmental, female, and male toxins) by the State of California under the Safe Drinking Water and Toxic Enforcement Act of 1986 (California Code of Regulations, Title 22, Division 2, Subdivision 1, Chapter 3, Sections 1200, et. Seq.).

L. SANDING SEALER: Clear/semi-transparent coating formulated to seal bare wood. Can be abraded to create a smooth surface for subsequent coatings. Does not include sanding sealers that are lacquers (see Clear Wood Finish above).

M. SEALANT: Any material with adhesive properties, formulated primarily to fill, seal, or waterproof gaps or joints

between surfaces. Includes sealant primers and caulks.

N. SHELLAC: Clear or pigmented coating formulated solely with the resinous secretions of the lac beetle, thinned with alcohol and formulated to dry by evaporation without chemical reaction. Excludes floor applications.

O. STAIN: Clear semi-transparent/opaque coating formulated to change the color but not conceal the grain pattern or texture of the substrate.

P. VOLATILE AROMATIC COMPOUND: Any hydrocarbon compound containing one or more 6-carbone benzene rings, and having an initial boiling point less than or equal to 280 degrees Celsius measured at standard conditions of temperature and pressure.

Q. VOLATILE ORGANIC COMPOUND: Any compound of carbon (excluding carbon monoxide, carbon dioxide, carbonic acid, metallic carbides or carbonates, and ammonium carbonate) which vaporizes (becomes a gas) and participates in atmospheric photochemical reactions, as specified in Part 51.00 of Chapter 40 of the U.S. Code of Federal Regulations, at normal room temperatures. For the purposes of this specification, formaldehyde and acetaldehyde are considered to be VOCs.

R. WATERPROOFING SEALER: A coating that prevents the penetration of water into porous substrates.

1.5 GENERAL REQUIREMENTS:

A. The City of New York is committed to implementing good environmental practices and procedures which include achieving a LEED Green building rating. Specific project requirements related to this goal which may impact this area of work are listed in the applicable paragraphs of this specification section. The Contractor shall ensure that the requirements as defined in the sections below and in related sections of the Contract Documents, are implemented to the fullest extent. Substitutions, or other changes to the work proposed by the Contractor or their Subcontractors, shall not be allowed if such changes compromise the stated environmental goals.

1.6 REFERENCES:

A. Rule 1168 – "Adhesive and Sealant Applications", amended 7 January 2005): South Coast Air Quality Management District (SCAQMD), State of California, www.aqmd.gov

B. Rule 1113 - "Architectural Coatings", amended 9 July 2004: South Coast Air Quality Management District (SCAQMD), State of California, www.aqmd.gov

C. Green Seal Standard GS-11- "Paints", of Green Seal, Inc., Washington, DC, www.greenseal.org

D. Green Seal Standard GC-03- "Anti-Corrosive Paints", of Green Seal, Inc., Washington, DC, www.greenseal.org

1.7 VOC REQUIREMENTS FOR INTERIOR ADHESIVES, SEALANTS, PAINTS AND COATINGS:

A. GENERAL: Unless otherwise specified herein, the VOC content of all interior adhesives, sealants, paints and coatings (herein referred to as "products") shall not be in excess of **250 grams per liter.**

B. No product shall contain any ingredients that are carcinogens, mutagens, reproductive toxins, persistent bioacculmulative compounds, hazardous air pollutants, or ozone-depleting compounds. An exception shall be made for titanium dioxide and, for products that are pre-tinted by the manufacturer, carbon black, which shall be less than or equal to 1% by weight of the product.

C. No product shall contain the following:
   1. methylene chloride
   2. 1,1,1-trichloroethane
   3. benzene

4. toluene
5. ethylbenzene
6. vinyl chloride
7. naphthalene
8. 1,2-dichlorobenzene
9. di (2-ethylhexyl) phthalate
10. butyl benzyl phthalate
11. di-n-butyl phthalate
12. di-n-octyl phthalate
13. diethyl phthalate
14. dimethyl phthalate
15. isophorone
16. antimony
17. cadmium
18. hexavalent chromium
19. lead
20. mercury
21. formaldehyde
22. methyl ethyl ketone
23. methyl isobutyl ketone
24. acrolein
25. acrylonitrile

D. No product shall contain more than 1.0% by weight of sum total of volatile aromatic compounds.

1.8 VOC REQUIREMENTS FOR INTERIOR ADHESIVES:

A. The volatile organic compound (VOC) content of adhesives, adhesive bonding primers, or adhesive primers used in this project shall not exceed the limits defined in Rule 1168 – "Adhesive and Sealant Applications" of the South Coast Air Quality Management District (SCAQMD), of the State of California.

B. The VOC limits defined by SCAQMD are as follows. All VOC limits are defined in grams per liter, less water and less exempt compounds.

C. For specified building construction related applications, the allowable VOC content is as follows:

1. Architectural Applications:

a.	Indoor carpet adhesive	50
b.	Carpet pad adhesive	50
c.	Wood flooring adhesive	100
d.	Rubber floor adhesive	60
e.	Subfloor adhesive	50
f.	Ceramic tile adhesive	65
g.	VCT and asphalt tile adhesive	50
h.	Drywall and panel adhesive	50
i.	Cove base adhesive	50
j.	Multipurpose construction adhesive	70
k.	Structural glazing adhesive	100

2. Specialty Applications:

a.	PVC welding	510
b.	CPVC welding	490
c.	ABS welding	325
d.	Plastic cement welding	250

e.	Adhesive primer for plastic	550
f.	Contact Adhesive	80
g.	Special Purpose Contact Adhesive	250
h.	Structural Wood Member Adhesive	140
i.	Sheet Applied Rubber Lining Operations	850
j.	Top and Trim Adhesive	250

3. Substrate Specific Applications:

a.	Metal to metal	30
b.	Plastic foams	50
c.	Porous material (except wood)	50
d.	Wood	30
e.	Fiberglass	80

4. Aerosol Adhesives:

a.	General purpose mist spray	65% VOC's by weight
b.	General purpose web spray	55% VOC's by weight
c.	Special purpose aerosol adhesives (all types)	70% VOC's by weight

1.9 VOC REQUIREMENTS FOR INTERIOR SEALANTS:

A. The volatile organic compound (VOC) content of sealants, or sealant primers used in this project shall not exceed the limits defined in Rule 1168 – "Adhesive and Sealant Applications" of the South Coast Air Quality Management District (SCAQMD), of the State of California.

B. The VOC limits defined by SCAQMD are as follows. All VOC limits are defined in grams per liter, less water and less exempt compounds.

1. Sealants:

a.	Architectural	250
b.	Non-membrane roof	300
c.	Roadway	250
d.	Single-ply roof membrane	450
e.	Other	420

2. Sealant Primer:

a.	Architectural – Nonporous	250
b.	Architectural – Porous	775
c.	Other	750

1.10 VOC REQUIREMENTS FOR INTERIOR PAINTS:

A. Paints and Primers: Paints and primers used in non-specialized interior applications (i.e., for wallboard, plaster, wood, metal doors and frames, etc.) shall meet the VOC limitations of the Green Seal Paint Standard GS-11, of Green Seal, Inc., Washington, DC. Product-specific environmental requirements are as follows:

1. Volatile Organic Compounds:
   a. The VOC concentrations (in grams per liter) of the product shall not exceed those listed below as determined by U. S. Environmental Protection Agency (EPA) Reference Test Method 24.

   Interior Paints and Primers:
   Non-flat: 150 g/l
   Flat: 50 g/l
   The calculation of VOC shall exclude water and tinting color added at the point of sale.

B. Anti- Corrosive and Anti-Rust Paints: Anti-corrosive and anti-rust paints applied to interior ferrous metal substrates shall meet the VOC limitations of the Green Seal Paint Standard GC-03, of Green Seal, Inc., Washington, DC. Product-specific environmental requirements are as follows:
   1. Volatile Organic Compounds:
      a. The VOC concentrations (in grams per liter) of the product shall not exceed those listed below as determined by U. S. Environmental Protection Agency (EPA) Reference Test Method 24.
      Anti-Corrosive and Anti-Rust Paints: 250 g/l

   The calculation of VOC shall exclude water and tinting color added at the point of sale.

1.11 VOC REQUIREMENTS FOR INTERIOR COATINGS:

A. Clear wood finishes, floor coatings, stains, sealers, and shellacs applied to the interior shall meet the VOC limitations defined in Rule 1113, "Architectural Coatings" of SCAQMD, of the State of California. The VOC limits defined by SCAQMD, based on 7/9/04 amendments, are as follows. VOC limits are defined in grams per liter, less water and less exempt compounds.

1.	Clear Wood Finishes:	
	a. Varnish	350
	b. Sanding Sealers	350
	c. Lacquer	550
2.	Shellac:	
	a. Clear	730
	b. Pigmented	550
3.	Stains	250
4.	Floor Coatings	100
5.	Waterproofing Sealers	250
6.	Sanding Sealers	275
7.	Other Sealers	200

The calculation of VOC shall exclude water and tinting color added at the point of sale.

1.12 SUBMITTALS:

A. Submit Material Safety Data Sheets, for all applicable products in accordance with Section 01 33 00, SUBMITTAL PROCEDURES. Applicable products include, but are not limited to adhesives, sealants, carpets, paints and coatings. Material Safety Data Sheets shall indicate the Volatile Organic Compound (VOC) limits of products submitted. (If an MSDS does not include a product's VOC limits, then product data sheets, manufacturer literature, or a letter of certification from the manufacturer can be submitted in addition to the MSDS to indicate the VOC limits).

B. Submit Environmental Building Materials Certification Form (EBMCF) as referenced in Section 01 81 13.03 SUSTAINABLE REQUIREMENTS FOR LEED v3 BUILDINGS: For each field-applied adhesive, sealant, paint, and coating product, provide the VOC requirement, as provided in this Specification, for the relevant material category indicated on the documentation noted above.

PART II – PRODUCTS (Not Used)

PART III – EXECUTION (Not Used)

END OF SECTION 01 81 13.13

SECTION 01 81 19
INDOOR AIR QUALITY REQUIREMENTS FOR LEED BUILDINGS

REFER TO THE ADDENDUM FOR APPLICABILITY OF THIS SECTION 01 81 19

PART I – GENERAL

1.1 RELATED DOCUMENTS:

A. The following documents apply to all required work for the Project: (1) the Contract Drawings, (2) the Specifications, (3) the General Conditions, (4) the Addendum, and (5) the Contract [City of New York Standard Construction Contract].

1.2 CONSTRUCTION IAQ MANAGEMENT GOALS FOR THE PROJECT:

A. The City of New York has determined that this Project shall minimize the detrimental impacts on Indoor Air Quality (IAQ) resulting from construction activities. Factors that contaminate indoor air, such as dust entering HVAC systems and ductwork, improper storage of materials on-site, poor housekeeping, shall be minimized.

1.3 RELATED SECTIONS:

A. All sections of the Specifications related to interior construction, MEP systems and items affecting indoor air quality.

B. Division 9 (of the Specifications): Finishes.

C. Refer to the Addendum to identify whether this project is designed to comply with a Certification Level according to the U.S. Green Building Council's LEED Rating System, as specified in Section 01 81 13.03 "SUSTAINABLE DESIGN REQUIREMENTS FOR LEED v3 BUILDINGS" or Section 01 81 13.04 "SUSTAINABLE DESIGN REQUIREMENTS FOR LEED v4 BUILDINGS".

D. Refer to the Addendum to identify whether this project is designed to comply with Section 01 81 13.13 VOLATILE ORGANIC COMPOUND (VOC) LIMITS FOR ADHESIVES, SEALANTS, PAINTS AND COATINGS FOR LEED v3 BUILDINGS

E. Section 01 91 13 GENERAL COMMISSIONING REQUIREMENTS FOR MEP SYSTEMS

1.4 DEFINITIONS:

A. Refer to Article 2 of the Contract for definition of terms, words and expressions used in the General Conditions not otherwise defined herein.

B. Design Consultant: "Design Consultant" shall mean the entity responsible for providing design services for the Project, including without limitation, preparing the construction documents (drawings and specifications) and providing services in connection with such documents during construction. The entity serving as the "Design Consultant" may be a corporation, firm, partnership, joint venture, individual or combination thereof. Such entity may be either an employee(s) of the City or an entity engaged by the City to provide such services.

C. Volatile Organic Compounds (VOC's): Chemical compounds common in and emitted by many building products, including solvents in paints, coatings, adhesives and sealants, wood preservatives, composite

wood binder, and foam insulations. Not all VOC's are harmful, but many of those contained within building products contribute to the formation of smog and may irritate building occupants by their smell and/or health impact.

D. Materials that act as "sinks" for VOC contamination: Absorptive materials, typically dry and soft materials (such as textiles, carpeting, acoustical ceiling tiles and gypsum board) that readily absorb VOC's emitted by "source" materials and release them over a prolonged period of time.

E. Materials that act as "sources" for VOC contamination: Products with high VOC contents that emit VOC's either rapidly during application and curing (typically "wet" products, such as paints, sealants, adhesives, caulks and sealers) or over a prolonged period (typically "dry" products such as flooring coverings with plasticizers and engineered wood with formaldehyde).

1.5 REFERENCES, RESOURCES:

A. "IAQ Guidelines for Occupied Buildings Under Construction", Second Edition, 2007, The Sheet Metal and Air Conditioner Contractors National Association (SMACNA). (703) 803-2980, www.smacna.org.

B. ANSI/ASHRAE 52.2-2007, "Method of Testing General Ventilation Air-Cleaning Devices for Removal Efficiency by Particle Size", www.ashrae.org

1.6 LEED BUILDING GENERAL REQUIREMENTS:

A. Implement practices and procedures as necessary to meet the Project's environmental performance goals as set forth in the specific requirements of this section. Specific Project goals that may impact this area of work include: use of recycled-content materials; use of low-emitting materials; construction waste recycling; and the implementation of a construction indoor air quality management plan. Ensure that the requirements related to these goals, as defined in this Section, are implemented to the fullest extent. Substitutions or other changes to the work shall not be allowed if such changes compromise the stated LEED BUILDING Performance Criteria.

1.7 CONSTRUCTION IAQ MANAGEMENT PLAN:

A. The Contractor shall prepare a Construction IAQ Management Plan in coordination with each subcontractor and submit the Construction IAQ Management Plan to the Commissioner for approval in accordance with Section 01 33 00 SUBMITTAL PROCEDURES. The Construction IAQ Management Plan shall meet the following criteria:

1. Construction activities shall be planned to meet or exceed the minimum requirements of the Sheet Metal and Air Conditioning National Contractors' Association (SMACNA) "IAQ Guidelines for Occupied Buildings under Construction", Second Edition, 2007.
2. Absorptive materials shall be protected from moisture damage when stored on-site and after installation.
3. The planned operation of air handlers during construction shall be described. If air handlers are to be used during construction, filtration media with a Minimum Efficiency Reporting Value (MERV) of 8 must be used at each return air grille and return or transfer duct inlet opening, such that there is no bypass around the filtration media, as determined by ASHRAE 52.2-2007.
4. Filtration media shall be replaced immediately prior to occupancy. Filtration media shall have a MERV of 13 as determined by ASHRAE 52.2-2007.
5. A "Sequence of Finish Installation Plan" shall be developed, highlighting measures to reduce the absorption of VOCs by materials that act as "sinks".
6. The use of tobacco products shall be prohibited inside the building and within 25 feet of the building entrance during construction.

7. A flush-out or air testing shall be performed.
8. Upon approval of the Plan by the Commissioner, it shall be implemented by the Contractor through the duration of the construction process, and documented in accordance with the Submittal Requirements of Sub-Section 1.8 herein.

B. Detailed requirements of the Construction IAQ Management Plan are as follows:

1. SMACNA Guidelines: Chapter 3 of the referenced "IAQ Guidelines for Occupied Buildings Under Construction", outline IAQ measures in five categories as listed below. The Construction IAQ Management Plan shall be organized in accordance with the SMACNA format, and shall address measures to be implemented in each of the five categories (including subsections). All subsections shall be listed in the Plan; items that are not applicable for this Project should be listed as such.
   a. HVAC Protection
      1) Protect air handling and distribution equipment and air supply and return ducting during construction.
      2) All ductwork arriving on site will be sealed with plastic sheeting and stored on pallets or dunnage until installed.
      3) Cover and protect all exposed air inlets and outlets, openings, grilles, ducts, plenums, etc. to prevent water, moisture, dust and other contaminant intrusion.
      4) Apply protection immediately after ducting.
      5) Protect ducting runs at the end of day's work.
      6) Inspect temporary filtration weekly and replace as required to maintain the proper ventilation rates in the building.
      7) To reduce debris and contamination to mechanical systems, do not store materials in mechanical rooms.
   b. Source Control
      1) Protect stored on-site or installed absorptive or porous materials. Store materials in dry conditions indoors, under cover, and off the ground or floor.
      2) Do not use wet or damaged porous materials in the building. Materials which become contaminated through direct exposure to moisture from precipitation, plumbing leaks, or condensation shall be replaced by the Contractor, at no additional cost to the City of New York.
      3) Use low-toxicity and low-VOC materials to the greatest extent possible.
      4) Recover, isolate, and ventilate containers housing toxic materials and materials with VOC levels above the limits for interior adhesives, sealants, paints, and coatings described in these Specifications.
      5) Prevent exhaust fumes from idling vehicles, equipment, and fossil-fueled tools from entering the building.
      6) Containers housing toxic materials and materials with VOC levels above the limits for interior adhesives, sealants, paints, and coatings described in these Specifications, shall be closed when not in use.
      7) Enforce the no-smoking job site policy.
   c. Pathway Interruption
      1) Depressurize work areas to contain dust and odors.
      2) Pressurize occupied spaces to prevent intrusion of dust and odors.
      3) Erect barriers to contain construction areas.
      4) Relocate pollutant sources.
      5) Temporarily seal the building and provide 100% outside air for ventilation.
      6) Provide walk-off mats at entryways to reduce introduced dirt and pollutants.
      7) Use dust guards and collectors on saws and other tools.
   d. Housekeeping
      1) Store materials on elevated platforms under cover, in a designated dry, clean location, prior to unpacking for installation.

2) If materials are not stored in an enclosed location, cover tops and sides of material with waterproof sheeting, securely tied.
3) Institute cleaning activities to remove contaminants from the building prior to occupancy. Clean all coils, air filters, and ductwork prior to performing testing, adjusting, and balancing of HVAC systems.
4) Sweep the work area on a daily basis. Use an efficient and effective dust collecting method such as damp cloth, wet mop, or vacuum with high-efficiency particulate filters. Activities which produce high levels of dust shall be cleaned up immediately upon completion.
5) Spills or excess applications of products containing solvents, or with VOC levels above the limits for interior adhesives, sealants, paints, and coatings described in these Specifications, must be removed immediately.
6) Dust all walls prior to application of finishes.
7) Vacuum all stud tracks prior to application of insulation.
8) Keep materials organized to improve job safety as well as indoor air quality.

e. Scheduling
1) Phase construction such that absorptive materials are installed only in areas that are weathertight.
2) Schedule activities that utilize "sources" of VOC contamination to take place prior to installing high absorbent materials that will act as "sinks" for contaminants.
3) Review of the appropriate components of the Construction IAQ Management Plan shall be a regular action topic at weekly site coordination meetings. Implementation of the Plan shall be documented in the meeting minutes.

2. Protection of Materials from Moisture Damage: As part of the "Source Control" section of the Construction IAQ Management Plan, measures to prevent installed materials or material stored on-site from moisture damage shall be described. This section shall also describe corrective measures to be taken if moisture damage does occur to absorptive materials during the course of construction (see Section 1.7 B.1.b).

3. Replacement of Filtration Media: Under the "HVAC Protection" section of the Construction IAQ Management Plan, a description of the filtration media in all ventilation equipment shall be provided. The description shall include replacement criteria for filtration media during construction, and confirmation of filtration media replacement for all equipment immediately prior to occupancy.

4. Sequence of Finish Installation for Materials: Where feasible, absorptive materials shall be installed after the installation of materials or finishes which have high short-term emissions of VOC's, formaldehyde, particulates, or other air-borne compounds. Absorptive materials include, but are not limited to: carpets; acoustical ceiling panels; fabric wall coverings; insulations (exposed to the airstream); upholstered furnishings; and other woven, fibrous or porous materials. Materials with high short-term emissions include, but are not limited to: adhesives, sealants and glazing compounds (specifically those with petrochemical vehicles or carriers); paints, wood preservatives and finishes; control and/or expansion joint fillers; hard finishes requiring adhesive installation; gypsum board (with associated finish processes and products); and composite or engineered wood products with formaldehyde binders.

5. Pre-Occupancy Phase: Perform either a flush-out or air sample testing (Options 1 or 2), as follows:

a. <u>OPTION 1 — Flush-Out</u>
1) Perform flush-out using either Path 1 or Path 2.
i. Path 1: After construction ends, prior to occupancy and with all interior finishes installed, install new filtration media and perform a building flush-out by supplying a total air volume of 14,000 cu.ft. of outdoor air per sq.ft. of floor area while

maintaining an internal temperature of at least 60 degrees F and no higher than 80 degrees F and relative humidity no higher than 60%.

ii. Path 2: If occupancy is desired prior to completion of the flush-out, the space may be occupied following delivery of a minimum of 3,500 cu.ft. of outdoor air per sq.ft. of floor area to the space. Once a space is occupied, it shall be ventilated at a minimum rate of 0.30 cfm/sq.ft. of outside air or the design minimum outside air rate determined in IEQ Prerequisite: Minimum Indoor Air Quality Performance, whichever is greater. During each day of the flush-out period, ventilation shall begin a minimum of three hours prior to occupancy and continue during occupancy. These conditions shall be maintained until a total of 14,000 cu.ft./sq.ft. of outside air has been delivered to the space.

2) Commissioning can occur during flush-out, at the discretion of the Commissioning Agent, provided none of the commissioning procedures introduce contaminants into the space and none of the flush-out procedures circumvent the commissioning process. Complete testing and balancing of the HVAC system after the flush-out is complete. Refer to Section 01 91 13 GENERAL COMMISSIONING REQUIREMENTS FOR MEP SYSTEMS.

3) If even partial construction work occurs during the flush-out, the flush-out must be started again from the beginning for that space. If multiple, discrete HVAC systems operate independently, flush-out may be completed in portions of the building as work is completed in each area served by a given system.

OR

b. OPTION 2 — Air Testing

1) Conduct baseline IAQ testing, after construction ends and prior to occupancy, using testing protocols consistent with current versions of the United States Environmental Protection Agency Compendium of Methods for the Determination of Air Pollutants in Indoor Air or ISO methods, as additionally detailed in the LEED BD+C Reference Guide.

2) Demonstrate that the contaminant maximum concentrations listed below are not exceeded.

CONTAMINANT	MAXIMUM CONCENTRATION
Formaldehyde	27 parts per billion
Particulates (PM10 for all buildings; PM25 for buildings in EPA nonattainment areas, or local equivalent)	PM10: 50 micrograms per cubic meter PM25: 15 micrograms per cubic meter
Ozone (for buildings in EPA nonattainment areas)	0.075 parts per million
Total Volatile Organic Compounds (TVOC)	500 micrograms per cubic meter
Target chemicals listed in CDPH Standard Method c1.1, Table 4-1, except formaldehyde	CDPH Standard Method v1.1-2010, Allowable Concentrations, Table 4-1
Carbon Monoxide (CO)	9 part per million and no greater than 2 parts per million above outdoor levels

3) The air sample testing shall be conducted as follows:

i. All measurements shall be conducted prior to occupancy, but during normal occupied hours and with the building ventilation system starting at the normal daily start time and operated at the minimum outside air flow rate for the occupied mode throughout the duration of the air testing.
ii. The building shall have all interior finishes installed, including but not limited to millwork, doors, paint, carpet and acoustic tiles. Non-fixed furnishings such as workstations and partitions are required to be in place for the testing.
iii. Prior to air sample testing, all punch-list items that would generate VOCs or other contaminants, the testing and balancing of the HVAC system and finalization of all cleaning shall be complete. Use low-emitting cleaning products and vacuum cleaners with HEPA filtration.
iv. The number of sampling locations will vary depending upon the size of the building and number of ventilation systems. For each portion of the building served by a separate ventilation system, the number of sampling points shall not be less than one per 25,000 sq.ft., or for each contiguous floor area, whichever is larger, and include areas with the least ventilation and greatest presumed source strength.
v. Air samples shall be collected between 3 feet and 6 feet from the floor to represent the breathing zone of occupants, and over a minimum 4-hour period.
vi. For each sampling point where the maximum concentration limits are exceeded, conduct additional flush-out with outside air and retest the specific parameter(s) exceeded to indicate the requirements are achieved. Repeat procedure until all requirements have been met. When retesting non-complying building areas, take samples from the same locations as in the first test.

6. Implementation and Coordination: Before Demolition and/or Construction begins, the Contractor shall implement the Construction IAQ Management Plan, coordinate the Plan with all affected trades, and designate one individual as the Construction IAQ Representative at no additional cost to the City of New York, who will be responsible for communicating the progress of the Construction IAQ Management Plan with the Commissioner monthly and for assembling the required LEED documentation. Include provisions in the Construction IAQ Management Plan for addressing conditions in the field that do not adhere to the Plan, including provisions to implement a stop work order, or to rectify non-compliant conditions.

   a. Distribution: The Contractor shall distribute copies of the Construction IAQ Management Plan in accordance with Section 01 33 00 SUBMITTAL PROCEDURES.

   b. Instruction: The Contractor shall provide on-site instruction of appropriate site management to all Contractor's Subcontractors.

   c. Monitoring: The Construction IAQ Representative shall monitor the implementation of the Construction IAQ Management Plan.

1.8 SUBMITTALS:

Submit the following LEED-required records and documents in accordance with Section 01 33 00 SUBMITTAL PROCEDURES and, as applicable, Section 01 81 13.03 SUSTAINABLE DESIGN REQUIREMENTS FOR LEED v3 BUILDINGS or Section 01 81 13.04 SUSTAINABLE DESIGN REQUIREMENTS FOR LEED v4 BUILDINGS.

A. A copy of the Construction IAQ Management Plan as defined in Sub-Section 1.7 herein.

B. IAQ Tracking Log
   1. Note date of observed major Construction IAQ issues, describe any damage, describe any repairs or maintenance of specific control measures performed and note responsible party.
   2. Note date and findings of weekly site review, describe any repairs or maintenance performed, and note responsible party. Provide date-stamped photographs, inspection reports or other recording processes.

3. Submit monthly.

B. Product cut-sheets for all filtration media used during construction and installed immediately prior to occupancy, with MERV values highlighted. Cut sheets shall be submitted with the Contactor's or Subcontractor's 'approved' stamp as confirmation that the products are the products installed on the Project.

C. PHOTOGRAPHS: Submit to the Commissioner a minimum of 18 photographs as required under the provision for Special Photographs, in accordance with Section 01 32 33 PHOTOGRAPHIC DOCUMENTATION, comprised of at least six photographs taken on three different occasions during construction of each IAQ measure. The photographs shall document the implementation of the Construction IAQ Management Plan throughout the course of the Project construction. Examples include photographs of ductwork sealing and protection, temporary ventilation measures, and conditions of on-site materials storage (to prevent moisture damage). Photographs shall include integral date stamping, and shall be submitted with brief descriptions of the Construction IAQ Management Plan measure documented, or be referenced to Project meeting minutes or similar Project documents which reference to the Construction IAQ Management Plan measure documented.

D. A copy of the Project's Testing, Adjusting and Balancing (TAB) report, if applicable.

1.9 QUALITY ASSURANCE:

A. The Contractor shall be responsible for preparing and implementing the Construction IAQ Management Plan and shall coordinate and incorporate the work of its subcontractors in the IAQ Management Plan. Include the Construction IAQ Management Plan requirements in contract agreements with subcontractors. Familiarize subcontractors with the plan and how it will affect their daily activities. Hold a subcontractors' orientation meeting to review the plan requirements.

B. Responsibility of Subcontractors: Subcontractors for this Project shall be responsible to cooperate with the Contractor in the preparation and implementation of the Construction IAQ Management Plan.

C. Include construction IAQ progress check-ins as a regular item in weekly subcontractor meetings and safety meetings. Provide a copy of the plan on site, posted in an accessible area.

PART II – PRODUCTS (Not Used)

PART III – EXECUTION (Not Used)

END OF SECTION 01 81 19

(No Text on This Page)

SECTION 01 91 13
GENERAL COMMISSIONING REQUIREMENTS FOR MEP SYSTEMS

REFER TO THE ADDENDUM FOR APPLICABILITY OF THIS SECTION 01 91 13

PART I – GENERAL

1.1 RELATED DOCUMENTS:

A. The following documents apply to all required work for the Project: (1) the Contract Drawings, (2) the Specifications, (3) the General Conditions, (4) the Addendum, and (5) the Contract [City of New York Standard Construction Contract].

B. The Owner's Project Requirements (OPR) and Basis of Design (BOD) documents are included by reference for information only.

C. The Commissioning Plan, prepared by the Commissioning Agent (CxA) under separate contract with the City of New York, contains requirements that apply to this section.

1.2 SUMMARY:

This Section includes general requirements that apply to implementation of Commissioning without regard to systems, subsystems, and equipment being commissioned. General Requirements for Building Enclosure Commissioning are addressed in a separate specification.

A. This Section includes:
1. Definitions
2. Commissioning Team
3. City's Responsibilities
4. Contractor's Responsibilities
5. CxA Responsibilities
6. Commissioning Documentation
7. Submittals
8. Coordination
9. Execution

1.3 RELATED SECTIONS: Include without limitation the following:

A. System-Specific Commissioning requirements indicated in other sections of the Project Specifications for specific requirements for commissioning systems.

B. This Project will be commissioned by an independent third party under separate contract with the City of New York. Commissioning shall be in accordance with ASHRAE and USGBC LEED procedures, and specific commissioning requirements of the Project Specifications, whichever is more stringent. The Contractor shall cooperate with the CxA and provide whatever assistance is required.

C. Related Sections include without limitation the following:

1.	Section 01 10 00	SUMMARY
2.	Section 01 31 00	PROJECT MANAGEMENT AND COORDINATION
3.	Section 01 32 00	CONSTRUCTION PROGRESS DOCUMENTATION
4.	Section 01 78 39	CONTRACT RECORD DOCUMENTS
5.	Section 01 79 00	DEMONSTRATION AND OWNERS PRE-ACCEPTANCE ORIENTATION
6.	Section 01 81 13	SUSTAINABLE DESIGN REQUIREMENTS FOR LEED BUILDINGS

7. Section 01 91 15 GENERAL COMMISSIONING REQUIREMENTS FOR BUILDING ENCLOSURE

1.4 DEFINITIONS:

A. Refer to Article 2 of the Contract for definition of terms, words and expressions used in the General Conditions not otherwise defined herein.

B. Basis of Design (BOD): A document, prepared by the Design Consultant, that records concepts, calculations, decisions, and product selections used to meet the OPR and to satisfy applicable regulatory requirements, standards, and guidelines. The document includes both narrative descriptions and lists of individual items that support the design process.

C. Checklists: Forms that outline the step by step process that must be executed to fulfill the test requirements and to verify that materials, equipment, assemblies, and systems are installed in accordance with the Contract Documents. The CxA shall develop the checklists; the Contractor shall complete them.

D. Commissioning: Commissioning is a systematic process of ensuring and documenting that the building systems, including the mechanical and electrical systems, have been installed in the prescribed manner, are functionally checked and capable of being operated and maintained to perform with the design intent and have documentation to support proper installation and operation. The process does not eliminate or reduce the responsibility of the installing contractors to provide a finished product.

E. Commissioning Agent (Aka Commissioning Authority) (CxA): Consultant under separate contract with the City of New York to provide Commissioning Services for this project. The CxA shall not be an employee of the Contractor, nor shall the CxA have any interest in the Contract.

F. Commissioning Plan: A document developed by the CxA that outlines the organization, schedule, roles and responsibilities, allocation of resources, and documentation requirements of the commissioning process.

G. Deferred Performance Tests: Performance tests that are performed, at the discretion of the CxA, after substantial completion, due to partial occupancy, equipment, seasonal requirements, design, or other site conditions that disallow the test from being performed.

H. Design Consultant: "Design Consultant" shall mean the entity responsible for providing design services for the Project, including without limitation, preparing the construction documents (drawings and Specifications) and providing services in connection with such documents during construction. The entity serving as the "Design Consultant" may be a corporation, firm, partnership, joint venture, individual or combination thereof. Such entity may be either an employee(s) of the City or an entity engaged by the City to provide such services.

I. Factory Testing: Testing of equipment on-site or at the factory, by factory personnel, with or without an owner's representative.

J. Functional Performance Test (FPT): Functional performance testing includes the dynamic functions and operations of equipment and systems using manual or monitoring methods under various levels of operation. Systems are tested under various modes, such as during low cooling loads, high loads, component failures, unoccupied, varying outside air temperatures, fire alarms, power failure, etc. The systems are run through all the control system's sequences of operation and components are verified to respond as the sequences state. Such tests shall be performed as per the protocol written by the CxA, defining the methods, personnel, and expectations.

K. Issue (or Deficiency): A condition in the installation or function of a component, piece of equipment, or system that is not in compliance with the Contract Documents.

L. Issues Log: A formal and ongoing record of problems, deficiencies or concerns that have been raised by members of the Commissioning Team during the course of commissioning. The issues log is the primary tracking tool to address all commissioning issues by concerned parties. All issues must be addressed and resolved by the concerned parties before the closeout of the Project. This log tracks the resolution performed and date of closure of each issue.

M. Master Equipment List (MEL): A complete listing of all commissioned building equipment, including details such as make, model, location, ID Tag number, etc. that is taken from submittals and is the basis from which checklists will be generated. The MEL is a spreadsheet which is also used as a tracking tool for all milestones of the commissioning process, such as the creation and performance of checklists, startup of equipment, TAB work, etc.

N. Monitoring: The recording of parameters (flow, current, status, pressure, etc.) of equipment operation using data loggers or the trending capabilities of control systems.

O. Owner (City of New York) Contracted Tests: Tests paid for by the City of New York outside of the Contractor's Contract and for which the CxA does not provide oversight. These tests will not be repeated during functional testing if properly documented.

P. Owner's (City of New York) Project Requirements (OPR): A document, prepared by the Design Consultant that details the functional requirements of a Project and the expectations of how it will be used and operated. These include Project goals, measurable performance criteria, cost considerations, benchmarks, success criteria, and supporting information.

Q. Pre-functional (Installation) Checklists: A list of items to inspect and elementary component tests to conduct to verify proper installation of equipment, provided by the CxA to the Contractor. Installation checklists are primarily static inspections and procedures to prepare equipment or systems for initial operation. Pre-functional (Installation) checklists augment, and are combined with, the manufacturer's startup checklist. The Checklists are filled out by the Contractor and reviewed by the CxA.

R. Sampling: Functional testing for a percentage of the total number of identical or near-identical pieces of equipment.

S. Seasonal Performance Tests: Functional tests that are deferred until, or performed again when, the system(s) will experience climate conditions close to their design conditions.

T. Startup: The initial starting or activating of equipment, including executing construction checklists.

U. Systems, Subsystems, Equipment, and Components: Where these terms are used together or separately, they shall mean "as-built" systems, subsystems, equipment, and components.

V. Systems Manual: A system-focused composite document that includes the Operation and Maintenance Manual, and additional information of use to the owner during the occupancy and operations phase.

W. Testing, Adjusting, and Balancing (TAB): Testing, adjusting, and balancing of the Heating Hot Water (HHW), Chilled Water (CHW) and Heating, Cooling, and Ventilation Airflow distribution system flows and pressures as specified in Contract Documents by a subcontractor certified to perform such work.

X. Test requirements: Requirements specifying what modes and functions, etc. shall be tested on any given piece of equipment or any given system (integrated or standalone). The test requirements are not the detailed test procedures. The test requirements for each system are specified in the respective Contract Documents.

Y. Trending: Monitoring using the building controls system, and analysis of the data gathered over a period of time.

1.5 COMMISSIONING TEAM:

A. Members Appointed by the Contractor and its Subcontractors: Individuals, each having authority to act on behalf of the entity he or she represents, explicitly organized to implement the commissioning process through coordinated actions. The Commissioning Team shall consist of, but not be limited to, representatives of the Contractor, including Project superintendent and subcontractors, installers, suppliers, and specialists deemed appropriate by the CxA.

B. Members Appointed by the City:

1. Commissioning Authority/Agent (CxA): The designated person, company, or entity under separate Contract with the City that plans, schedules, and coordinates the Commissioning Team to implement the commissioning process.
2. Representatives of the facility user and operation and maintenance personnel.
3. Design Consultant and other concerned entities.

1.6 CITY'S RESPONSIBILITIES:

A. Provide the OPR and BOD documentation to the CxA for use in developing the Commissioning Plan; systems manual; operation and maintenance orientation plan; and testing plans and checklists.

B. Assign operation and maintenance personnel to participate in Commissioning Team activities.

C. Provide full details and results of any Owner Contracted tests relevant to the current Project.

1.7 CONTRACTOR'S RESPONSIBILITIES:

A. The Contractor shall provide utility services required for the commissioning process.

B. As a member of the Commissioning Team, the Contractor and subcontractor(s) shall assign representatives with expertise and authority to act on behalf of the Contractor and its subcontractor(s) and schedule them to participate in and perform Commissioning Team activities including, but not limited to, the following:

1. Participate in scheduled construction-phase coordination and Commissioning Team meetings.
2. Integrate and coordinate commissioning process activities with the construction schedule.
3. Provide any and all factory acceptance test reports to the CxA through the Commissioner.
4. Respond to any additional specific information requests from the CxA. CxA may request additional documentation necessary for the commissioning process. Requests by CxA may precede, be concurrent with, or follow normal submittals.
5. Ensure the cooperation and participation of all subcontractors and manufacturers of equipment to be commissioned.
6. Verify and confirm that components, equipment, and system are functioning as per design prior to CxA witnessing testing.
7. Perform testing required in the Commissioning Schedule as per the Commissioning Process test procedures provided by the CxA, providing no less than 48 hours' notice to the CxA through the Commissioner.

8. Complete installation checklists as Work is completed and return to CxA through the Commissioner.
9. Provide written responses to to the CxA through the Commissioner for resolution of issues recorded in the Issues Log within five (5) business days.
10. Evaluate performance deficiencies identified in test reports and, in collaboration with entity responsible for system and equipment installation, recommend corrective action.
11. Submit As-Built documents, operation and maintenance manuals for systems and subsystems, and equipment in accordance with Section 01 78 39 CONTRACT RECORD DOCUMENTS. Such documents shall be submitted prior to functional testing.
12. Provide orientation sessions for operation and maintenance personnel (sessions will be witnessed by the CxA) in accordance with Section 01 79 00 DEMONSTRATION AND OWNER'S PRE-ACCEPTANCE ORIENTATION. Provide no less than 48 hours' notice to the CxA, through the Commissioner. Video record and edit orientation sessions and provide DVD to the CxA and Commissioner no later than two weeks after the orientation session occurs. Edit as requested by the Commissioner.

1.8 COMMISSIONING AGENT'S (CxA) RESPONSIBILITIES:

A. Organize and lead the Commissioning Team.

B. Prepare a construction-phase Commissioning Plan. Collaborate through the Commissioner with each Contractor and with subcontractors to develop test and inspection procedures. Include design changes and coordinate commissioning activities with the overall Project schedule. Identify Commissioning Team member responsibilities, by name, firm, and trade specialty, for performance of each commissioning task. Update the Commissioning Plan during construction as required.

C. Review and comment in accordance with Section 01 33 00 SUBMITTAL PROCEDURES, on submittals from the Contractor for compliance with the OPR, BOD, Contract Documents, and construction-phase Commissioning Plan. Review and comment on performance expectations of systems and equipment and interface between systems relating to the OPR and BOD.

D. Coordinate with the Commissioner, in accordance with Section 01 31 00 PROJECT MANAGEMENT AND COORDINATION, to convene Commissioning Team meetings for the purpose of coordination, communication, and conflict resolution; discuss progress of the commissioning processes.

E. At the beginning of the construction phase, coordinate with the Commissioner's kick-off meeting schedule to conduct an initial construction-phase coordination meeting for the purpose of reviewing the commissioning activities and establishing tentative schedules for operation and maintenance submittals, operation and maintenance orientation sessions, TAB Work, testing, and Project completion.

F. Perform site visits to observe and inspect construction as described in the Commissioning Plan. Report progress and deficiencies to the Commissioner. In addition to compliance with the OPR, BOD, and Contract Documents, inspect systems and equipment installation for adequate accessibility required for component maintenance replacement and repair.

G. Prepare and distribute project-specific test and inspection procedures and checklists and maintain a Master Equipment List.

H. Verify air and water systems balancing by sampling, by reviewing completed reports, and by selected site observation. Coordinate submittal reviews with the Commissioner so that the comments are combined into a single review and submitted to the Contractor.

I. Coordinate with the Commissioner to witness and document tests, inspections, and systems startup, as per the Commissioning Plan.

J. Maintain an issues log and a record of functional testing. Report all issues as they occur to the Commissioner.

K. Compile test data, inspection reports, and certificates and include them in the systems manual and Commissioning Report.

L. Certify date of acceptance and startup for each item of equipment for start of warranty periods.

M. Review and comment on operation and maintenance documentation and systems manual outline for compliance with the OPR, BOD, and Contract Documents. Operation and maintenance documentation requirements are specified in other sections of the Project Specifications and described in Section 01 78 39 CONTRACT RECORD DOCUMENTS.

N. Review agenda for orientation; witness and confirm orientation session conforms with agenda and Contract Documents; review recording of demonstration and orientation sessions provided by the Contractor on USB drive or other electronic media as requested by the Commissioner and provide appropriate comments for editing.

O. Return to the site 10 months into the 12-month guaranty period, to review with facility staff the current building operation and the condition of outstanding issues related to the original and seasonal commissioning. Interview facility staff and identify problems or concerns they have with operating the building as originally intended.

P. Prepare Commissioning Reports.

Q. Assemble the final commissioning documentation, including the Commissioning Report and Systems Manual.

R. Perform all CxA tasks as defined by LEED; prepare LEED submittal documents.

1.9 COMMISSIONING DOCUMENTATION:

The Contractor shall assist the CxA in the development and compiling of the following Commissioning Documentation:

A. Index of Commissioning Documents: The CxA will prepare an index including the storage location of each document.

B. Commissioning Plan: A document prepared by the CxA that outlines the schedule, allocation of resources, roles and responsibilities, and documentation requirements of the commissioning process.

C. Test Checklists: The CxA will develop test checklists for each system, subsystem, or equipment including interfaces and interlocks, and include a separate entry, with space for comments, for each item to be tested. The CxA will prepare separate checklists for each mode of operation and provide space to indicate whether the mode under test responded as required. Space will be provided for testing personnel to sign off on each checklist. Specific checklist content requirements are specified in other sections of the Project Specifications, but shall include without limitation:

1. Identification of tested item
2. Date of test
3. Indication of whether the record is for a first test or retest following correction of a problem or issue
4. Dated signatures of the person performing the test and of the witness if applicable
5. Deficiencies and issues, if any, generated as a result of the test

D. Inspection Checklists will be signed by the Contractor, Subcontractor(s), Installer(s), and CxA certifying that systems, subsystems, equipment, and associated controls are ready for testing.

E. Test and Inspection Reports: The CxA will record test data, observations, and measurements on test checklists. Photographs, forms, and other means appropriate for the application will be included with data. CxA shall compile test and inspection reports and test and inspection certificates and include them in systems manual and Commissioning Report.

F. Corrective Action Documents: The CxA will document corrective action taken for systems and equipment that fail tests and include required modifications to systems and equipment and revisions to test procedures, if any. The Contractor shall retest systems and equipment requiring corrective action. The CxA will document retest results.

G. Issues Log: The CxA will prepare and maintain an issues log that describes design, installation, and performance issues that are at variance with the OPR, BOD, and Contract Documents. The log will identify and track issues as they are encountered, documenting the status of unresolved and resolved issues. The Issues Log will identify, at a minimum:

1. The party responsible for correcting the issue,
2. The person documenting the issue resolution,
3. The exact location of the issue (floor and room),
4. The applicable system component,
5. A detailed description of the issue,
6. The issue status, and
7. The date the issue was discovered and the date the issue was resolved.

H. Commissioning Report: The CxA will document results of the commissioning process including unresolved issues and performance of systems, subsystems, and equipment. The Commissioning Report will indicate whether systems, subsystems, and equipment have been completed and are performing according to the OPR, BOD, and Contract Documents. The Commissioning Report shall include:

1. An Executive Summary, including participants and their roles, a brief building description, an overview of the commissioning and testing scope, and a general description of testing and verification methods,
2. Installation/ Pre-Functional Checklists,
3. Start-up Reports,
4. Functional Test documentation,
5. Trend Log Analysis,
6. The final Issues Log, with all issues identified through the commissioning process, identifying which, if any, issues remain unresolved,
7. The Commissioning Plan,
8. Commissioning progress and field reports,
9. Commissioning review documents, and
10. Record of Owner's Orientation.

I. Systems Manual: The CxA will gather required information and compile systems manual as specified in other sections of the Project Specifications and described in Section 01 78 39 CONTRACT RECORD DOCUMENTS.

1.10 SUBMITTALS:

A. Submittal of shop drawings, product data, samples, etc., relevant to commissioning shall be provided to the CxA as requested. Such submittals shall be in compliance with Section 01 33 00 SUBMITTAL PROCEDURES.

B. As-Built Contract Record Drawings and Operating and Maintenance Manuals relevant to commissioning shall be provided to the CxA as requested. Such submittals shall be in compliance with Section 01 78 39 CONTRACT RECORD DOCUMENTS.

C. All demonstration and orientation submittals relevant to commissioning shall be provided to the CxA as requested. Such submittals shall be in compliance with Section 01 79 00 DEMONSTRATION AND OWNER'S PREACCEPTANCE ORIENTATION.

D. Completed Prefunctional (Installation) Checksheets shall be provided to the CxA.

1.11 COORDINATION:

A. Coordination of Commissioning is the responsibility of all Commissioning Team members.

B. Coordinating Meetings: The CxA will coordinate with the Commissioner's regularly scheduled construction progress meetings to conduct coordination meetings of the Commissioning Team to review progress on the Commissioning Plan, to discuss scheduling conflicts, and to discuss upcoming commissioning process activities. Commissioner and Contractor shall ensure that all required Commissioning Team members attend.

C. Construction Documents: The Contractor, through the Commissioner, will furnish copies of all construction documents, addenda, change orders and appropriate submittals and shop drawings to the CxA.

D. Pre-testing Meetings: The CxA will coordinate with the Commissioner to conduct pretest meetings of the Commissioning Team to review startup reports, pretest inspection results, testing procedures, testing personnel and instrumentation requirements, and manufacturers' authorized service representative services for each system, subsystem, equipment, and component to be tested. Commissioner and Contractor shall ensure that all required Commissioning Team members attend.

E. Testing Coordination: Contractor shall coordinate schedule times with the Commissioning Team, through the Commissioner, for tests, inspections, obtaining samples, and similar activities. The CxA will advise the Commissioning Team as to the sequence of testing activities to accommodate required quality-assurance and -control services with a minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspecting.

F. Manufacturers' Field Services: The Contractor shall coordinate manufacturers' field services, as per the Commissioning Plan.

G. The CxA will regularly apprise the Commissioner of progress, pending problems and/or disputes, as well as provide regular status reports on progress with each system.

PART II – PRODUCTS

2.1 TEST EQUIPMENT

A. All industry standard test equipment required for performing the specific tests shall be provided by the Contractor responsible for testing. Any proprietary Vendor-specific test equipment shall be provided by that Vendor or Manufacturer.

B. Special equipment, tools, instruments, software, and equipment communication network access hardware and software (only available from Vendor, specific to the piece of equipment) required for testing equipment according to the Contract Documents shall be included at no extra cost to the City and shall be turned over to the City at Project close-out, except for stand-alone data logging equipment that may be used by the CxA.

C. Any portable or handheld setup and/or calibration devices required to initialize the control system shall be made available by the control vendor for use by the CxA at no additional cost to the City.

D. The instrumentation used in the commissioning process shall comply with the following:
   1. Be of sufficient quality and accuracy to test and/or measure system performance within the tolerances required
   2. Be calibrated at the manufacturer's recommended intervals with calibration tags permanently affixed to the instrument
   3. Be maintained in good repair and operating condition throughout use duration on this Project
   4. Be immediately recalibrated or repaired if dropped and/or damaged in any way during this Project.

PART III – EXECUTION

3.1 COMMISSIONING PROCESS

A. The following provides an overview of the Commissioning tasks during Project construction and the general order in which they occur.
   1. Construction-phase Commissioning begins with a Commissioning Kickoff Meeting, conducted by the CxA through the Commissioner in accordance with section 01 31 00 PROJECT MANAGEMENT AND COORDINATION, where the Commissioning process is reviewed with all the Commissioning Team Members.
   2. Additional meetings may be required throughout construction, scheduled by the CxA through the Commissioner in accordance with 01 31 00 PROJECT MANAGEMENT AND COORDINATION with necessary parties attending, to plan, scope, coordinate and schedule future activities and resolve open issues.
   3. The CxA will review the Contractor submittals concurrent with the Commissioner and provide comments to the Commissioner for inclusion in their review. The reviewed submittals will include all commissioned equipment information, including detailed startup procedures, and coordination drawings that include commissioned equipment and systems, control drawings and sequences, and interfaces and interlocks between systems.
   4. The CxA works with the Commissioner and Contractor in developing Pre-functional and Functional Test documentation formats.
   5. Periodically throughout the construction process, the CxA will perform site visits to observe component and system installations.

6. The checkout and performance verification generally proceeds from component level to equipment to systems and intersystem levels. Pre-functional (Installation) Checklists are to be completed before Functional Performance Checklists.
7. The Contractor shall, with guidance from the CxA, execute and document the Pre-Functional (Installation) Checklists and perform startup and initial checkout of equipment and systems. The CxA documents that the checklists and startup are completed according to the approved plans. This will include the CxA witnessing selected assembly markups, portions of the startup of selected equipment, and spot checking the Pre-Functional (Installation) Checklists.
8. The CxA develops specific equipment and system Functional Checklists. The Contractor receives a copy of the procedure through the Commissioner. The CxA may request additional design narrative from the Commissioner and Controls Contractor, depending on the completeness of the Basis of Design and sequences provided within the design documents.
9. The Functional Checklists are executed by the Contractor and witnessed and documented by the CxA.
10. Items of non-compliance in material, installation startup, and operation are corrected and the equipment or system is rechecked. The CxA will maintain an Issues Log to track issues and issue resolution.
11. The CxA will review the Operation & Maintenance documentation for completeness.
12. Commissioning, excluding the Warranty Walkthrough, shall be completed prior to Substantial Completion.
13. The CxA reviews the orientation documentation. The orientation schedules and agenda are provided by the subcontractors. The CxA verifies that orientation is completed, attended by the appropriate City of New York personnel, is thorough and provides all necessary information required to operate and service the equipment or system.
14. Deferred testing/ checkouts are conducted, as specified or required in the Contract Documents.

3.2 COMMISSIONING PLAN AND SCHEDULE

A. Commissioning Plan: The Commissioning Plan provides guidance in the execution of the commissioning process. After the initial construction phase Commissioning kickoff meeting, the CxA will update the plan. This plan is a living document that shall evolve and expand as the Project progresses. The Commissioning Plan shall include:
   1. Description of the facility and Project.
   2. Description of the commissioning process and associated deliverable documents.
   3. Description of equipment and systems to be commissioned.
   4. Description of schedules for testing procedures along with identification of parties involved in performing and verifying tests.
   5. Sample rates for equipment to be tested.
   6. Identification of task items that must be completed before the next operation can proceed.
   7. Description of responsibilities of Commissioning Team members.
   8. Description of observations to be made and reported on during testing and witnessing of testing by all parties involved in the Project.

B. Commissioning Schedule: Contractor shall provide construction schedules to the CxA, in accordance with Section 01 31 00 PROJECT MANAGEMENT AND COORDINATION. The CxA will develop and submit a schedule identifying the commissioning process and provide commissioning scheduling information to the Commissioner and Contractor for review and planning activities. The Contractor shall incorporate the CxA's activities into the Project schedule.

3.3 TESTING PROCEDURES

A. The CxA will determine and document the acceptance procedures for each system within disciplines. The acceptance procedures shall incorporate the commissioning standards and successful testing results as referred to throughout the Specifications.

B. The CxA will provide performance checklists and performance checkout data sheets for each system based on actual system configuration. Special emphasis shall be placed on checkout procedures that shall conclusively determine actual system performance and compliance with the OPR and BoD.

C. The Contractor and appropriate Vendor(s) shall be informed of what tests are to be performed and the expected results. The Commissioning Plan shall address the test requirements and be distributed to all parties involved with that system.

D. Prior to Functional Testing, the Contractor shall provide the following:
   1. Contractor shall certify in writing that commissioned systems, subsystems, and equipment have been installed, calibrated and started, and are operating according to the Contract Documents.
   2. Contractor shall certify in writing that all relevant instrumentation and control systems have been completed and calibrated; are operating according to the Contract Documents; and that pretest set points have been recorded.
   3. Contractor shall certify in writing that TAB procedures have been completed, and that the TAB report has been submitted, discrepancies corrected, and corrective work approved.
   4. Contractor shall perform tests for system and intersystem performance only after CxA and Commissioner have approved the completed testing checklists for systems, subsystems, and equipment.

E. The Functional Performance tests shall be performed by the Contractor and Vendor(s) with oversight by the CxA. The CxA shall witness, verify, and document these tests.
   1. Functional Performance Tests shall include operating the systems and components through each of the written sequences of operation, other significant modes of miscellaneous alarms, power failure, and security alarm when impacted by and interlocked with commissioned equipment, as detailed in the Commissioning Plan.
   2. Checklists shall be completed comprehensively and to the extent necessary to enable the CxA to assure the Commissioner that the systems perform as per the OPR, BOD, and Contract Documents.
   3. If a test is failed for any reason and retesting is required, the Contractor shall provide retesting at no additional cost to the City.
   4. After testing, Contractor shall return settings to normal operating conditions.

3.4 OPERATION & MAINTENANCE MANUALS

A. General

1. The CxA shall review the Operation & Maintenance manuals provided by the Contractor for completeness of the document. The review process shall verify that Operation & Maintenance instructions meet Specifications and are included for all commissioned equipment furnished by the Contractor.
2. Published literature shall be specifically oriented to the provided equipment, indicating required operation and maintenance procedures, parts lists, assembly / disassembly diagrams and related information.
3. The Contractor shall incorporate the standard technical literature into system specific formats for this facility as designed and as actually installed. The resulting Operation & Maintenance information shall be system specific, concise, to the point and tailored specifically to this facility. The CxA shall review these documents as necessary for final corrections by the Contractor.
4. Contractor shall submit Operations & Maintenance Manuals for each piece of equipment for review no later than 45 days after submittal approval.

B. The Operation & Maintenance Manual review and coordination efforts shall be completed prior to Owner orientation sessions, as these documents are to be utilized in the orientation sessions.

C. System Operations Manual
   1. The CxA shall prepare and deliver these documents with inputs from the Contractor. The Contractor shall provide all required documents to the CxA, through the Commissioner. The required documents shall be described in the Commissioning Plan and Contract Documents. Typically, the manual includes the following:
      a. System, subsystem, and equipment descriptions
      b. Commissioned systems single line diagrams (to be provided by Mechanical, Electrical, Plumbing, and Building Management System (BMS) subcontractors).
      c. As built sequences of operations, control drawings and original set points (to be provided by Design Consultant and BMS subcontractor).
      d. Operating instructions for integrated building systems (to be provided by Mechanical and BMS subcontractors).
      e. Recommended schedule of maintenance requirements and frequency (to be provided by subcontractors).
      f. Recommended schedule for calibrating sensors and actuators (to be provided by BMS subcontractor).

3.5 DEMONSTRATION AND INSTRUCTION

A. The Contractor shall schedule and coordinate instruction sessions for the facility's staff for each commissioned system. Demonstrations shall be held per Contract Documents, along with the appropriate schematics, handouts and visual / audio orientation aids onsite with equipment.

B. The equipment vendors shall provide instruction on the specifics of each major equipment item including philosophy, troubleshooting and repair techniques.

C. The Contractor shall record and edit demonstration and orientation sessions, and provide these records to the CxA, through the Commissioner.

D. For additional direction pertinent to instruction, refer to other specific divisions for demonstration and instruction requirements.

3.6 WARRANTY REVIEW / SEASONAL TESTING

A. The CxA will return upon the start of the new season (cooling or heating) after Project completion to conduct performance tests that could not be performed due to ambient conditions. The seasonal testing will only be performed if suitable loads / conditions were unavailable during the performance testing stages (in other words; the requirement for testing is warranted).

B. The CxA will return to the site approximately 10 months into the 12-month guaranty period and interview the occupants and maintenance staff, review the operation of the building, provide recommendations for installation and operational problems and document warranty and operational issues in the issues database.

3.7 RECORD DRAWINGS

A. The CxA shall review the as built Contract Documents to verify incorporation of both design changes and as built construction details. Discrepancies noted shall be corrected by the appropriate party.

END OF SECTION 01 91 13

SECTION 01 91 15
GENERAL COMMISSIONING REQUIREMENTS FOR BUILDING ENCLOSURE

REFER TO THE ADDENDUM FOR APPLICABILITY OF THIS SECTION 01 91 15

PART I – GENERAL

1.1 RELATED DOCUMENTS

A. The following documents apply to all required work for the Project: (1) the Contract Drawings, (2) the Specifications, (3) the General Conditions, (4) the Addendum, and (5) the Contract [City of New York Standard Construction Contract].

B. The Owner's Project Requirements (OPR) and Basis of Design (BOD) documents are included by reference for information only.

C. The Commissioning Plan, prepared by the Commissioning Agent (CxA) under separate contract with the City of New York, contains requirements that apply to this section.

1.2 SECTION INCLUDES

A. This section includes the commissioning requirements for the Building Enclosure systems. Refer to "Building Enclosure Functional Performance Test Protocol" in other sections of the Project specifications for specific requirements regarding Building Enclosure Commissioning.

1. The commissioning requirements for the Building Enclosure systems given in this section are entirely separate from, and in addition to, the Section 01 91 13 GENERAL COMMISSIONING REQUIREMENTS FOR MEP SYSTEMS for this Project. The Contractor, and his/her Suppliers, Subcontractors, Vendors, etc., are required to participate in both commissioning processes as required.

1.3 DESCRIPTION

A. Building Enclosure Commissioning (BECx) is a systematic process of ensuring all building enclosure systems responsible for environmental separation perform as per the OPR and BOD. The BECx process is intended to verify and document proper installation and performance of building enclosure materials and systems in accordance with the Contract Documents.

B. Commissioning does not take away from, or reduce, the Contractor's responsibility to provide a finished and fully functioning product and installation.

C. This section shall in no way diminish the responsibility of the Contractor in performing all aspects of work and testing as outlined in the Contract Documents. Any requirements outlined in this section are in addition to requirements outlined in the Contract Drawings and Specifications.

1.4 RELATED WORK

A. Specific BECx requirements are given in this Section. The following Project Specification sections are related to the commissioning work specified in this section:

1. Basic Concrete Requirements: Refer to Division 03
2. Basic Metal Requirements: Refer to Division 05
3. Basic Waterproofing, Roofing, Air Barrier and Insulation Requirements: Refer to Division 07

4. Basic Fenestrations Requirements: Refer to Division 08
5. Basic Finishing Requirements: Refer to Division 09

1.5 DEFINITIONS AND ABBREVIATIONS

A. Refer to Article 2 of the Contract and Section 01 91 13 GENERAL COMMISSIONING REQUIEMENTS FOR MEP SYSTEMS for terms, words, and expressions not otherwise defined herein.

B. Approval: Acceptance that a material or system has been properly installed and is functioning in tested modes according to the Contract Documents.

C. Building Enclosure Commissioning Agent (BECA): Consultant under separate contract with the City of New York to provide BECx Services for this Project. BECA directs and coordinates day-to-day BECx commissioning activities.

D. Building Enclosure Testing Agency (BETA): Building Enclosure Testing Agency whom is an independent agency retained by the Contractor and approved by the Commissioner, fully accredited by the appropriate governing body for each of the materials, components or systems to be tested or evaluated for compliance with requirements of the Contract Documents and as directed by the BECA. Documentation of such certification must be submitted to and approved by the Commissioner prior to the start of any work by the BETA.

E. Commissioning: Commissioning is a systematic process of ensuring and documenting that the building systems, including the Building Enclosure, have been installed in the prescribed manner, are functionally checked and capable of being operated and maintained to perform with the design intent and have documentation to support proper installation and operation. The process does not eliminate or reduce the responsibility of the installing Contractors to provide a finished product.

F. Commissioning Agent (CxA): Refer to Section 01 91 13 GENERAL COMMISSIONING REQUIREMENTS FOR MEP SYSTEMS for Definition.

G. Commissioning Plan: Refer to Section 01 91 13 GENERAL COMMISSIONING REQUIREMENTS FOR MEP SYSTEMS for Definition.

H. Deficiency: Condition of a building enclosure material or system that is not in compliance with Contract Documents (that is, does not perform properly or is not complying with design intent).

I. Design Consultant: Refer to Section 01 91 13 GENERAL COMMISSIONING REQUIREMENTS FOR MEP SYSTEMS for Definition.

J. Functional Performance Test (FPT): Test of performance of building enclosure materials and systems. Systems are tested under various simulated environmental conditions, such as air leakage under pressure differential and water leakage under pressure differential with water spray.

K. Simulated Condition: Condition created for testing component or system (e.g., applying pressure differential across the building enclosure concurrent with water spray to simulate a wind driven rain).

L. Mock-up: The activities where systems or materials are initially constructed and tested.

1.6 COORDINATION

A. Building Enclosure Commissioning Team: Members of the Building Enclosure Commissioning Team shall consist of:

1. CxA
2. BECA
3. BETA
4. Commissioner
5. Contractor, and all Building Enclosure Subcontractors
6. Design Consultant

B. Management: City of New York shall contract services of the BECA through a separate contract. The BECA shall direct and coordinate commissioning activities and report to the Commissioner. All members of the Building Enclosure Commissioning Team shall cooperate to fulfill contracted responsibilities and objectives of the Contract Documents.

C. Scheduling: BECA shall work with Building Enclosure Commissioning Team to establish required commissioning activities to incorporate in preliminary commissioning schedule. The Contractor shall integrate commissioning activities into master construction schedule, in accordance with Section 01 32 00 CONSTRUCTION PROGRESS DOCUMENTATION. Necessary notifications are to be made in a timely manner in order to expedite commissioning.

1.7 SUBMITTALS

A. Contractor shall provide documentation required for commissioning work in accordance with Section 01 33 00 SUBMITTAL PROCEDURES. At minimum, documentation shall include but not be limited to:
1. Submittal of shop drawings, product data, samples, etc., relevant to BECx and as requested by the BECA. Such submittals shall be in compliance with Section 01 78 39 CONTRACT RECORD DOCUMENTS.
2. As-Built Record Drawings and Operation and Maintenance Information relevant to BECx and as required by the BECA. Such submittals shall be in compliance with Section 01 78 39 CONTRACT RECORD DOCUMENTS.
3. All demonstration and orientation submittals relevant to BECx and as requested by the BECA. Such submittals shall be in compliance with Section 01 79 00 DEMONSTRATION AND OWNER'S PREACCEPTANCE ORIENTATION.
4. Performance data, any performance test procedures, and installation and checkout materials.

B. The Contractor shall provide all submittals to the Design Consultant, as per Section 01 33 00 SUBMITTAL PROCEDURES. The Design Consultant will transmit all building enclosure related submittals to the BECA for concurrent review.

PART II – PRODUCTS – Part not used.

PART III – EXECUTION

3.1 SYSTEMS TO BE COMMISSIONED

A. Building Enclosure systems to be commissioned may include, but are not limited to, Below Grade Waterproofing Systems, Opaque Wall/Cladding Systems, and Fenestration systems. Refer to the Contract Documents for clarity.

3.2 RESPONSIBILITIES OF COMMISSIONING TEAM MEMBERS DURING CONSTRUCTION PHASE

A. Responsibilities of the Design Consultant include without limitation the following:

1. Review BECA comments on construction document and shop drawings.
2. Assist in dispute resolution regarding building enclosure items.
3. Review BECA reports.
4. Incorporate BECA Submittal Review Comments into response on Submittals.

B. Responsibilities of the BECA include the following without limitation, as needed per the Contract Documents:

1. Review and comment on mock-up construction and testing plan as provided by Contractor.
2. Development of BECx Plan.
3. Review of building enclosure shop drawings and submittals, including "approved equal" requests, through the Commissioner in accordance with Section 01 33 00 Submittal Procedures.
4. Attend combined Pre-construction and BECx kick-off meeting.
5. Develop construction checklists for the building enclosure for the Contractor's use.
6. Observe the construction of a building enclosure mock-up.
7. Witness the testing of a building enclosure mock-up.
8. Project meetings / conference calls / Coordination.
9. Field monitor installation of exterior enclosure components.
10. Update field report log.
11. Update BECx Plan.
12. Advise on Requests For Information.
13. Assist with the preparation of LEED paperwork.
14. Prepare Systems Manual, with required inputs and documentation from the Contractor in accordance with Section 01 78 39 CONTRACT RECORD DOCUMENTS.
15. Complete Maintenance Plan, with required inputs and documentation from the Contractor in accordance with Section 01 78 39 CONTRACT RECORD DOCUMENTS.
16. Prepare Training Manual, with required inputs and documentation from the Contractor in accordance with Section 01 78 39 CONTRACT RECORD DOCUMENTS.
17. Prepare final BECx record and enclosure commissioning close-out documents.
18. Develop on-going BECx Plan.

C. Responsibilities of the Contractor and Building Enclosure Subcontractors include without limitation the following:

1. Review BECx Plan and FPT specification.
2. Attend commissioning kick-off meeting and other Building Enclosure Commissioning Team meetings.
3. Incorporate commissioning activities into the construction schedule.
4. Periodically update commissioning activities in the construction schedule.
5. Notify Commissioner and BECA of work completion.
6. Verify building enclosure materials and assemblies are ready for functional testing.
7. Retain the services of an approved independent BETA; submit qualifications of independent BETA to Commissioner for approval; coordinate all activities and deliverables of this BETA; ensure all BETA deliverables are provided to the Building Enclosure Commissioning Team.
8. Attend all required material and systems testing.
9. Execute all periodic maintenance or repairs required on started systems from initial mock-up of equipment to final acceptance by Commissioner to prevent material warranties from being voided.

10. Submit maintenance logs of all interim maintenance or repair tasks performed by Contractor.
11. Ensure installation work is complete, is in compliance with Contract Documents, and is ready for Functional Performance Testing. FPT test results shall be documented by BECA.
12. Ensure resolution of non-compliance and deficiencies in construction or test results. Obtain written documentation of completion from the appropriate Contractors.
13. Provide letters of compatibility for adjacent building enclosure materials and assemblies.
14. Facilitate all repairs and retesting of failed condition at no additional cost to the City of New York.
15. Provide all warrantee information to BECA.

D. Responsibilities of the BETA include without limitation the following:

1. Attend commissioning kick-off meeting and other Building Enclosure Commissioning Team meetings.
2. Provide on-site technician and equipment to complete mock-up and field Functional Performance Testing.
3. Prepare and submit reports to the Commissioner at the conclusion of all testing.
4. Perform retesting and prepare corresponding reports.

3.3 BUILDING ENCLOSURE COMMISSIONING TEAM (BECx) MEETINGS

A. BECx meetings shall be held periodically as determined by the Commissioner and recommended by BECA.

B. Discussions held in BECx meetings shall include, but not be limited to, system/materials, mock-up/field, progress, scheduling, testing, documentation, deficiencies, and problem resolution.

C. The Contractor shall attend BECx meetings, and shall ensure the attendance of required subcontractors, as requested.

3.4 REPORTING

A. BECA shall provide status reports to the Commissioner. The Commissioner will provide such status reports to the Contactor, CxA, Design Consultant, and other entities as needed.

B. BECA shall submit non-compliance and deficiency reports to Commissioner. The Commissioner shall provide such reports to the Contractor, CxA, Design Consultant, and other entities as needed.

C. BECA shall provide a final summary report to Commissioner and CxA.

3.5 MOCK-UP AND FINAL CONSTRUCTION

A. Contractor shall verify completion of all assemblies compliant with Contract Documents and deficiency log items prior to Functional Performance Testing or concealment of functional performance layers within the building enclosure.

3.6 FUNCTIONAL PERFORMANCE TESTING

A. Objectives and Scope

1. The objective of Functional Performance Testing is to demonstrate that the building enclosure is performing according to documented design intent and Contract Documents. Functional Performance Testing facilitates bringing the building enclosure systems from a state of substantial completion to fully operational. Additionally, during Functional Performance Testing, areas of deficient performance are identified and corrected, improving building enclosure system performance.

B. Development of Test Procedures

1. The purpose of a specific test is to verify and document compliance of the installed enclosure systems with the OPR. Building Enclosure Functional Performance Test Protocols are provided in other sections of the Project Specifications for specific requirements regarding BECx.

C. Coordination and Scheduling

1. Contractor shall provide sufficient notice to BECA, through the Commissioner, regarding completion schedule for materials and systems. Testing to be performed in conjunction with site visits. Contractor shall schedule Functional Performance Tests with Commissioning Team. BECA shall witness and document functional testing of equipment and systems. BETA, as retained by the Contractor, shall execute tests under direction of BECA.

2. Successful completion of mock-up functional performance testing shall occur prior to full production installation of building enclosure materials and systems.

3.7 DOCUMENTATION, NON-CONFORMANCE, AND APPROVAL OF TESTS

A. Documentation

1. BECA shall witness and document results of FPT.

B. Non-Conformance

1. BECA shall record results of functional testing. Deficiency or non-conformance issues shall be noted and reported to the Commissioner. The Commissioner shall provide such non-conformance reports to the CxA, Design Consultant, Contractor, and other entities, as needed.

2. Corrections of minor deficiencies identified may be made during tests at discretion of the Commissioner and recommended by the BECA. In such cases, deficiency and resolution shall be documented.

3. Every effort shall be made to expedite testing and minimize unnecessary delays, while not compromising integrity of tests.

4. Deficiencies are handled in the following manner:

a) BECA documents deficiencies and notes Contractors response and intentions. Finding a deficiency shall not end the testing process.
b) BECA submits deficiency report to the Commissioner. The Commissioner shall provide such deficiency report to the CxA, Contractor, Design Consultant, and other entities as required.
c) Contractor corrects deficiency and certifies that material or assembly is ready to be retested.
d) Contractor informs Commissioner of retesting schedule for coordination with the BECA.
e) Contractor reschedules test with the Commissioner and BETA at no additional cost to the City of New York.

C. Testing

1. Costs for all testing and retesting required for the Project shall be the responsibility of the Contractor. The Contractor is to provide access to the test specimens to the Commissioning Team, through the Commissioner.

3.8 COMMISSIONING DOCUMENTATION

A. Final Report Details

1. Final BECx Report shall include an executive summary, list of participants and roles, brief building description, overview of commissioning and testing scope, and general description of testing and verification methods. Report shall contain evaluation regarding:

   a) Conformance to specifications and design intent
   b) Material/system installation
   c) Functional performance

2. All outstanding non-compliance items shall be specifically listed.

3. Recommendations for improvement to system or operations, future actions, etc. shall also be listed.

END OF SECTION 01 91 15

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FMS ID: **S136-367**

THE CITY OF NEW YORK
DEPARTMENT OF DESIGN AND CONSTRUCTION
DIVISION OF PUBLIC BUILDINGS
30-30 THOMSON AVENUE LONG ISLAND CITY, NEW YORK 11101-3045
TELEPHONE (718) 391-1000 WEBSITE www.nyc.gov/buildnyc

Department of Design and Construction

Contract for Furnishing all Labor and Material Necessary and Required for:

CONTRACT NO. 1 **GENERAL CONSTRUCTION WORK**

Staten Island 1 & 3 Garage - Phase 2

LOCATION: **1000 West Service Road**
BOROUGH: **Staten Island, NY 10314**
CITY OF NEW YORK

Prismatic Development Corp.
Contractor

Dated January 8th , 2021

Approved as to Form
Certified as to Legal Authority

Acting Corporation Counsel

AP 12/16/19

Dated December 16 , 20 19

Entered in the Comptroller's Office

First Assistant Bookkeeper

Dated _____ , 20 ____

Department of Design and Construction

PROJECT ID: S136-367

THE CITY OF NEW YORK
DEPARTMENT OF DESIGN AND CONSTRUCTION
DIVISION OF PUBLIC BUILDINGS

30-30 THOMSON AVENUE
LONG ISLAND CITY, NEW YORK 11101-3045
TELEPHONE (718) 391-1000
WEBSITE www.nyc.gov/buildnyc

VOLUME 3 OF 3

ADDENDUM TO THE GENERAL CONDITIONS

SPECIFICATIONS

FOR FURNISHING ALL LABOR AND MATERIALS
NECESSARY AND REQUIRED FOR:

Staten Island 1 & 3 Garage - Phase 2

LOCATION: 1000 West Service Road
BOROUGH: Staten Island, NY 10314
CITY OF NEW YORK

CONTRACT NO. 1 GENERAL CONSTRUCTION WORK

DSNY

TEN Arquitectos

20-026

Date: November 20, 2019

Department of Design and Construction

THE CITY OF NEW YORK
DEPARTMENT OF DESIGN AND CONSTRUCTION
DIVISION OF PUBLIC BUILDINGS

ADDENDUM TO THE GENERAL CONDITIONS FOR SINGLE CONTRACT PROJECTS

The General Conditions are hereby amended in accordance with the terms and conditions set forth in this Addendum.

I. PROJECT DESCRIPTION

FMS #:	**S136-367**
PROJECT NAME:	**Staten Island 1 & 3 Garage – Phase II**
PROJECT DESCRIPTION:	This project consists of a New Garage Building, Salt Shed structure, Fueling Station, Open-air Household waste drop-off area, Existing Building Repair shop and garage renovation, site development including outdoor DSNY truck parking with integrated plow rack storage, and personnel parking.
PROJECT LOCATION:	1000 West Service Road
BOROUGH:	Staten Island
CITY OF NEW YORK	
ZIP CODE:	10314
COMMUNITY BOARD #:	SI-03

LANDMARK STATUS:

DESIGNATED LANDMARK STRUCTURE OR SITE: ***NO***
If this is a Designated Landmark Structure or Site, Section 01 3591, Historic Treatment Procedures applies to this project.
LANDMARK QUALITY STRUCTURE: ***NO***
If this is a Landmark Quality Structure, Section 01 3591, Historic Treatment Procedures applies to this project.

II. LEED GREEN BUILDING REQUIREMENTS

This project must achieve a ***Silver*** LEED Green Building Rating. A certain number of credits are required for this rating and are detailed in the Addendum.

Sections 01 7419 Sub-Section 1.5(C) Waste Management Performance Requirements / LEED Certification, 01 8113.04 Sustainable Design Requirements for LEED v4 Buildings and 01 8119 Indoor Air Quality Requirements for LEED Buildings of the DDC Standard General Conditions shall apply to this project.

III. COMMISSIONING REQUIREMENTS

This project includes ***MEP and Building Enclosure*** Commissioning Requirements.

Other specific Commissioning Requirements can be found in the Project Specification Sections.

IV. PROJECT MANAGEMENT

☐ DDC shall publicly bid and enter into all contracts for the Project. DDC shall manage the Project using its own personnel.

☒ DDC shall publicly bid and enter into all contracts for the Project. A Construction Management firm (the "CM") hired by DDC shall manage the Project. The Contractor is advised that the CM shall serve as the representative of the Commissioner at the site and shall, subject to review by the Commissioner, be responsible for the inspection, management, coordination and administration of the required construction work, as delineated in the article of the Standard Construction Contract entitled "The Resident Engineer".

V. CONTRACTS FOR THE PROJECT

The Project consists of a single contract, the Contract for General Construction Work. The Contractor for General Construction Work is responsible for the performance of all required work for the Project as set forth in the Contract Documents (General Conditions, Drawings and Specifications), including all responsibilities and obligations assigned to separate Contractors for the following subdivisions of the work: Plumbing Work, HVAC Work, and Electrical Work. All responsibilities and obligations in the Contract Documents assigned to separate Contractors for such subdivisions of the work are the responsibility of the Contractor for General Construction Work.

VI. SCHEDULES

The Contractor is advised that Schedules A through F are attached to, and incorporated as part of, this Addendum to the General Conditions. These schedules contain important information that is specific to this Project. The Contractor is advised to carefully review these schedules.

VII. APPLICABILITY OF SECTIONS/SUB-SECTIONS AND AMENDED SUB-SECTIONS

The Contractor is advised that various Sections/Sub-Sections in the General Conditions may not apply to this Project or may apply as amended. Such Sections/Sub-Sections advise the Contractor to "Refer to the Addendum for the applicability of this Section/Sub-Section." Such Sections/Sub-Sections are set forth below. A check mark indicates whether the Section/Sub-Section (1) applies to the Project, (2) does not apply to the Project, or (3) applies to the Project as amended. If no box is checked, the Section/Sub-Section, as set forth in the General Conditions, applies to the Project. Amended Sections/Sub-Sections, if any, are set forth following this list of Sections.

Section	Sub-Section	Sub-Section	Applies	Does not Apply	Applies as Amended
01 1000	1.4 (B)	Scope and Intent / LEED	X		
	1.4(C)	Scope and Intent / Commissioning	X		
01 3233		Photographic Documentation	X		
01 3300	1.7 (A-E)	LEED Submittals	X		
01 3503		General Mechanical Requirements	X		
01 3506	3.2 (A-B)	Electrical Conduit System Including Boxes (Pull, Junction and Outlet)	X		
	3.3 (A-E)	Electrical Wiring Devices	X		
	3.4 (A-I)	Electrical Conductors and Terminations	X		
	3.5 (A-B)	Circuit Protective Devices	X		
	3.6 (A-J)	Distribution Centers	X		
	3.7 (A-I)	Motors	X		
	3.8 (A-I)	Motor Control Equipment	X		
01 3591		Historic Treatment Procedures		X	
01 5000	3.2 (A)	Temporary Water Facilities / Temporary Water	X		
	3.2 (B)	Temporary Water Facilities / Temporary Water – Work in Existing Facilities		X	
	3.3 (B)	Temporary Sanitary Facilities / Self-Contained Toilet Units	X		
	3.3 (C)	Temporary Sanitary Facilities / Existing Toilets		X	
	3.4 (B) 1	Temporary Power, Lighting, and Site Lighting / Connection to Utility Lines	X		
	3.4 (B) 2	Temporary Power, Lighting, and Site Lighting / Connection to Existing Electrical Power Service		X	
	3.4 (B) 3	Temporary Power, Lighting, and Site Lighting / Electrical Generator Power Service	X		
	3.4 (D)	Temporary Power, Lighting, and Site Lighting / Temporary Lighting	X		
	3.4 (E)	Temporary Power, Lighting, and Site Lighting / Site Security Lighting (for New Construction Only)	X		
	3.5 (A-J)	Temporary Heat	X		
	3.8 (A)	DDC Field Office / Office Space in Existing Building		X	
	3.8 (B)	DDC Field Office / DDC Field Office Trailer	X		
	3.8 (B-3a)	DDC Field Office / DDC Managed Field Office Trailer		X	
	3.8 (B-3b)	DDC Field Office / CM Managed Field Office Trailer	X		
	3.8 (D)	DDC Field Office / Additional Equipment for the DDC Field Office	X		

Section	Sub-Section	Sub-Section	Applies	Does not Apply	Applies as Amended
01 5000	3.13(A-D)	Work Fence Enclosure	X		
	3.17(B)	Project Rendering	X		
	3.18 (A-C)	Security Guards / Fire Guards on Site	X		
01 5411	3.1 (A-J)	Temporary Use, Operation and Maintenance of Elevators During Construction for New Buildings Up To and Including 15 Stories		X	
	3.2 (A-M)	Temporary Use, Operation and Maintenance of Elevators During Construction for New Buildings Over 15 Stories		X	
	3.3 (A-E)	Temporary Use, Operation and Maintenance of Elevators During Construction for Existing Buildings	X		
01 7300	3.3 (A-I)	Surveys	X		
	3.4 (A-B)	Borings	X		
	3.12 (A-D)	Sleeves and Hangers	X		
	3.13 (A)	Sleeve and Penetration Drawings	X		
	3.15 (A)	Location of Partitions	X		
01 7419	1.5 (C)	Waste Management Performance Requirements / LEED Certification	X		
01 7900		Demonstration and Owner's Pre-Acceptance Orientation	X		
01 8113.03		Sustainable Design Requirements for LEED v3 Buildings		X	
01 8113.04		Sustainable Design Requirements for LEED v4 Buildings			X
01 8113.13		VOC Limits for Adhesives, Sealants, Paints and Coatings for LEED v3 Buildings		X	
01 8119		Indoor Air Quality Requirements for LEED Buildings			X
01 9113		General Commissioning Requirements for MEP Systems	X		
01 9115		General Commissioning Requirements for Building Enclosure			X

AMENDED SECTIONS/SUB-SECTIONS

The Contractor is advised that the amended Sub-Sections set forth below are included in the General Conditions and apply to the Project.

Revised Section 01 33 00 as follows:

1.2 SUMMARY, add section E:
E. LEED requirements apply to all Phase II work with the exception of the Existing Building Scope. EPP requirements apply to the Project's Existing Building scope only

Revised Section 01 74 19 as follows:

1.2 SUMMARY, add section C:
C. LEED requirements apply to all Phase II work with the exception of the Existing Building Scope. EPP requirements apply to the Project's Existing Building scope only

Revised Section 01 81 13.04 as follows:

1.2 SUMMARY, add section E:
E. LEED requirements apply to all Phase II work with the exception of the Existing Building Scope. EPP requirements apply to the Project's Existing Building scope only

1.6 LEED SUBMITTALS, add section D:
D. LEED Documentation Submittals:

1. EA prerequisite, Building-Level Energy Metering: Product data for meters, sensors, and data collection system used to provide continuous metering of building energy-consumption performance.

2. EA credit Advanced Energy Metering: Provide the list of all advanced meters installed, including type, energy source metered and manufacturers' cut sheets.

3. EA credit Demand Response Program: Control system to be fully automated and capable of receiving and acting on external signal.

Revised Section 01 81 19 as follows:

1.6 LEED BUILDING GENERAL REQUIREMENTS, add section B:
B. LEED requirements apply to all Phase II work with the exception of the Existing Building Scope. EPP requirements apply to the Project's Existing Building scope only

Revised Section 01 91 15 as follows:
1.3 DESCRIPTION, add section D:
D. Requirements apply to all Phase II work with the exception of the Existing Building Scope.

ADDITIONAL SECTIONS/SUB-SECTIONS

The Contractor is advised that the additional Sub-Sections set forth below are included in the General Conditions and apply to the Project.

PHASING NARRATIVE

1. Refer to drawings PH.010.00, PH.020.00 and PH.030.00 for phasing logistics.
2. The existing DSNY facility must remain operational during Phase II construction.

3. Work at the existing facility shall be phased so that the facility is operational and accessible at all times with no interruption to any service during construction. The sequence of the work in phases shall be per areas shown on the contract phasing plan diagram and coordinated with DSNY.
4. The contractor shall submit a construction phasing plan for approval by the Commissioner before commencement of the work.
5. The contractor shall coordinate the contractor's phasing plan with the Commissioner and building management to maintain continuous facility operation.
6. The contractor shall be responsible to maintain the operation of the building, including providing necessary repairs, at all times for a 24 hour period during construction activities. In addition, upon completion of each phase, the contractor will be responsible for interim maintenance until substantial completion.
7. City of New York to remove all equipment, materials, and furnishings within work limit lines. Contractor to verify with owner that all equipment, furnishings, and equipment within work limit lines has been removed prior to construction.
8. Maintain all existing utilities. A 24 hour turnaround is required to re-establish any working utility connection.
9. All site lighting shown in drawings is to be removed within work limit is to be disconnected, taken down, and stored at a location on site provided by DSNY.
10. Contractor to verify and maintain operation of existing site lighting beyond phase II work limits.
11. Contractor to maintain emergency vehicle access around existing building at all times.
12. Contractor to adjust construction fences and gates as required per phasing sequence.
13. Contractor to provide traffic control flagmen during construction hours
14. Contractor shall include after hour work if needed to complete tasks to reopen roadway.
15. Contractor shall restore temporary staging areas upon completion of operations.
16. Contractor shall not perform work in the event any snow removals operation by DSNY, with the exceptions of zones A5, C1, & C4. The commissioner will be the sole determiner if work is able to take place on site in the event of snow
17. Contractor shall coordinate with existing building, roof and HVAC replacement 'sister' project contractor with regards to site and construction access.

ADDITIONAL SECTIONS

- 01 32 34 Building Information Modeling (BIM) Protocol
- 01 43 39 Façade Mockup Testing & Samples
- 01 80 00 Building Enclosure Contractor Performance Requirements

ADDITIONAL SUB-SECTIONS

The Contractor is advised that the additional Sub-Sections set forth below are included in the General Conditions and apply to the Project's Existing Building ONLY:

- All equipment, material and product purchasing associated with the Existing Building is required to comply with the requirements of New York City Environmentally Preferable Purchase (EPP) Minimum Standards for Construction Products.

    1. Architectural Coatings
        - For the products listed below, the maximum content of Volatile Organic Compounds (VOCs) shall be determined according to the American Society for Testing and Materials test method D 5116 (Guide for Small-Scale Environmental Chamber Determinations of Organic Emissions from Indoor Materials/Products).

Architectural Coating	Maximum Concentration of VOC in Grams per Liter
Floor Coatings	100
Lacquers - Pigmented	275
Primers for Flat Paint	100
Primers for Non-Flat Paint	150

Rust Preventative/Anti-Corrosive Paint	250

- Any product listed below that is compliant with Part 205 of Title Six of the New York Codes, Rules and Regulations meets the standard required under EPP Minimum Standards for Construction Products. The maximum content of VOCs for these products shall be determined according to the test method required under part 205.6 of such part.

Architectural Coating	Maximum Concentration of VOC in Grams per Liter
Concrete Bond Breakers	350
Concrete Curing Compounds	350
Concrete Surface Retarders	780
Dry Fog Coatings	400
Fire-Resistive Coatings	350
Fire-Retardant Coatings	650
Fire-Retardant Coatings - Opaque	350
Flat Paint	100
Form Release Compounds	250
Graphic Arts Coatings (Sign Paints)	500
High Temperature Coatings	420
Industrial Maintenance (IM) Coatings	340
Low Solids Coatings	120
Magnesite Cement Coatings	450
Mastic Texture Coatings	300
Metallic Pigmented Coatings	500
Multi-Color Coatings	500
Nonflat High-Gloss Coatings	250
Nonflat Paint	150
Pre-Treatment Wash Primers	420
Primers, Sealers, and Undercoaters	200
Quick-Dry Enamels	250
Quick-Dry Primers, Sealers, and Undercoaters	200
Recycled Coatings	250
Roof Coatings	250
Roof Coatings (Bituminous)	300
Roof Primers (Bituminous)	350
Shellacs – Clear	730
Shellacs – Opaque	550
Specialty Primers, Sealers and Undercoaters	350
Stains	250
Thermoplastic Rubber Coatings and Mastics	550
Waterproofing Concrete / Masonry Sealers	400
Waterproofing Sealers	250

- The products listed below shall be recovered material and comply with the Post-consumer Content and Total Recovered Materials Content requirements.

Architectural Coating	Post-consumer Content (%)	Total Recovered Materials Content (%)
Latex Paint – Consolidated	100	100
Latex Paint – Reprocessed White, Off-White and Pastel Colors	20	20
Latex Paint – Reprocessed Grey, Brown, Earthtones and Other Dark Colors	50-99	50-99

2. HVAC Equipment – Commercial

- All energy-using products for which the United States Environmental Protection Agency and the United States Department of Energy have developed energy efficiency standards for compliance with the Energy Star program shall be ENERGY STAR labeled. The following Commercial HVAC Equipment shall comply with this requirement:
  a. Air Conditioners, Air-Cooled
  b. Air Conditioners, Gas/Electric Package Units
  c. Heat Pumps, Air Source

- Chillers shall comply with the following Part Load Optimized Chillers IPLV and Full Load Optimized Chillers IPLV requirements:

Type	Compressor Type and Capacity	Part Load Optimized Chillers IPLV (kW/ton) Required	Full Load Optimized Chillers IPLV (kW/ton) Required
Air-Cooled	Scroll (30 – 60 tons)	0.86 or less	1.23 or less 1.1
Air-Cooled	Reciprocating (30 – 150 tons)	0.90 or less	1.23 or less 1
Air-Cooled	Screw (70 – 200 tons)	0.98 or less	1.23 or less 0.94
Water-Cooled	Centrifugal (150 – 299 tons)	0.52 or less	0.59 or less
Water-Cooled	Centrifugal (300 – 2,000 tons)	0.45 or less	0.56 or less
Water-Cooled	Rotary Screw (>150 tons)	0.49 or less	0.64 or less

3. Lighting Products
   - The following lighting products shall comply with the corresponding BEF requirement:

Product Type	Number of Lamps	Required BEF
Ballast, Fluorescent, Four-Foot, Linear T12, 34-Watts	1	2.64 or higher
Ballast, Fluorescent, Four-Foot, Linear T12, 34-Watts	2	1.41 or higher
Ballast, Fluorescent, Four-Foot, Linear T12, 34-Watts	3	0.93 or higher
Ballast, Fluorescent, Eight-Foot, Linear T12, 60-Watts	2	0.80 or higher
Ballast, Fluorescent, Four-Foot, Linear T8, 32-Watts	1	2.54 or higher
Ballast, Fluorescent, Four-Foot, Linear T8, 32-Watts	2	1.44 or higher
Ballast, Fluorescent, Four-Foot, Linear T8, 32-Watts	3	1.44 or higher
Ballast, Fluorescent, Four-Foot, Linear T8, 32-Watts	4	0.73 or higher
Ballast, Fluorescent, Eight-Foot, Linear T8, 59-Watts	2	0.80 or higher
Ballast, Fluorescent, Four-Foot, U-Bent T12, 34-Watts	1	2.64 or higher
Ballast, Fluorescent, Four-Foot, U-Bent T12, 34-Watts	2	1.41 or higher
Ballast, Fluorescent, Four-Foot, U-Bent T12, 34-Watts	3	0.93 or higher
Ballast, Fluorescent, U-Tube, U-Bent T8, 32-Watts	1	2.54 or higher
Ballast, Fluorescent, U-Tube, U-Bent T8, 32-Watts	2	1.44 or higher
Ballast, Fluorescent, U-Tube, U-Bent T8, 32-Watts	3	0.93 or higher
Ballast, Fluorescent, U-Tube, U-Bent T8, 32-Watts	4	0.73 or higher

- All energy-using products for which the United States Environmental Protection Agency and the United States Department of Energy have developed energy efficiency standards for compliance with the Energy Star program shall be ENERGY STAR labeled. The following Lighting Products shall comply with this requirement:
  a. Exit Signs
  b. Luminaires

- Luminaires, Downlight, With Compact Fluorescent Lamps (13-32 Lamp Wattage) shall

comply with the following LER requirements:

Luminaire Type (NEMA Designation)	Required LER
Open Optics	29 or higher
Baffled Optics	21 or higher
Lensed Optics	24 or higher

- Luminaires, Downlight, With Metal Halide Lamps (<150 Watts) shall comply with the following LER requirements:

Luminaire Type (NEMA Designation)	Required LER
Open Optics	35 or higher
Lensed Optics	30 or higher

- Luminaires, Fluorescent shall comply with the following LER requirements:

Luminaire Type (NEMA Designation)	Number of Lamps	Required LER
Lensed (FL)	2	62 or higher
Lensed (FL)	3	61 or higher
Lensed (FL)	4	61 or higher
VDT-Preferred Louvered (FP)	2	50 or higher
VDT-Preferred Louvered (FP)	3	51 or higher
VDT-Preferred Louvered (FP)	4	54 or higher
Four-Foot (FW)	2	63 or higher
Four-Foot (FW)	4	62 or higher
Four-Foot (FS)	1	70 or higher
Four-Foot (FS)	2	70 or higher
Four-Foot (FI)	1	67 or higher

- Luminaires, Industrial HID, With High Pressure Sodium Lamps (<150 Lamp Wattage) shall comply with the following LER requirements:

Upward Efficiency	Lamp Wattage	Closed Fixture (HR) LER Required	Open Fixture (HR) LER Required
0%	150-399	58 or higher	68 or higher
0%	400-999	63 or higher	84 or higher
0%	>1000	N/A	N/A
1%-10%	150-399	64 or higher	63 or higher
1%-10%	400-999	82 or higher	89 or higher
1%-10%	>1000	N/A	109 or higher
11%-20%	150-399	N/A	78 or higher
11%-20%	400-999	N/A	94 or higher
11%-20%	>1000	N/A	N/A
>20%	150-399	75 or higher	77 or higher
>20%	400-999	N/A	N/A
>20%	>1000	N/A	N/A

- Luminaires, Industrial HID, With Metal Halide Lamps (<150 Lamp Wattage) shall comply with the following LER requirements:

Upward Efficiency	Lamp Wattage	Closed Fixture (HR) LER Required	Open Fixture (HR) LER Required
0%	150-399	41 or higher	N/A
0%	400-999	53 or higher	59 or higher
0%	>1000	77 or higher	N/A
1%-10%	150-399	56 or higher	N/A
1%-10%	400-999	62 or higher	64 or higher
1%-10%	>1000	N/A	88 or higher
>20%	150-399	62 or higher	77 or higher
>20%	400-999	65 or higher	N/A

>20%	>1000	N/A	N/A

4. Miscellaneous Products – Construction
   - The products listed below shall comply with the Post-consumer Content and Total Recovered Materials Content requirements.

Cement and Concrete		
Material	**Recovered Post-consumer Content (%)**	**Total Recovered Materials Content (%)**
Cenospheres	No Range Recommended	Minimum 10% (by volume)
Coal fly Ash	No Range Recommended	No Range Recommended
GGBF Slag	No Range Recommended	No Range Recommended
Silica Fume	No Range Recommended	5-10% of cementitious material (dry weight basis)

Channelizers		
Material	**Recovered Post-consumer Content (%)**	**Total Recovered Materials Content (%)**
Plastic	25-90	No Range Recommended
Rubber (base only)	100	No Range Recommended

Delineators – Fixed		
Material	**Recovered Post-consumer Content (%)**	**Total Recovered Materials Content (%)**
Plastic	25-90	No Range Recommended
Rubber (base only)	100	No Range Recommended
Steel (BOF, base only)	16	25-30
Steel (BOF, base only)	67	100

Delineators – Flexible		
Material	**Recovered Post-consumer Content (%)**	**Total Recovered Materials Content (%)**
Plastic PET	25-85	No Range Recommended

Floor Tiles		
Material	Recovered Post-consumer Content (%)	Total Recovered Materials Content (%)
Rubber	90-100	No Range Recommended
Plastic	No Range Recommended	90-100

Insulation - Cellulose		
Material	**Recovered Post-consumer Content (%)**	**Total Recovered Materials Content (%)**
Post-consumer Paper	75	75

Insulation - Foam-in-Place		
Material	**Recovered Post-consumer Content (%)**	**Total Recovered Materials Content (%)**
Recovered Material	No Range Recommended	5

Insulation - Glass Fiber Reinforced		
Material	**Recovered Post-consumer Content (%)**	**Total Recovered Materials Content (%)**
Recovered Material	No Range Recommended	6

Insulation - Laminated Paperboard		
Material	**Recovered Post-consumer Content (%)**	**Total Recovered Materials Content (%)**
Post-consumer Paper	100	100

Insulation - Perlite Composition Board		
Material	**Recovered Post-consumer Content (%)**	**Total Recovered Materials Content (%)**

Post-consumer Paper	23	23

Insulation - Phenolic Rigid Foam

Material	Recovered Post-consumer Content (%)	Total Recovered Materials Content (%)
Recovered Material	No Range Recommended	5

Insulation - Plastic, Non-woven Batt

Material	Recovered Post-consumer Content (%)	Total Recovered Materials Content (%)
Recovered and/or Post-consumer Plastic	No Range Recommended	100

Insulation - Plastic Rigid Foam, Polyisocyanurate/Polyurethane, Rigid Foam

Material	Recovered Post-consumer Content (%)	Total Recovered Materials Content (%)
Recovered Material	No Range Recommended	9

Insulation - Structural Fiberboard

Material	Recovered Post-consumer Content (%)	Total Recovered Materials Content (%)
Recovered Material	No Range Recommended	80-100

Modular Threshold Ramps

Material	Recovered Post-consumer Content (%)	Total Recovered Materials Content (%)
Steel (BOF)	16	25-30
Steel (EAF)	67	100
Aluminum	No Range Recommended	10
Rubber	100	100

Nonpressure Pipe

Material	Recovered Post-consumer Content (%)	Total Recovered Materials Content (%)
Steel (BOF)	16	25-30
Steel (EAF)	67	100
Plastic (HDPE)	100	100
Plastic (PVC)	5-15	25-100
Cement	No Range Recommended	No Range Recommended

Roofing Materials

Material	Recovered Post-consumer Content (%)	Total Recovered Materials Content (%)
Steel (BOF)	16	25-30
Steel (EAF)	67	100
Aluminum	20-95	20-95
Fiber (felt) or Fiber Composite	50-100	50-100
Rubber	12-100	100
Plastic or Plastic/Rubber Composite	100	100
Wood/Plastic Composite	No Range Recommended	100
Cement	No Range Recommended	No Range Recommended

Traffic Barricades

Material	Recovered Post-consumer Content (%)	Total Recovered Materials Content (%)
Plastic (High Density Polyethylene [HDPE], Low-Density Polyethylene [LDPE], Polyethylene terephthalate [PET])	80-100	100

Steel (BOF)	16	25-30
Steel (EAF)	67	100
Fiberglass	No Range Recommended	No Range Recommended

- All energy-using products for which the United States Environmental Protection Agency and the United States Department of Energy have developed energy efficiency standards for compliance with the Energy Star program shall be ENERGY STAR labeled. The following Construction Products shall comply with this requirement:
  a. Roof Products

- Electric Motors shall comply with the following Nominal Efficiencies requirements:

Nominal Efficiencies for Induction Motors Rated 600 Volts or Less (Random Wound)						
Motor Size (HP)	**Open Drip-Proof (ODP)**			**Totally Enclosed Fan-Cooled (TEFC)**		
	6-pole (1200 rpm)	**4-pole (1200 rpm)**	**2-pole (1200 rpm)**	**6-pole (1200 rpm)**	**4-pole (1200 rpm)**	**2-pole (1200 rpm)**
1	82.5	85.5	77.0	82.5	85.5	77.0
1.5	86.5	86.5	84.0	87.5	86.5	84.0
2	87.5	86.5	85.5	88.5	86.5	85.5
3	88.5	89.5	85.5	89.5	89.5	86.5
5	89.5	89.5	86.5	89.5	89.5	88.5
7.5	90.2	91.0	88.5	91.0	91.7	89.5
10	91.7	91.7	89.5	91.0	91.7	90.2
15	91.7	93.0	90.2	91.7	92.4	91.0
20	92.4	93.0	91.0	91.7	93.0	91.0
25	93.0	93.6	91.7	93.0	93.6	91.7
30	93.6	94.1	91.7	93.0	93.6	91.7
40	94.1	94.1	92.4	94.1	94.1	92.4
50	94.1	94.5	93.0	94.1	94.5	93.0
60	94.5	95.0	93.6	94.5	95.0	93.6
75	94.5	95.0	93.6	94.5	95.4	93.6
100	95.0	95.4	93.6	95.0	95.4	94.1
125	95.0	95.4	94.1	95.0	95.4	95.0
150	95.4	95.8	94.1	95.8	95.8	95.0
200	95.4	95.8	95.0	95.8	96.2	95.4
250	95.4	95.8	95.0	95.8	96.2	95.8
300	95.4	95.8	95.4	95.8	96.2	95.8
350	95.4	95.8	95.4	95.8	96.2	95.8
400	95.8	95.8	95.8	95.8	96.2	95.8
450	96.2	96.2	95.8	95.8	96.2	95.8
500	96.2	96.2	95.8	95.8	96.2	95.8

Nominal Efficiencies for Induction Motors Rated Medium Voltage or Less (Form Wound)		
Motor Size	**Open Drip-Proof (ODP)**	**Totally Enclosed Fan-Cooled (TEFC)**

(HP)	6-pole (1200 rpm)	4-pole (1200 rpm)	2-pole (1200 rpm)	6-pole (1200 rpm)	4-pole (1200 rpm)	2-pole (1200 rpm)
250-500	95.0	95.0	94.5	95.0	95.0	95.0

VIII. SPECIAL EXPERIENCE REQUIREMENTS FOR THE PROJECT

Refer to page 3 of the Bid Booklet in Volume 1 for Special Experience Requirements.

IX. REVISIONS: SPECIFICATIONS AND CONTRACT DRAWINGS

The Specifications and the Contract Drawings for the Project are revised in accordance with the provisions set forth below.

(1) Owner: Wherever the term "Owner" is used in the Specifications and/or the Contract Drawings, such term shall mean the City of New York.

(2) Other Entities: In the event any entity other than the City of New York is referred to or named as the "Owner" in the Specifications and/or the Contract Drawings, the name of such other entity is deemed deleted and replaced with the "City of New York".

(3) Architect / Engineer: Wherever the words "Architect", "Engineer", "Architect / Engineer" or "Architect and/or Engineer" are used in the Specifications and/or the Contract Drawings, such words are deemed deleted and replaced with the word "Commissioner".

(4) Products / Manufacturers: Wherever the Specifications and/or the Contract Drawings require the contractor to provide a particular product (i.e., material and/or equipment) from a designated manufacturer and/or vendor, the term "or approved equal" is deemed inserted, even if only one product and/or manufacturer is specified, except as otherwise provided below.

(a) Proprietary Items: If the Bid Booklet contains a Notice which identifies a particular product from a designated manufacturer as a "Sole Source Product, the Contractor shall be required to provide such specified product. In such case, no substitution or "approved equal" will be permitted.

(5) Special Experience Requirements: Special Experience Requirements for the Project, if any, are set forth in the Bid Booklet. Special Experience Requirements may apply to contractors, subcontractors, installers, manufacturers and/or suppliers. If the Specifications and/or the Contract Drawings contain any Special Experience Requirement that is not set forth in the Bid Booklet, such Special Experience Requirement is deemed deleted, except as otherwise provided below.

(a) Any Special Experience Requirement that provides that the entity performing the work or supplying the material must have more than three (3) years of experience, is revised to provide that the entity performing the work or supplying the material must have three (3) years of experience, except as described in paragraph (b) below.
(b) Any Special Experience Requirement that pertains to the abatement of hazardous materials shall not be subject to the deletion and/or revision set forth above. Such Special Experience Requirement shall remain in full force and effect.
(c) Any Special Experience Requirement that provides that the entity performing the work must be licensed, authorized, certified, approved by or acceptable to the manufacturer, is deemed deleted and replaced with the requirement that such entity must be properly trained for the specified work.
(d) Any Special Experience Requirement that provides that the individual workers performing the work must be licensed, authorized, certified, approved by or acceptable to the manufacturer, is deemed deleted and replaced with the requirement that such individual workers must be properly trained for the specified work.

(6) Alternate Bids: If the agency is requesting the submission of Alternate Bids, a Notice regarding such Alternate Bids is set forth in the Bid Booklet. In the event of any conflict or inconsistency between (1) the Notice regarding Alternate Bids set forth in the Bid Booklet and (2) a provision in the Specifications and/or the Contract Drawings regarding Alternate Bids, the Notice set forth in the Bid Booklet shall prevail. If the agency is not requesting the submission of Alternate Bids, as indicated by the absence of a Notice in the Bid Booklet, and the Specifications and/or the Contract Drawings contain any provision regarding Alternate Bids, such provision is deemed deleted.

(7) Contractor Retained Engineer: If the Specifications and/or the Contract Drawings require the Contractor to retain an Engineer to provide engineering services for the Project, the following sentence is deemed inserted: "Such Engineer must be a Professional Engineer, licensed in the State of New York."

(8) LEED Related Provisions: If the Specifications and/or the Contract Drawings require the Contractor to purchase FSC certified wood, rapidly renewable materials, materials within 500 miles, metal materials, products, anchors, framing and accessories with recycled content, or incorporate fly ash in concrete, such provisions are

deemed deleted and replaced with the requirement that if the contractor has purchased FSC certified wood, rapidly renewable materials, materials within 500 miles, metal materials, products, anchors, framing and accessories with recycled content, or incorporated fly ash in concrete, the contractor shall submit such forms or documentation as may be required by the City in order for the USGBC to certify that the Project qualifies for the related LEED credit(s).

(9) Guarantees: Requirements for Guarantees and Maintenance are set forth in Schedule B, which is included in the Addendum to the General Conditions. In the event of any conflict or inconsistency between (1) a guarantee and/or maintenance requirement set forth in the Specifications and/or the Contract Drawings and (2) a guarantee and/or maintenance requirement set forth in Schedule B, the guarantee and/or maintenance requirement set forth in Schedule B shall prevail.

(10) Warranties: Requirements for Warranties are set forth in Schedule B, which is included in the Addendum to the General Conditions.

(a) The term "manufacturer's warranty" as described in this article encompasses the following terms as indicated in the Specifications: "Manufacturer's Warranty", "Manufacturer's Special Warranty", "Special Warranty", "Special Finish Warranty", "Manufacturer's Special Warranty for a (product, assembly).

(b) In the event of any conflict or inconsistency between (1) a warranty requirement set forth in the Specifications and/or the Contract Drawings and (2) a warranty requirement set forth in Schedule B, the warranty requirement set forth in Schedule B shall prevail.

(c) In the event a warranty requirement set forth in the Specifications and/or the Contract Drawings is omitted from Schedule B, such omission from Schedule B shall have no effect and the Contractor's obligation to provide the manufacturer's warranty, as set forth in the Specifications and/or the Contract Drawings, shall remain in full force and effect.

(d) In the event a warranty requirement for a particular item of material or equipment is omitted from Schedule B, as well as from the Specifications or the Contract Drawings, and the manufacturer of such item actually provides a warranty, the Contractor shall be obligated to obtain and deliver to the Commissioner the highest level of warranty actually provided by that manufacturer.

(11) Exculpatory Provisions: In the event the Specifications and/or the Contract Drawings contain any provision whereby the consultant and/or any of its officers, employees or agents, including subconsultants, is absolved of responsibility for any act or omission, such provision is deemed deleted.

(12) Insurance: Provisions regarding insurance coverage the Contractor is required to provide are set forth in Article 22 of the City of New York Standard Construction Contract and Schedule A, which is included in the Addendum to the General Conditions. In the event the Specifications and/or the Contract Drawings contain any provision regarding insurance requirements, such provision is deemed deleted.

(13) Indemnification: Provisions regarding indemnification are set forth in Articles 7, 12, 22 and 57 of the City of New York Standard Construction Contract. In the event the Specifications and/or the Contract Drawings contain any provision regarding indemnification, such provision is deemed deleted.

(14) Dispute Resolution: Provisions regarding dispute resolution are set forth in Article 27 of the City of New York Standard Construction Contract. In the event the Specifications and/or the Contract Drawings contain any provision regarding dispute resolution, such provision is deemed deleted.

(15) Payment to Other Entities: In the event the Specifications and/or the Contract Drawings contain any provision which requires the Contractor to make payments to an entity other than a subcontractor and/or supplier providing services and/or material for the project, such provision is deemed deleted.

(16) General Conditions: In the event of any conflict or inconsistency between (1) the Specifications and/or the Contract Drawings and (2) the General Conditions, the General Conditions shall prevail.

(17) Standard Construction Contract: In the event of any conflict or inconsistency between (1) the Specifications and/or the Contract Drawings and (2) the City of New York Standard Construction Contract, the City of New York Standard Construction Contract shall prevail.

SCHEDULE A (FOR PUBLICLY BID PROJECTS)
PART I - Contract Requirements

Various Articles of the Contract refer to requirements which are set forth in Schedule A of the General Conditions. The Schedule set forth below specifies the following: (1) the referenced Articles of the Contract, and (2) the specific requirements applicable to the contract.

REFERENCE	ITEM	REQUIREMENTS	CONTRACT #1	
Information For Bidders	Bid Security		See Attachment 1 – Bid Information in the Bid Booklet	
Information For Bidders	Performance and Payment Bonds		See Attachment 1- Bid Information in the Bid Booklet	
Article 14 Contract	Time of Substantial Completion	Consecutive Calendar Days	915 CCDS	
Article 15 Contract	Liquidated Damages	For each consecutive calendar day over completion time	$7,000	
SECTION 012000 MILESTONE 1 AND LIQUIDATED DAMAGES	Milestone Liquidated Damages	For each consecutive calendar day over completion time If the **Contractor** fails to substantially complete the Milestone within the time fixed for Milestone Completion plus authorized time extensions, the **Contractor** shall pay to the **City** the amount indicated to the right.	Milestone 1: $6,000.00 for each calendar day over substantial completion time	
Article 17 Contract	Sub-Contracts	Not to exceed Percent of Contract Price	60%	
Article 21 Contract	Retainage	Percent of Voucher	If 100% bonds are required	5%
			If 100% bonds are not required, and Contract Price is $1,000,000 or less	5%
			If 100% bonds are not required, and Contract Price is more than $1,000,000	10%
Article 24 Contract	Deposit Guarantee	Percent of Contract Price	1%	
Article 24 Contract	Period of Guarantee		See Schedule B of the Addendum to the General Conditions	
Article 74 Contract	Statement of Work		Addenda, numbered: 5	
Article 75 Contract	Compensation to be Paid to Contractor		Amount for which the Contract was Awarded: one hundred twenty-seven million eight hundred eighty-eight thousand five hundred sixty-seven Dollars ($ 127,888,567.00)	
Article 79 Contract	MWBE Program		See M/WBE Utilization Plan in the Bid Booklet	

SCHEDULE A (FOR PUBLICLY BID PROJECTS)

Relating to Article 22 - Insurance

PART II. Types of Insurance, Minimum Limits and Special Conditions

Note: All certificate(s) of insurance submitted pursuant to Contract Article 22.3. 3 must be accompanied by a Certification by Broker consistent with Part III below and include the following information:

- **For each insurance policy, the name and NAIC number of issuing company, number of policy, and effective dates;**
- **Policy limits consistent with the requirements listed below;**
- **Additional insureds or loss payees consistent with the requirements listed below; and**
- **The number assigned to the Contract by the City (in the "Description of Operations" field).**

Insurance indicated by a blackened box (■) or by (X) in the ☐ to left will be required under this contract.

Types of Insurance (per Article 22 in its entirety, including listed paragraph)	Minimum Limits and Special Conditions
■ Commercial General Liability Art. 22.1.1	This Contract requires Commercial General Liability Insurance (CGL) that is at least as broad as ISO Form CG 00 01 (see Section 22.1.1 of the New York City Standard Construction Contract). CGL policies that include endorsements that add exclusions to ISO Form CG 00 01 do not comply with the Contract. The Department may, in its sole discretion, accept endorsements that add exclusions, but the Department will generally reject endorsements that add exclusions that exempt all or part of the Work of the Project. For example, if the Project includes Work on a roof of a four-story building, the Department will reject a CGL policy that includes a "Three Story Height Limitation Endorsement." The minimum limits shall be $1,000,000.00 per occurrence and $2,000,000.00 per project aggregate applicable to this **Contract.** Additional Insureds: 1. City of New York, including its officials and employees, with coverage at least as broad as ISO Forms CG 20 10 and CG 20 37, and 2. All person(s) or organization(s), if any, that Article 22.1.1(b) of the **Contract** requires to be named as Additional Insured(s), with coverage at least as broad as ISO Form CG 20 26. The Additional Insured endorsement shall either specify the entity's name, if known, or the entity's title (e.g., Project Manager). 3. The People of the State of New York; the State of New York; the State of New York and the Commissioner of Transportation of New York State, and all employees of the Commissioner of Transportation both officially and personally.

SCHEDULE A (FOR PUBLICLY BID PROJECTS)

Relating to Article 22 - Insurance

PART II. Types of Insurance, Minimum Limits and Special Conditions

Insurance indicated by a blackened box (■) or by (X) in the ☐ to left will be required under this contract.

Types of Insurance (per Article 22 in its entirety, including listed paragraph)	Minimum Limits and Special Conditions
■ Workers' Compensation Art. 22.1.2 ■ Disability Benefits Insurance Art. 22.1.2 ■ Employers' Liability Art. 22.1.2 □ Jones Act Art. 22.1.3 □ U.S. Longshoremen's and Harbor Workers Compensation Act Art. 22.1.3	Workers' Compensation, Employers' Liability, and Disability Benefits Insurance: Statutory per New York State law without regard to jurisdiction. **Note**: The following forms are acceptable: (1) New York State Workers' Compensation Board Form No. C-105.2, (2) State Insurance Fund Form No. U-26.3, (3) New York State Workers' Compensation Board Form No. DB-120.1 and (3) Request for WC/DB Exemption Form No. CE-200. The City will not accept an ACORD form as proof of Workers' Compensation or Disability Insurance. Jones Act and U.S. Longshoremen's and Harbor Workers' Compensation Act: Statutory per U.S. law.
■ Builders' Risk Art. 22.1.4	100 % of total value of **Work** **Contractor** the Named Insured; the **City** both an Additional Insured and one of the loss payees as its interests may appear. If the **Work** does not involve construction of a new building or gut renovation work, the **Contractor** may provide an installation floater in lieu of Builders Risk insurance. Note: Builders Risk Insurance may terminate upon **Substantial Completion** of the **Work** in its entirety.
■ Commercial Auto Liability Art. 22.1.5	$1,000,000.00 per accident combined single limit If vehicles are used for transporting hazardous materials, the **Contractor** shall provide pollution liability broadened coverage for covered vehicles (endorsement CA 99 48) as well as proof of MCS 90

SCHEDULE A (FOR PUBLICLY BID PROJECTS)

Relating to Article 22 - Insurance

PART II. Types of Insurance, Minimum Limits and Special Conditions

Insurance indicated by a blackened box (■) or by (X) in the ☐ to left will be required under this contract.

Types of Insurance (per Article 22 in its entirety, including listed paragraph)	Minimum Limits and Special Conditions
☐ Contractor's Pollution Liability Art. 22.1.6	$1,000,000 per occurrence $2,000,000 aggregate Additional Insureds: 1. City of New York, including its officials and employees, and 2 The People of the State of New York; the State of New York; the State of New York and the Commissioner of Transportation of New York State, and all employees of the Commissioner of Transportation both officially and personally.
☐ Marine Protection and Indemnity Art. 22.1.7(a)	$_____ per occurrence $_____ aggregate Additional Insureds: 1. City of New York, including its officials and employees, and 2. _____ 3. _____
☐ Hull and Machinery Insurance Art. 22.1.7(b)	$_____ per occurrence $_____ aggregate Additional Insureds: 1. City of New York, including its officials and employees, and 2. _____ 3. _____
☐ Marine Pollution Liability Art. 22.1.7(c)	$_____ each occurrence Additional Insureds: 1. City of New York, including its officials and employees, and 2. _____ 3. _____

[OTHER] □ Ship Repairers Legal Liability	Art. 22.1.8	$_____ each occurrence

SCHEDULE A (FOR PUBLICLY BID PROJECTS)

Relating to Article 22 - Insurance

PART II. Types of Insurance, Minimum Limits and Special Conditions (Continued)

Insurance indicated by a blackened box (■) or by (X) in the ☐ to left will be required under this contract.

Types of Insurance (per Article 22 in its entirety, including listed paragraph)	Minimum Limits and Special Conditions
[OTHER] Art. 22.1.8 □ Collision Liability/Towers Liability	$_____ per occurrence $_____ aggregate Additional Insureds: 1. City of New York, including its officials and employees, and 2. _____ 3. _____
[OTHER] Art. 22.1.8 □ Railroad Protective Liability _____	$_____ per occurrence $_____ aggregate Additional Insureds: 1. City of New York, including its officials and employees, and 2. _____ 3. _____
[OTHER] Art. 22.1.8 ■ Asbestos Liability _____	Only required of the Contractor or Subcontractor performing any required asbestos removal. $1,000,000 each occurrence, $2,000,000 aggregate (Combined Single Limit); only required of the Contractor or Subcontractor performing any required asbestos removal. Additional Insureds: 1. City of New York, including its officials and employees, and 2. The People of the State of New York; the State of New York; the State of New York and the Commissioner of Transportation of New York State, and all employees of the Commissioner of Transportation both officially and personally.

SCHEDULE A (FOR PUBLICLY BID PROJECTS)

Relating to Article 22 - Insurance

PART II. Types of Insurance, Minimum Limits and Special Conditions (Continued)

Insurance indicated by a blackened box (■) or by (X) in the ☐ to left will be required under this contract.

[OTHER] Art. 22.1.8 □ Boiler Insurance_____	 $200,000
[OTHER] Art. 22.1.8 ■ Professional Liability In the event any section of the Specifications requires the Contractor to engage a Professional Engineer to provide design and/or engineering services, the Engineer engaged by the Contractor, as well as any sub consultant(s) performing professional services, shall provide Professional Liability Insurance.	$1,000,000 per occurrence The Contractor's Professional Engineer shall maintain and submit evidence of Professional Liability Insurance in the minimum amount of $1,000,000 per claim. The policy or policies shall include an. endorsement to cover the liability assumed by the Contractor under this Agreement arising out of the negligent performance of professional services or caused by an error, omission or negligent act of the Contractor's Professional Engineer or anyone employed by the Contractor's Professional Engineer. Claims-made policies will be accepted for Professional Liability Insurance. All such policies shall have an extended reporting period option or automatic coverage of not less than two (2) years. If available as an option, the Contractor's Professional Engineer shall purchase extended reporting period coverage effective on cancellation or termination of such insurance unless a new policy is secured with a retroactive date, including at least the last policy year.

SCHEDULE A (FOR PUBLICLY BID PROJECTS)

Relating to Article 22 - Insurance

PART III. Certificates of Insurance

All certificates of insurance (except certificates of insurance solely evidencing Workers' Compensation Insurance, Employer's Liability Insurance, and/or Disability Benefits Insurance) must be accompanied by one of the following:

(1) the Certification by Insurance Broker or Agent on the following page setting forth the required information and signatures;

-- OR --

(2) copies of all policies as certified by an authorized representative of the issuing insurance carrier that are referenced in such certificate of insurance. If any policy is not available at the time of submission, certified binders may be submitted until such time as the policy is available, at which time a certified copy of the policy shall be submitted.

SCHEDULE A (FOR PUBLICLY BID PROJECTS)

Relating to Article 22 - Insurance

PART III. Certification by Insurance Broker or Agent

The undersigned insurance broker or agent represents to the City of New York that the attached Certificate of Insurance is accurate in all material respects.

_____

[Name of broker or agent (typewritten)]

_____

[Address of broker or agent (typewritten)]

_____

[Email address of broker or agent (typewritten)]

_____

[Phone number/Fax number of broker or agent (typewritten)]

_____

[Signature of authorized official or broker or agent]

_____

[Name and title of authorized official, broker or agent (typewritten)]

State of .....)
) ss:
County of .....)

Sworn to before me this

_____ day of _____, 20__

_____

NOTARY PUBLIC FOR THE STATE OF_____

SCHEDULE A (FOR PUBLICLY BID PROJECTS)

Relating to Article 22 - Insurance

PART IV. Address of Commissioner

Wherever reference is made in Article 7 or Article 22 to documents to be sent to the **Commissioner** (e.g., notices, filings, or submissions), such documents shall be sent to the address set forth below or, in the absence of such address, to the **Commissioner's** address as provided elsewhere in this **Contract**.

ACCO's Office, Insurance Unit

30-30 Thomson Avenue, 4th Floor

Long Island City, New York 11101

SCHEDULE B

Guarantees and Warranties

(Reference: Section 01 7839, Article 2.7 of the DDC Standard General Conditions)

GUARANTY FROM CONTRACTOR

(1) Contractor's Guaranty Obligation: The Contractor shall promptly repair, replace, restore or rebuild, as the Commissioner may determine, any finished Work in which defects of materials or workmanship may appear or to which damage may occur because of such defects, during the one (1) year period subsequent to the date of Substantial Completion (or use and occupancy in accordance with the Contract), except for the areas of Work set forth below:

- Roofing, Waterproofing, and Joint Sealant Work. For these types of work, the guarantee period shall be (2) two years.
- Trees and/or Plant Material. For trees and/or plant material furnished and installed, the guarantee period shall be (2) two years. During the guarantee period, the Contractor shall provide all maintenance services set forth in the Specifications.

(2) Guaranty Period: The obligation of the Contractor, and its Surety under the Performance Bond, is limited to the period(s) of time specified above.

(3) Other Provisions Deemed Deleted: In the event the Specifications and/or the Contract Drawings contain any provisions regarding guaranty requirements, such provisions are deemed deleted and replaced with the guaranty requirements set forth in this Schedule B.

****

WARRANTY FROM MANUFACTURER

(1) Contractor's Obligation to Provide Warranties: The items of material and/or equipment for which manufacturer warranties are required are listed below. For each item of material and/or equipment listed below, the Contractor shall obtain a written warranty from the manufacturer. Such warranty shall provide that the material or equipment is free from defects for the period set forth below and will be replaced or repaired within such specified period. The Contractor shall deliver all required warranties to the Commissioner.

(2) Required Warranties:

SPECIFICATION #	MATERIAL OR EQUIPMENT	WARRANTY PERIOD
020102	Vapor Barrier Installation	20 years
034500	Architectural Pre-Cast Concrete	1 year
070001	Rainscreen System Finish	20 years
070001	Rainscreen System Framing	10 years
071326	Sheet Membrane Waterproofing	10 years
071816	Vehicular Traffic Coating	5 years
072000	Thermoplastic Membrane Roofing	20 year
072701	Weather Resistive Barrier	5 years
074214	Metal Panel Finish	20 years
074646	Fiber-Cement Panels	30 years
076201	Façade Sheet Metal Flashings	2 years
078100	Sprayed Fire-Resistive Materials	1 year
078123	Intumescent Fireproofing	2 years min.
079200	Interior Joint Sealants	10 years
079200	Interior Joint Sealants Installation	2 years
079201	Exterior Joint Sealants	5 years

079201	Exterior Joint Sealants (Structural Silicone)	20 years
084001	Glazed Storefronts and Curtain Wall System Finish	20 years
084519	Polycarbonate Wall System	5 years
084900	Fire Rated Glass and Framing Systems	3 years
086301	Aluminum Framed Skylight Systems Finish	20 years
087100	Door Hardware (Closers - Mechanical)	30 years
087100	Door Hardware (Closers - Mechanical - Concealed)	15 years
087100	Door Hardware (Automatic Operators)	2 years
087100	Door Hardware (Exit Devices - Mechanical)	3 years
087100	Door Hardware (Exit Devices - Electrified)	1 year
087100	Door Hardware (Locksets - Mechanical mortise Locks)	3 years
087100	Door Hardware (Locksets - Electrified)	1 year
087100	Door Hardware (Continuous Hinges)	Lifetime
087100	Door Hardware (Key Blanks)	Lifetime
088000	Exterior Glazing (Glass)	10 years
088000	Exterior Glazing (Coated Glass Products)	10 years
088000	Exterior Glazing (Laminated Glass)	10 years
088000	Exterior Glazing (Insulation Glass)	10 years
088010	Interior Glass and Glazing (Coated Glass Products)	5 years min.
088010	Interior Glass and Glazing (Laminated Glass)	5 years
089000	Louvers (Finish)	20 years
096500	Resilient Tile Flooring	5 years
142400	Hydraulic Elevators	1 year
220533	Heat Tracing for Plumbing Piping (Heating Cable)	10 years
221513	General-Service Compressed-Air Piping (Aluminum Piping)	10 years
231113	Emergency Generator Fuel oil storage and distribution system (Tank)	30 years
235100	HVAC Breeching, Chimneys and Stack	10 years
235233	Condensing Boilers	25 years
235233	Condensing Boilers (Heat Exchanger)	25 years
235233	Condensing Boilers (Heat Exchanger Corrosion)	12 years
235233	Condensing Boilers (Parts)	2 years
235600	Solar Hot Water System (Performance)	10 years
235600	Solar Hot Water System (Mounting System)	20 years
238126	Split System Air Conditioners	5 years
238129	Variable Refrigerant Flow HVAC System	1 year
262413	Switchboards	5 years
262416	Panelboards	5 years
263213	Engine Generators	3 years
265100	Interior Lighting (Electronic Ballasts)	5 years
265100	Interior Lighting (Electromagnetic Ballasts)	3 years
265100	Interior Lighting (T5 and T8 Fluorescent Lamps)	2 years
265100	Interior Lighting (LED luminaires)	5 years
265113	Architectural Luminaires, Lamps, Ballasts	5 years
270200	Structured Cabling	20 years
274000	Audio Visual Communication	20 years
281600	Access Control & Video Surveillance	20 years
312500	Soil Erosion and Sediment Control (Temporary Erosion Control Materials)	1.5 years
312500	Soil Erosion and Sediment Control (Permanent Erosion Control Materials)	3 years
323119	Decorative Metal Fence and Gate (Product)	3 years
323119	Decorative Metal Fence and Gate (Finish)	20 years
481400	Solar Energy Electrical Power Generation System	10 years
481400	Solar Energy Electrical Power Generation System (Power Output)	25 years

(3) Application: The obligations under the warranty for the periods specified above shall apply only to the manufacturer of the material or equipment, and not to the Contractor or its Surety; provided, however, the Contractor retains responsibility for obtaining all required warranties from the manufacturers and delivering the same to the Commissioner.

(4) Other Provisions: The warranty requirements set forth in this Schedule B are also included in the

Specifications.

(a) In the event of any conflict between a warranty requirement set forth in the Specifications and a warranty requirement set forth in Schedule B, the warranty requirement set forth in Schedule B shall take precedence.

(b) In the event a warranty requirement set forth in the Specifications is omitted from Schedule B, such omission from Schedule B shall have no effect and the Contractor's obligation to provide the manufacturer's warranty, as set forth in the Specifications, shall remain in full force and effect

(c) In the event a warranty requirement for a particular item of material or equipment is omitted from both Schedule B and the Specifications, and the manufacturer of such item actually provides a warranty, the Contractor shall be obligated to obtain and deliver to the Commissioner the highest level of warranty actually provided by that manufacturer.

(d) In the event a warranty requirement is provided for a particular item of material or equipment, and such requirement specifies a warranty period that is longer than that which is actually provided by any of the specified manufacturers, the Contractor shall be obligated to obtain and deliver to the Commissioner the highest level of warranty actually provided by any of the specified manufacturers, unless otherwise directed in writing by the Commissioner.

(e) Unless indicated otherwise Warranties are to take effect on the date of Substantial Completion.

SCHEDULE C

Contract Drawings

(Reference: Section 01 1000, Article 1.5 (A) of the DDC Standard General Conditions)

The Schedule set forth below lists all Contract Drawings for the Project.

NUMBER	SHEET NUMBER	SHEET NAME
1	G-001	TITLE SHEET
2	G-002	DRAWING LIST
3	G-010	SITE PLAN
4	Z-001	ZONING NOTES, CALCULATIONS AND DIAGRAMS
5	Z-002	ZONING AREA ANALYSIS
6	Z-003	ZONING BASELINE CALCULATIONS
7	PH-010	PHASING DIAGRAM PHASE 1
8	PH-020	PHASING DIAGRAM PHASE 2
9	PH-030	PHASING DIAGRAM PHASE 3
10	C-001	CIVIL NOTES 1
11	C-002	CIVIL NOTES 2
12	C-050	SITE REMOVALS PLAN
13	C-051	SITE REMOVALS PLAN ENLARGEMENT 1
14	C-052	SITE REMOVALS PLAN ENLARGEMENT 2
15	C-100	EROSION & SEDIMENT CONTROL PLAN
16	C-111	DETAILS - EROSION AND SEDIMENT CONTROL DETAILS
17	C-211	DETAILS - SITE DETAILS
18	C-300	DRAINAGE PLAN
19	C-301	DRAINAGE PLAN: ENLARGEMENT 1
20	C-302	DRAINAGE PLAN: ENLARGEMENT 2
21	C-303	DRAINAGE PLAN: ENLARGEMENT 3
22	C-311	DETAILS - DRAINAGE DETAILS
23	C-400	GRADING PLAN
24	C-401	GRADING PLAN: ENLARGEMENT 1
25	C-402	GRADING PLAN: ENLARGEMENT 2
26	C-403	GRADING PLAN: ENLARGEMENT 3
27	C-500	UTILITY PLAN
28	C-501	UTILITY PLAN: ENLARGEMENT 1
29	C-502	UTILITY PLAN: ENLARGEMENT 2
30	C-511	DETAILS - UTILITY DETAILS 1
31	C-512	DETAILS - UTILITY DETAILS 2
32	C-700	SITE STRUCTURES PLAN
33	C-701	SITE STRUCTURES PLAN ENLARGEMENT 1
34	C-702	SITE STRUCTURES PLAN ENLARGEMENT 2
35	C-703	SITE STRUCTURES PLAN ENLARGEMENT 3
36	C-704	RETAINING WALL PLAN AT GARAGE
37	C-711	SITE STRUCTURES DETAILS
38	F-001	FUEL SYSTEM OVERVIEW
39	F-100	FUEL SYSTEM LAYOUT
40	F-101	FUEL SYSTEM DETAILS
41	F-102	FUEL SYSTEM DETAILS
42	F-103	FUEL SYSTEM DETAILS
43	F-104	FUEL SYSTEM DETAILS
44	F-105	FUEL SYSTEM DETAILS
45	N-200	SUBMEMBRANE DEPRESSURIZATION SYSTEM LAYOUT
46	N-201	SUBMEMBRANE DEPRESSURIZATION SYSTEM DETAILS
47	N-202	SUBMEMBRANE DEPRESSURIZATION SYSTEM DETAILS
48	N-203	SUBMEMBRANE DEPRESSURIZATION SYSTEM DETAILS
49	SOE-001	GENERAL NOTES
50	SOE-101	SUPPORT OF EXCAVATION PLAN
51	SOE-104	SUPPORT OF EXCAVATION PART PLAN D
52	SOE-306	SECTION I
53	SOE-307	SECTION J
54	SOE-308	SECTION K

55	L-000	LANDSCAPE NOTES
56	L-001	LANDSCAPE PAVING ASSEMBLIES (LPA)
57	L-002	LANDSCAPE VEGETATION TYPES (LVT) + LANDSCAPE FURNISHING ELEMENT (LFE)
58	L-020	OVERALL SITE PLAN
59	L-111	SITE SURFACE DEMOLITION PLAN
60	L-112	SITE SURFACE DEMOLITION PLAN
61	L-201	LAYOUT PLAN
62	L-202	LAYOUT PLAN
63	L-301	MATERIALS PLAN
64	L-302	MATERIALS PLAN
65	L-311	SCORING PLAN
66	L-312	SCORING PLAN
67	L-321	PAVEMENT STRIPING PLAN
68	L-322	PAVEMENT STRIPING PLAN
69	L-401	PLANTING PLAN - TREES & SHRUBS
70	L-402	PLANTING PLAN - TREES & SHRUBS
71	L-411	PLANTING PLAN - GROUNDCOVERS
72	L-412	PLANTING PLAN - GROUNDCOVERS
73	L-413	GREEN ROOF PLANTING PLAN / TREE AND PLAN SCHEDULES
74	L-500	ENLARGEMENT PLANS
75	L-501	ENLARGEMENT PLANS
76	L-502	ENLARGEMENT PLANS
77	L-600	SITE SECTIONS
78	L-700	SITE DETAILS
79	L-701	SITE DETAILS
80	L-702	SITE DETAILS
81	L-703	SITE DETAILS
82	L-704	SITE DETAILS
83	L-705	SITE DETAILS
84	L-706	SITE DETAILS
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497	AV1-401	AUDIO VISUAL DETAILS
498	AV1-500	MATRIX & EQUIPMENT LIST
499	SEC1-000	SECURITY SYSTEM TITLE PAGE AND SYMBOL LIST
500	SEC1-100	SECURITY PLAN - SITE PLAN
501	SEC1-101	SECURITY PLAN - 1ST FLOOR & 2ND FLOOR
502	SEC1-200	TELECOM SPACES
503	SEC1-300	SECURITY RISER & DETAILS
504	SEC1-400	SECURITY CAMERA DETAILS
505	SEC1-500	MATRIX & EQUIPMENT LIST
506	TC1-000	TELE/DATA SYSTEM TITLE PAGE AND SYMBOL LIST
507	TC1-100	TELECOMMUNICATIONS PLAN - SITE PLAN
508	TC1-101	TELECOMMUNICATIONS PLAN - 1ST & 2ND FLOOR
509	TC1-200	TELECOMMUNICATIONS TELECOM SPACES
510	TC1-201	TELECOMMUNICATIONS TELECOM SPACES
511	TC1-202	TYPICAL ROOM DETAILS
512	TC1-300	TELECOMMUNICATIONS RISER SCHEMATIC
513	TC1-400	TELECOMMUNICATIONS DETAILS
514	TC1-500.00	MATRIX & EQUIPMENT LIST
515	GS-001	INTERIOR SIGNAGE ELEVATIONS
516	GS-002	INTERIOR SIGNAGE ELEVATIONS
517	GS-003	INTERIOR SIGNAGE ELEVATIONS
518	GS-004	INTERIOR SIGNAGE ELEVATIONS
519	GS-005	INTERIOR SIGNAGE PLANS
520	GS-006	SITE SIGNAGE ELEVATIONS
521	GS-007	SITE SIGNAGE ELEVATIONS
522	GS-008	SITE SIGNAGE PLANS AND ELEVATIONS

SCHEDULE D

Electrical Motor Control Equipment

(Reference: 01 3506, Article 3.8 of the DDC Standard General Conditions)

Requirements for electrical motor equipment may be included in one or more sections of the Specifications for the Contract for the Project. Schedule D set forth below delineates specific information for electrical motor control equipment. In the event of any conflict between the Specifications and this Schedule D, Schedule D shall take precedence; provided, however, in the event of an omission from Schedule D (i.e., Schedule D omits either a reference to or information concerning electrical motor equipment which is set forth in the Specifications), such omission from Schedule D shall have no effect and the Contractor's obligation with respect to the electrical motor control equipment, as set forth in the Specifications, shall remain in full force and effect.

DB Disconnect Circuit Breaker (Switch)
TS Thermal Switch
MS Magnetic Starter
CMS Comb. Mag. Starter
P Pilot Light
F Firestat
T Thermostat
AL Alternator
BG Break Glass Station
HOA Hand-Off Auto.
PB Push Button Station
RO Remote "off"

NEW BUILDING ELECTRICAL MOTOR EQUIPMENT

INDOOR UNITS

Equip. Ident.	Location	# of Units	HP or KW	Volts and Phase	Control Type: See legend above	Remarks:
AC-1-1	1ST FLOOR	1	0.08 KW	208/1PH/60	Manual Motor Switch	
AC-1-2	1ST FLOOR	1	0.08 KW	208/1PH/60	Manual Motor Switch	
AC-1-3	1ST FLOOR	1	0.08 KW	208/1PH/60	Manual Motor Switch	
AC-1-4	1ST FLOOR	1	0.08 KW	208/1PH/60	Manual Motor Switch	
AC-1-5	1ST FLOOR	1	0.12 KW	208/1PH/60	Manual Motor Switch	
AC-1-5A	1ST FLOOR	1	0.18 KW	208/1PH/60	Manual Motor Switch	
AC-1-5B	1ST FLOOR	1	0.18 KW	208/1PH/60	Manual Motor Switch	
AC-1-6	1ST FLOOR	1	0.18 KW	208/1PH/60	Manual Motor Switch	
AC-1-8	1ST FLOOR	1	0.16 KW	208/1PH/60	Manual Motor Switch	
AC-1-9	1ST FLOOR	1	0.18 KW	208/1PH/60	Manual Motor Switch	
AC-1-10	1ST FLOOR	1	0.12 KW	208/1PH/60	Manual Motor Switch	
AC-1-11	1ST FLOOR	1	0.12 KW	208/1PH/60	Manual Motor Switch	
AC-1-12	1ST FLOOR	1	0.7 KW	208/1PH/60	Manual Motor Switch	
AC-1-13	1ST FLOOR	1	0.08 KW	208/1PH/60	Manual Motor Switch	
AC-1-14	1ST FLOOR	1	0.08 KW	208/1PH/60	Manual Motor Switch	
AC-1-15	1ST FLOOR	1	0.7 KW	208/1PH/60	Manual Motor Switch	
AC-1-16	1ST FLOOR	1	0.16 KW	208/1PH/60	Manual Motor Switch	
AC-1-17	1ST FLOOR	1	0.16 KW	208/1PH/60	Manual Motor Switch	
AC-1-17A	1ST FLOOR	1	0.16 KW	208/1PH/60	Manual Motor Switch	
AC-1-17B	1ST FLOOR	1	0.16 KW	208/1PH/60	Manual Motor Switch	
AC-1-19	1ST FLOOR	1	0.16 KW	208/1PH/60	Manual Motor Switch	
AC-1-20	1ST FLOOR	1	0.16 KW	208/1PH/60	Manual Motor Switch	
AC-1-21	1ST FLOOR	1	0.16 KW	208/1PH/60	Manual Motor Switch	
AC-1-22	1ST FLOOR	1	0.16 KW	208/1PH/60	Manual Motor Switch	
AC-1-23	1ST FLOOR	1	0.08 KW	208/1PH/60	Manual Motor Switch	
AC-1-24	1ST FLOOR	1	0.08 KW	208/1PH/60	Manual Motor Switch	
AC-1-25	1ST FLOOR	1	0.08 KW	208/1PH/60	Manual Motor Switch	
AC-1-25A	1ST FLOOR	1	0.08 KW	208/1PH/60	Manual Motor Switch	

AC-1-26	1ST FLOOR	1	0.19 KW	208/1PH/60	Manual Motor Switch	
AC-1-27	1ST FLOOR	1	0.19 KW	208/1PH/60	Manual Motor Switch	
AC-1-28	1ST FLOOR	1	0.08 KW	208/1PH/60	Manual Motor Switch	
AC-1-29	1ST FLOOR	1	0.19 KW	208/1PH/60	Manual Motor Switch	
AC-1-31	1ST FLOOR	1	0.19 KW	208/1PH/60	Manual Motor Switch	
AC-1-31B	1ST FLOOR	1	0.19 KW	208/1PH/60	Manual Motor Switch	
AC-1-32	1ST FLOOR	1	0.12 KW	208/1PH/60	Manual Motor Switch	
AC-1-33	1ST FLOOR	1	0.3 KW	208/1PH/60	Manual Motor Switch	
AC EMR-1-1	1ST FLOOR	1	0.12 KW	208/1PH/60	Manual Motor Switch	
AC EMR-1-2	1ST FLOOR	1	0.12 KW	208/1PH/60	Manual Motor Switch	
AC-2-3	2ND FLOOR	1	0.7 KW	208/1PH/60	Manual Motor Switch	
AC-2-4	2ND FLOOR	1	0.7 KW	208/1PH/60	Manual Motor Switch	
AC-2-5	2ND FLOOR	1	0.7 KW	208/1PH/60	Manual Motor Switch	
AC-2-6	2ND FLOOR	1	0.7 KW	208/1PH/60	Manual Motor Switch	
AC-2-7	2ND FLOOR	1	0.19 KW	208/1PH/60	Manual Motor Switch	
AC-2-8	2ND FLOOR	1	0.19 KW	208/1PH/60	Manual Motor Switch	
AC-2-9	2ND FLOOR	1	0.19 KW	208/1PH/60	Manual Motor Switch	
AC-2-10	2ND FLOOR	1	0.7 KW	208/1PH/60	Manual Motor Switch	
AC-2-11	2ND FLOOR	1	0.7 KW	208/1PH/60	Manual Motor Switch	
AC-2-12	2ND FLOOR	1	0.7 KW	208/1PH/60	Manual Motor Switch	
AC-2-13	2ND FLOOR	1	0.7 KW	208/1PH/60	Manual Motor Switch	
AC-2-16	2ND FLOOR	1	0.19 KW	208/1PH/60	Manual Motor Switch	
AC-2-17	2ND FLOOR	1	0.08 KW	208/1PH/60	Manual Motor Switch	
AC-2-17B	2ND FLOOR	1	0.08 KW	208/1PH/60	Manual Motor Switch	
AC-2-18	2ND FLOOR	1	0.08 KW	208/1PH/60	Manual Motor Switch	
AC-2-18B	2ND FLOOR	1	0.08 KW	208/1PH/60	Manual Motor Switch	
AC-2-19	2ND FLOOR	1	0.08 KW	208/1PH/60	Manual Motor Switch	
AC-2-19B	2ND FLOOR	1	0.08 KW	208/1PH/60	Manual Motor Switch	
AC-2-20	2ND FLOOR	1	0.19 KW	208/1PH/60	Manual Motor Switch	
AC-2-20B	2ND FLOOR	1	0.19 KW	208/1PH/60	Manual Motor Switch	
AC-2-21	2ND FLOOR	1	0.19 KW	208/1PH/60	Manual Motor Switch	
AC-2-22	2ND FLOOR	1	0.7 KW	208/1PH/60	Manual Motor Switch	
AC EMR-1	ROOF	1	0.12 KW	208/1PH/60	Manual Motor Switch	

AIR CURTAIN HEATERS

Equip. Ident.	Location	# of Units	HP or KW	Volts and Phase	Control Type: See legend above	Remarks:
AIR-CURTAIN - 1-1	1ST FLOOR	1	1.2 KW	208/3PH/60	Manual Motor Switch	
AIR-CURTAIN - 1-2	1ST FLOOR	1	1.2 KW	208/3PH/60	Manual Motor Switch	
AIR-CURTAIN - 1-3	1ST FLOOR	1	1.2 KW	208/3PH/60	Manual Motor Switch	
AIR-CURTAIN - 1-4	1ST FLOOR	1	1.2 KW	208/3PH/60	Manual Motor Switch	
AIR-CURTAIN - 2-1	2ND FLOOR	1	2.1 KW	208/1PH/60	Manual Motor Switch	
AIR-CURTAIN - 2-2	2ND FLOOR	1	2.1 KW	208/1PH/60	Manual Motor Switch	

CONDENSING UNITS

Equip. Ident.	Location	# of Units	HP or KW	Volts and Phase	Control Type: See legend above	Remarks:
ACCU-1	ROOF	1	25.4 KW	460/3PH/60	DB	
		1	25.4 KW	460/3PH/60	DB	
		1	25.4 KW	460/3PH/60	DB	

ACCU-2	ROOF	1	16.8 KW	460/3PH/60	DB	
		1	12.1 KW	460/3PH/60	DB	
ACCU-3	ROOF	1	25.4 KW	460/3PH/60	DB	
		1	25.4 KW	460/3PH/60	DB	
		1	25.4 KW	460/3PH/60	DB	
ACCU-4	ROOF	1	20.6 KW	460/3PH/60	DB	
ACCU-5	ROOF	1	20.6 KW	460/3PH/60	DB	
ACCU-6	ROOF	1	20.6 KW	460/3PH/60	DB	
ACCU-7	ROOF	1	16.4 KW	460/3PH/60	DB	
ACCU-8	ROOF	1	20.6 KW	460/3PH/60	DB	
ACCU-9	ROOF	1	16.4 KW	460/3PH/60	DB	
ACCU-10	ROOF	1	20.6 KW	460/3PH/60	DB	
ACCU-11	ROOF	1	12.1 KW	460/3PH/60	DB	
ACCU-12	ROOF	1	9.8 KW	460/3PH/60	DB	
ACCU-13	ROOF	1	12.1 KW	460/3PH/60	DB	
ACCU-14	ROOF	1	12.1 KW	460/3PH/60	DB	
ACCU-EMR-1	ROOF	1	5.9 KW	208/3PH/60	DB	
ACCU-EMR-2	ROOF	1	5.9 KW	208/3PH/60	DB	
ACCU-EMR-3	ROOF	1	5.9 KW	208/3PH/60	DB	
ACCU-AV-1	ROOF	1	5.9 KW	208/3PH/60	DB	

PUMPS

Equip. Ident.	Location	# of Units	HP or KW	Volts and Phase	Control Type: See legend above	Remarks:
HXWP-1	GARAGE CEILING	1	2 HP	208/1PH/60	Manual Motor Switch	
HXWP-2	GARAGE CEILING	1	2 HP	208/1PH/60	Manual Motor Switch	
HXWP-3	GARAGE CEILING	1	2 HP	208/1PH/60	Manual Motor Switch	
HXWP-4	GARAGE CEILING	1	2 HP	208/1PH/60	Manual Motor Switch	
HXWP-5	GARAGE CEILING	1	2 HP	208/1PH/60	Manual Motor Switch	
HXWP-6	GARAGE CEILING	1	2 HP	208/1PH/60	Manual Motor Switch	
HXWP-7	GARAGE CEILING	1	1 HP	208/3PH/60	DB	
HXWP-8	GARAGE CEILING	1	1/6 HP	115/1PH/60	Manual Motor Switch	
HXWP-9	1ST FLOOR STORAGE RM. CEILING	1	1 HP	208/3PH/60	DB	
HXWP-10	1ST FLOOR STORAGE RM. CEILING	1	1 HP	208/3PH/60	DB	
HWP-P1	BOILER ROOM	1	50 HP	460/3PH/60	DB	
HWP-P2	BOILER ROOM	1	50 HP	460/3PH/60	DB	
HWP-P3	BOILER ROOM	1	5 HP	460/3PH/60	DB	
HWP-P4	BOILER ROOM	1	5 HP	460/3PH/60	DB	
P-3A	BOILER ROOM	1	7 1/2 HP	208/1PH/60	DB	
P-3B	BOILER ROOM	1	7 1/2 HP	208/1PH/60	DB	
P-4A	BOILER ROOM	1	1 1/2 HP	208/1PH/60	Manual Motor Switch	
P-4B	BOILER ROOM	1	1 1/2 HP	208/1PH/60	Manual Motor Switch	
P-5A	BOILER ROOM	1	3/4 HP	208/1PH/60	Manual Motor Switch	
P-5B	BOILER ROOM	1	3/4 HP	208/1PH/60	Manual Motor Switch	
SUMP PUMP	GROUND FLOOR	1	1/2 HP	115/1PH/60	Manual Motor Switch	
HWCP	BOILER ROOM	1	2/5 HP	208/3PH/60	DB	

BOILERS

Equip. Ident.	Location	# of Units	HP or KW	Volts and Phase	Control Type: See legend above	Remarks:
B-1	2ND FLOOR	1	9.5 KW	460/3PH/60	DB	
B-2	2ND FLOOR	1	9.5 KW	460/3PH/60	DB	
B-3	2ND FLOOR	1	9.5 KW	460/3PH/60	DB	

BRANCH SELECTOR UNITS

Equip. Ident.	Location	# of Units	HP or KW	Volts and Phase	Control Type: See legend above	Remarks:
BS-1-1	1ST FLOOR	1	0.25 KW	208/1PH/60	Manual Motor Switch	
BS-1-2	1ST FLOOR	1	0.08 KW	208/1PH/60	Manual Motor Switch	
BS-1-3	1ST FLOOR	1		208/1PH/60	Manual Motor Switch	
BS-1-4	1ST FLOOR	1	0.25 KW	208/1PH/60	Manual Motor Switch	
BS-1-5	1ST FLOOR	1	0.08 KW	208/1PH/60	Manual Motor Switch	
BS-2-1	2ND FLOOR	1	0.12 KW	208/1PH/60	Manual Motor Switch	
BS-2-2	2ND FLOOR	1	0.12 KW	208/1PH/60	Manual Motor Switch	
BS-2-3	2ND FLOOR	1	0.12 KW	208/1PH/60	Manual Motor Switch	
BS-2-4	2ND FLOOR	1	0.08 KW	208/1PH/60	Manual Motor Switch	
BS-2-5	2ND FLOOR	1		208/1PH/60	Manual Motor Switch	

FANS

Equip. Ident.	Location	# of Units	HP or KW	Volts and Phase	Control Type: See legend above	Remarks:
TPEF-1	REPAIR BAY	1	7 1/2 HP	208/3PH/60	DB	
TPEF-2	REPAIR BAY	1	10 HP	208/3PH/60	DB	
EF-G-1	2ND FLOOR	1	1/10 HP	115/1PH/60	TS	
EF-B-1	2ND FLOOR	1	1/10 HP	115/1PH/60	TS	
EF-BS-1	2ND FLOOR	1	1/10 HP	115/1PH/60	TS	
EF-CR-1	2ND FLOOR	1	3/4 HP	208/1PH/60	TS	
EF-G-1	2ND FLOOR	1	1/10 HP	115/1PH/60	TS	
EF-B-1	2ND FLOOR	1	1/10 HP	115/1PH/60	TS	
KEF-1	ROOF	1	1/6 HP	115/1PH/60	TS	
KEF-2	ROOF	1	1/6 HP	115/1PH/60	TS	
KEF-3	ROOF	1	1/6 HP	115/1PH/60	TS	
KEF-4	ROOF	1	1/6 HP	115/1PH/60	TS	
KEF-5	ROOF	1	1/2 HP	115/1PH/60	TS	
KEF-6	ROOF	1	1/2 HP	115/1PH/60	TS	
TEF-R1	ROOF	1	1/3 HP	208/1PH/60	TS	
TEF-R2	ROOF	1	1/3 HP	208/1PH/60	TS	
EF-1	ROOF	1	1/4 HP	115/1PH/60	TS	
EF-2	ROOF	1	1/4 HP	115/1PH/60	TS	
GEF-R-1	ROOF	1	1/2 HP	115/1PH/60	TS	

ELECTRIC UNIT HEATERS

Equip. Ident.	Location	# of Units	HP or KW	Volts and Phase	Control Type: See legend above	Remarks:
EUH-A	1ST FLOOR	1	3.0 KW	208/1PH/60	DB	
EUH-B	1ST FLOOR	1	5.0 KW	208/3PH/60	DB	
ECUH-1-1	1ST FLOOR	1	5.0 KW	208/3PH/60	DB	
UH-1	100 / 101 - PARKING/VEHICLE CIRCULATION	1	1/3 HP	115/1PH/60	TS	
UH-2	100 / 101 - PARKING/VEHICLE CIRCULATION	1	1/3 HP	115/1PH/60	TS	
UH-3	100 / 101 - PARKING/VEHICLE CIRCULATION	1	1/3 HP	115/1PH/60	TS	
UH-4	100 / 101 - PARKING/VEHICLE CIRCULATION	1	1/3 HP	115/1PH/60	TS	

UH-5	100 / 101 - PARKING/VEHICLE CIRCULATION	1	1/3 HP	115/1PH/60	TS	
UH-6	100 / 101 - PARKING/VEHICLE CIRCULATION	1	1/3 HP	115/1PH/60	TS	
UH-7	100 / 101 - PARKING/VEHICLE CIRCULATION	1	1/3 HP	115/1PH/60	TS	
UH-8	100 / 101 - PARKING/VEHICLE CIRCULATION	1	1/3 HP	115/1PH/60	TS	
UH-9	100 / 101 - PARKING/VEHICLE CIRCULATION	1	1/3 HP	115/1PH/60	TS	
UH-10	100 / 101 - PARKING/VEHICLE CIRCULATION	1	1/3 HP	115/1PH/60	TS	
UH-11	100 / 101 - PARKING/VEHICLE CIRCULATION	1	1/3 HP	115/1PH/60	TS	
UH-12	100 / 101 - PARKING/VEHICLE CIRCULATION	1	1/3 HP	115/1PH/60	TS	
UH-13	100 / 101 - PARKING/VEHICLE CIRCULATION	1	1/3 HP	115/1PH/60	TS	
UH-14	100 / 101 - PARKING/VEHICLE CIRCULATION	1	1/3 HP	115/1PH/60	TS	
UH-15	100 / 101 - PARKING/VEHICLE CIRCULATION	1	1/3 HP	115/1PH/60	TS	
UH-16	100 / 101 - PARKING/VEHICLE CIRCULATION	1	1/3 HP	115/1PH/60	TS	
UH-17	100 / 101 - PARKING/VEHICLE CIRCULATION	1	1/3 HP	115/1PH/60	TS	
UH-18	100 / 101 - PARKING/VEHICLE CIRCULATION	1	1/3 HP	115/1PH/60	TS	
UH-19	100 / 101 - PARKING/VEHICLE CIRCULATION	1	1/3 HP	115/1PH/60	TS	
UH-20	100 / 101 - PARKING/VEHICLE CIRCULATION	1	1/3 HP	115/1PH/60	TS	
UH-21	100 / 101 - PARKING/VEHICLE CIRCULATION	1	1/3 HP	115/1PH/60	TS	
UH-22	100 / 101 - PARKING/VEHICLE CIRCULATION	1	1/3 HP	115/1PH/60	TS	
UH-R-1	REPAIR BAY	1	1/8 HP	115/1PH/60	TS	
UH-R-2	REPAIR BAY	1	1/8 HP	115/1PH/60	TS	
UH-R-3	REPAIR BAY	1	1/8 HP	115/1PH/60	TS	
UH-R-4	REPAIR BAY	1	1/8 HP	115/1PH/60	TS	
UH-R-5	REPAIR BAY	1	1/8 HP	115/1PH/60	TS	
UH-R-6	REPAIR BAY	1	1/8 HP	115/1PH/60	TS	

ELECTRIC HEATERS

Equip. Ident.	Location	# of Unit	HP or KW	Volts and Phase	Control Type: See legend above	Remarks:
EH-1	1ST FLOOR	1	3.0 KW	208/1PH/60	DB	

RTUs

Equip. Ident.	Location	# of Unit	HP or KW	Volts and Phase	Control Type: See legend above	Remarks:
RTU-1	ROOF	1	15 HP	460/3PH/60	DB	
RTU-2	ROOF	1	15 HP	460/3PH/60	DB	

ERVs

Equip. Ident.	Location	# of Unit	HP or KW	Volts and Phase	Control Type: See legend above	Remarks:
ERV-1-1	1ST FLOOR	1	3/4 HP	208/1PH/60	DB	
ERV-2-1	2ND FLOOR	1	3 HP	208/3PH/60	DB	
ERV-2-2	2ND FLOOR	1	3 HP	208/3PH/60	DB	
ERV-2-3	2ND FLOOR	1	1.5 HP	208/3PH/60	DB	
ERV-2-4	2ND FLOOR	1	3 HP	208/3PH/60	DB	
ERV-2-5	2ND FLOOR	1	3 HP	208/3PH/60	DB	
ERV-2-6	2ND FLOOR	1	1 HP	208/3PH/60	DB	
ERV-2-7	2ND FLOOR	1	3 HP	208/3PH/60	DB	

HEATING VENTILATING UNITS

Equip. Ident.	Location	# of Unit	HP or KW	Volts and Phase	Control Type: See legend above	Remarks:
HV-1	ROOF	2	15 HP	460/3PH/60	DB	
HV-2	ROOF	2	15 HP	460/3PH/60	DB	
HV-3	ROOF	2	15 HP	460/3PH/60	DB	
HV-4	ROOF	2	15 HP	460/3PH/60	DB	
HV-5	ROOF	2	15 HP	460/3PH/60	DB	
HV-6	ROOF	2	15 HP	460/3PH/60	DB	
HV-7	ROOF	2	15 HP	460/3PH/60	DB	
HV-8	ROOF	2	15 HP	460/3PH/60	DB	

OUTSIDE AIR PROCESSING UNIT

Equip. Ident.	Location	# of Unit	HP or KW	Volts and Phase	Control Type: See legend above	Remarks:
AC OA-1-1	1ST FLOOR	1	0.4 KW	208/1PH/60	MANUAL MOTOR SWITCH	
AC OA-1-2	1ST FLOOR	1	0.4 KW	208/1PH/60	MANUAL MOTOR SWITCH	
AC OA-1-3	1ST FLOOR	1	0.55 KW	208/1PH/60	MANUAL MOTOR SWITCH	
AC-OA-2-1	2ND FLOOR	1	0.64 KW	208/1PH/60	MANUAL MOTOR SWITCH	
AC-OA-2-2	2ND FLOOR	1	0.55 KW	208/1PH/60	MANUAL MOTOR SWITCH	
AC-OA-2-3	2ND FLOOR	1	0.55 KW	208/1PH/60	MANUAL MOTOR SWITCH	
AC-OA-2-4	2ND FLOOR	1	0.55 KW	208/1PH/60	MANUAL MOTOR SWITCH	

AC-OA-2-5	2ND FLOOR	1	0.64 KW	208/1PH/60	MANUAL MOTOR SWITCH	
AC-OA-2-6	2ND FLOOR	1	0.55 KW	208/1PH/60	MANUAL MOTOR SWITCH	
AC-OA-2-7	2ND FLOOR	1	0.64 KW	208/1PH/60	MANUAL MOTOR SWITCH	
AC-OA-2-8	2ND FLOOR	1	0.55 KW	208/1PH/60	MANUAL MOTOR SWITCH	
AC-OA-2-9	2ND FLOOR	1	0.55 KW	208/1PH/60	MANUAL MOTOR SWITCH	
AC-OA-2-10	2ND FLOOR	1	0.55 KW	208/1PH/60	MANUAL MOTOR SWITCH	

EXISTING BUILDING ELECTRICAL MOTOR EQUIPMENT						
Equip. Ident.	Location	# of Units	HP or KW	Volts and Phase	Control Type: See legend above	Remarks:
INDOOR UNITS						
AC-10	1ST FLOOR	1	1/2 HP	208/3PH/60	DB	
FANS						
TP-4	1ST FLOOR	1	3 1/2 HP	208/3PH/60	DB	
RTUs						
RTU-BME	FIRST FLOOR	1	59.4 KW	208/3PH/60	DB	

SCHEDULE E

Separation of Trades

NOT USED FOR SINGLE CONTRACTS

SCHEDULE F

Submittals Schedule

(Reference: Section 01 3300 Article 1.5 (C) of the General Conditions)

The Schedule set forth below lists all submittal requirements for the Contract. In the event of any conflict between the Specifications and this Schedule F, Schedule F shall take precedence; provided, however, in the event of an omission from Schedule F (i.e., Schedule F omits either a reference to or information concerning a submittal requirement which is set forth in the Specifications), such omission from Schedule F shall have no effect and the Contractor's submittal obligation, as set forth in the Specifications, shall remain in full force and effect.

CONSULTANT:
TELEPHONE NUMBER:
DDC PROJECT MANAGER:
TELEPHONE NUMBER:

DATE: _____

APPROVED: _____
(DDC RESIDENT ENGINEER/CPM)

REPORT DATE		FMS ID #/PROJECT ID #: CONTRACT REGISTRATION #: PROJECT NAME:							CONTRACT #: **Contract 1 – GENERAL CONSTRUCTION** TRADE: SHOP DRAWING LOG SHEET #								
SPEC. SECT. #	DESCRIPTION	COORD. WITH CONTR.	SUBMITTAL			SUB. DATE	REQ'D DEL.	FABRIC. TIME	SUBMISSIONS								
			SHOP DWG.	SAMPLE	CAT. CUTS				REC'D	RET'D	ACTION	REC'D	RET'D	ACTION	REC'D	RET'D	ACTION
01 3234	Building Information Modeling (BIM) Protocol	X															
01 3526	Safety and Health Program	X															
01 3526	Contractor's Safety Plan	X															
01 3591	Historic Treatment Plan	X															
01 4339	Façade Mockup Testing and Samples		X	X	X												
01 5000	Site Plan		X														
01 5000	Reports	X															

01 5423	NYC DOB Scaffold & Sidewalk Shed Permits	X	X														
01 5423	Site Logistics/Site Safety Plan	X															
01 5423	Scaffold & Shed Installation Drawings		X														
01 7419	Waste Management Plan	X															
01 7900	Instruction Program for Demonstration & Orientation	X															
01 7900	Qualification Data	X															
01 8000	Building Enclosure Contractor Performance Requirements	X															
01 8113.13	MSDS			X	X												
01 8119	IAQ Management Plan	X															
01 8119	Product Cut Sheets				X												
01 8119	IAQ Management Plan Photographs	X															
02 0101	Petroleum Bulk Storage Tank Removal	X	X		X												
02 0102	Vapor Barrier Installation		X	X	X												
02 4119	Selective Demolition and Alteration Work	X	X		X												

02 6113	Excavation and Handling of Contaminated Materials	X															
02 8013	Incidental Asbestos Abatement	X															
03 3000	Cast-in-Place Concrete	X	X	X	X												
03 3300	Architectural Cast-in-Place Concrete	X	X	X	X												
03 4500	Architectural Pre-Cast Concrete	X	X	X	X												
04 2000	Unit Masonry		X	X	X												
04 9000	Masonry Restoration and Cleaning	X			X												
05 1200	Structural Steel	X	X	X	X												
05 2100	Steel Joist Framing	X	X	X	X												
05 3100	Steel Decking	X	X	X	X												
05 4000	Cold Formed Metal Framing	X	X	X	X												
05 5000	Miscellaneous Metals		X	X	X												
05 5100	Steel Pan Stairs		X	X	X												
05 7000	Ornamental Metals	X	X	X	X												
05 7113	Ornamental Metal Stairs		X	X													
06 2000	Carpentry		X	X	X												
06 4023	Architectural Woodwork		X	X	X												
07 0001	Rainscreen System																
07 1326	Sheet Membrane Waterproofing		X	X	X												
07 1816	Vehicular Traffic Coatings			X	X												

072000	Thermoplastic Membrane Roofing		X		X												
07 2100	Thermal Insulation			X	X												
07 2129	Spray-Applied Thermal Insulation			X	X												
07 2701	Weather Resistive Barriers		X	X	X												
07 4214	Metal Panels		X	X	X												
07 4646	Fiber-Cement Panels		X	X	X												
07 5216	Modified Bituminous Membrane Roofing	X	X		X												
07 6201	Façade Sheet Metal Flashings		X		X												
07 7100	Roof Specialties and Accessories		X	X	X												
07 8100	Sprayed Fire Resistive Materials		X	X	X												
07 8123	Intumescent Fireproofing		X	X	X												
07 8413	Firestops and Smokeseals		X	X	X												
07 9200	Interior Joints Sealants		X	X	X												
07 9201	Exterior Joint Sealants		X	X	X												
07 9500	Expansion Control		X	X	X												
08 1113	Steel Doors and Frames		X	X	X												
08 3113	Access Doors		X	X	X												
08 3323	Overhead Coiling Doors		X	X	X												
08 3324	Roll-Up Doors		X	X	X												

08 4001	Glazed Storefronts and Curtain Wall System		X	X	X												
08 4519	Polycarbonate Wall System		X	X	X												
08 4900	Fire Rated Glass and Framing System		X	X	X												
08 6301	Aluminum-Framed Skylight System		X	X	X												
08 7100	Door Hardware		X	X	X												
08 7101	Door Hardware Schedule																
08 8000	Exterior Glazing		X	X	X												
08 8010	Interior Glass and Glazing		X	X	X												
08 9000	Louvers		X	X	X												
09 2900	Gypsum Drywall		X	X	X												
09 3000	Tiling		X	X	X												
09 5113	Acoustical Panel Ceilings		X	X	X												
09 5133	Metal Ceilings		X	X	X												
09 6500	Resilient Tile Flooring			X	X												
09 9000	Painting and Finishing			X	X												
10 1400	Signage		X	X	X												
10 2113	Toilet Compartments		X	X	X												
10 2116	Shower Compartments		X	X	X												
10 2600	Corner Guards			X	X												
10 2813	Toilet Accessories		X	X	X												
10 4416	Fire Extinguisher Cabinets		X	X	X												
10 5113	Metal Lockers		X	X	X												

10 7500	Flagpoles	X	X	X	X												
11 1136	Vehicle Charging Equipment		X	X	X												
11 2400	Suspended Maintenance and Fall Protection	X	X		X												
11 9101	Wooden Pallets		X	X	X												
12 4823	Entrance Floor Grids		X	X	X												
14 2400	Hydraulic Elevators		X	X	X												
14 6050	Single Girder Crane	X	X	X	X												
21 0500	Common Work Results for Fire Suppression		X		X												
21 0513	Common Motor Requirements for Fire Suppression Equipment		X		X												
21 0548	Vibration and Seismic Controls for Fire Suppression Piping and Equipment		X		X												
21 0800	Commissioning of Fire Suppression System	X	X		X												
21 1100	Facility Fire Suppression Water Service Piping		X		X												
21 1200	Fire Suppression Standpipes		X		X												
21 1313	Wet Pipe Sprinkler Systems		X		X												
21 3113	Electric-Drive, Centrifugal Sprinkler Booster Pumps		X		X												

21 3900	Controllers for Sprinkler Booster Pump Drivers		X		X												
22 0500	Common Results for Plumbing				X												
22 0516	Expansion Fittings and Loops for Plumbing Piping				X												
22 0519	Meters and Gages for Plumbing Piping				X												
22 0523	General Duty Valves for Plumbing Piping				X												
22 0529	Hangers and Supports for Plumbing Piping and Equipment		X		X												
22 0533	Heat Tracing for Plumbing Piping				X												
22 0553	Identification for Plumbing Piping and Equipment		X	X	X												
22 0700	Plumbing Insulation			X	X												
22 0800	Commissioning of Plumbing	X			X												
22 1113	Facility Water Distribution Piping		X		X												
22 1114	Facility Natural Gas Piping		X		X												
22 1116	Domestic Water Piping		X	X	X												
22 1119	Domestic Water Piping Specialties		X		X												
22 1316	Sanitary Waste and Vent Piping		X		X												
22 1413	Facility Storm Drainage Piping		X		X												

22 1423	Storm Drainage Piping Specialties		X		X												
22 1513	Compressed Air Equipment		X		X												
22 1513.10	Motor Fuel Dispensing System		X		X												
22 1513.20	Fluid Dispensing System		X		X												
22 1513.30	General-Service Compressed-Air Piping																
22 3500	Domestic Water Heat Exchanger				X												
22 4000	Plumbing Fixtures		X		X												
23 0500	Common Work Results for HVAC				X												
23 0513	Common Motor Requirements for HVAC Equipment		X		X												
23 0516	Expansion Fittings and Loops for HVAC Piping				X												
23 0519	Meters and Gauges for HVAC Piping				X												
23 0523	General-Duty Valves for HVAC Piping		X		X												
23 0529	Hangers and Supports for HVAC Piping and Equipment		X		X												
23 0548	Vibration and Seismic Controls for HVAC Piping and Equipment		X		X												
23 0549	HVAC Seismic Specification		X		X												

23 0553	Identification for HVAC Piping and Equipment		X	X	X												
23 0593	Testing for HVAC	X															
23 0594	Balancing for HVAC	X															
23 0700	Piping Insulation			X	X												
23 0701	Ductwork Insulation			X	X												
23 0800	Commissioning of HVAC Systems	X	X		X												
23 0900	Instrumentation and Control for HVAC	X	X		X												
23 0993	Sequence of Operations	X			X												
23 1217	Vehicle Exhaust System		X		X												
23 2113	Hydronic Piping				X												
23 2116	Hydronic Piping Specialties				X												
23 2123	Hydronic Pumps	X	X		X												
23 2300	Refrigerant Piping		X		X												
23 2500	HVAC Water Treatment		X		X												
23 3113	Metal Ducts		X		X												
23 3300	Air Duct Accessories		X		X												
23 3301	Dampers		X		X												
23 3416	Centrifugal HVAC Fans		X		X												
23 3433	Air Curtains		X		X												
23 3713	Diffusers, Registers and Grilles		X		X												
23 5100	HVAC Breeching, Chimneys and Stack		X		X												

23 5233	Condensing Boilers	X	X		X													
23 5600	Solar Hot Water System	X	X		X													
23 5700	Heat Exchangers for HVAC				X													
23 7200	Heating and Ventilating / Rooftop Units w/ Energy Recovery Equipment	X	X		X													
23 8126	Split System Air Conditioners		X	X	X													
23 8129	Variable Refrigerant Flow HVAC Systems																	
23 8233	Radiators		X	X	X													
23 8239	Unit Heaters		X	X	X													
26 0500	Common Work Results for Electrical				X													
26 0519	Low Voltage Electrical Power Conductors and Cables				X													
26 0526	Grounding and Bonding for Electrical Systems				X													
26 0529	Hangers and Supports for Electrical Systems		X		X													
26 0533	Raceways and Boxes for Electrical Systems		X		X													
26 0543	Underground Ducts and Raceways for Electrical System		X		X													

26 0548	Vibration and Seismic Controls for Electrical Systems		X		X												
26 0553	Identification for Electrical Systems			X	X												
26 0573	Overcurrent Protective Device Coordination Study				X												
26 0800	Commissioning of Electrical	X															
26 0923	Lighting Control Devices		X		X												
26 0933	Distributed Lighting Control System		X		X												
26 2200	Low Voltage Transformers	X	X		X												
26 2413	Switchboards		X	X	X												
26 2414	Electric Sub-Metering System																
26 2416	Panelboards		X	X	X												
26 2726	Wiring Devices		X	X	X												
26 2813	Fuses				X												
26 2816	Enclosed Switches and Circuit Breakers		X		X												
26 2913	Enclosed Controllers		X		X												
26 2923	Variable Frequency Motor Controllers		X		X												
26 3213	Engine Generators		X		X												
26 3600	Transfer Switches		X		X												
26 4113	Lightning Protection for Structures	X	X		X												

26 5100	Interior Lighting		X	X	X													
26 5113	Architectural Luminaires, Lamps, Ballasts		X	X	X													
27 0200	Structured Cabling for Voice & Data Systems	X	X		X													
27 0500	Common Work Results for Communications				X													
27 4000	Audio Visual Communications		X		X													
28 0800	Commissioning of Electronic Security Systems	X			X													
28 1000	Access Control & Video Surveillance	X	X		X													
28 3111	Digital, Addressable Fire-Alarm System	X	X		X													
31 0000	Earthwork	X		X	X													
31 1000	Site Clearing, Removals and Preparation	X																
31 2116	Sub-Membrane Depressurization System	X	X		X													
31 2500	Soil Erosion and Sediment Control	X	X		X													
31 5000	Excavation Support and Protection	X	X		X													
31 6219	Timber Piles	X	X		X													
32 1216	Asphaltic Paving	X			X													
32 1315	Concrete Curbs and Pavement	X	X															
32 1543	Crushed Stone Edging		X	X	X													
32 1723	Pavement Markings	X	X		X													

32 1726	Tactile Warning Surfacing	X	X														
32 3119	Decorative Metal Fence and Gate	X	X	X	X												
32 3300	Site Furnishings	X			X												
32 9300	Trees Shrubs Groundcovers																
33 0200	Protection of Existing Utilities	X															
33 1000	Water Utilities	X			X												
33 3100	Sanitary Sewer System	X	X		X												
33 4000	Storm Drainage Utilities	X			X												
33 4900	Storm and Sanitary Structures	X	X		X												
33 4910	Other Utilities	X			X												
33 5213.13	Fiberglass Double Containment Piping		X		X												
33 5213.16	Stainless Steel Double Containment Piping		X		X												
33 5614	Underground Storage Tanks		X		X												
43 4116	Petroleum Bulk Storage (PBS) Tank Systems		X		X												
43 4117	Petroleum Bulk Storage (PBS) Product Piping		X		X												
43 4118	Petroleum Bulk Storage (PBS) Instrumentation and Control		X		X												
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07 42 14	Metal Panels
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26 28 16	Enclosed Switches and Circuit Breakers
26 29 13	Enclosed Controllers
26 29 23	Variable Frequency Motor Controllers
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APPENDIX

REFERENCE VOLUME I

I. Geotechnical Report

II. Phase I Environmental Site Assesment (ESA) Report

III. Final Phase II Environmental Site Investigation (ESI) Report

IV. Stormwater Pollution Prevention Plan (SWPPP)

REFERENCE VOLUME II

I. Existing Garage Reference Drawings

II. S136-383S - 'Sister Project' / WSP Drawings

III. S136-367 – Construction of DSNY Staten Island 1&3 Garage - Phase I Drawings

IV. Survey

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CONTRACT # 1

GENERAL CONSTRUCTION WORK

SECTION 01 32 34
Building Information Modeling (BIM) Protocol

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The following documents apply to all required work for the Project: (1) the Contract Drawings, (2) the Specifications, (3) the General Conditions, (4) the Addendum and (5) the Contract [City of New York Standard Construction Contract].

1.2 SUMMARY

A. The Project shall utilize 3D Modeling for the coordination of all Architectural Structural Steel, Mechanical, Plumbing, Fire Protection, Electrical, Low Voltage Systems and Exterior Envelope. The 3D coordination shall be based on a coordinated design.

B. This specification covers the intended scope for using BIM for construction purposes. The Contractor will develop a coordinated clash-free Model including Structure, Architecture and complete MEP services. The Construction Model will be used to generate all Shop Drawings that are directly referencing the Model. The coordinated Construction Model will be used to generate points for automated layout stations which ensure that the installation is accurate and verified. The scope also includes the production of a dimensionally accurate As-Built Model including embedded Facilities Management data.

C. The Contractor agrees to participate in the use of digital/computer based three dimensional models and other related functionality, generally referred to as Building Information Modeling (such models and functionality are referred to herein as BIM) as Commissioner may determine to be beneficial for use in facilitating coordination, sequencing, scheduling and production of as- built depictions of the Project and performance of the Work and as hereafter provided.

D. Contractor agrees that neither the BIM nor the use of the BIM is in lieu of nor intended to relieve the Contractor of its responsibilities under the contract. It is expressly understood and agreed that, notwithstanding the requirement for submittals in connection with the BIM, traditional shop drawings and other submissions shall be required of the Contractor as per the Contract Documents.

1.3 SUBMITTAL PROCEDURES

A. Refer to DDC General Conditions Section 01 33 00 "Submittal Procedures".

1.4 QUALITY ASSURANCE

A. Refer to DDC General Conditions Section 01 40 00 "Quality Requirements".

PART 2 - PRODUCTS

2.1 CONTRACTOR SCOPE OF WORK

A. The Contractor will be provided a Design Intent Model consisting of Site Plan, Architecture, Structure and MEP trades in LOD 400.

B. The Contractor will be provided the final design model as a base to detach and create their own Construction Model. The Contractor will work collaboratively with the Commissioner to ensure all field conditions are accurately documented in the Construction Model and ensure that they are using the most up to date documents for construction phase coordination.

C. The Contractor may not rely on the accuracy of the Design Intent Model. The Design Intent Model can be used for reference only and all dimensions must be retrieved from the hard copy Drawings and verified by the Contractor.

D. The Contractor's Construction Model shall be coordinated with the Design Intent Drawings. Any conflicts with the Models that need to be resolved prior to fabrication and construction shall be reported in the form of a Request for Information (RFI). Clash reports may also be issued by the Contractor as background information for RFI's and submittals.

E. The Contractor shall include required clearances for maintenance and other access, code clearances and other required clearances. In addition, all modeling to include proposed underground / utilities associated with the project scope to the extent of the property line of the site, in all directions.

F. Clash detection and analysis: Perform clash detection to identify and highlight spatial conflicts within and between the various trades and the building. This can be performed using Navisworks or equivalent application using subcontractor Construction Models, tracking file versions used in each clash analysis.

G. Work collaboratively with subcontractors to recommend potential solutions to conflicts.

H. Indicate where conflict resolution requires modification of design requirements by the Commissioner.

I. Update final design model to include an As-built Models in Revit that includes complete structure, architecture Models to LOD 400. MEP equipment and accessories that require FM attribute will be modeled to LOD 400. The Models will be populated with Facilities data using parameters provided by the Commissioner. Any ducts and pipes generated using CAD based authoring software will be linked in as reference to the Revit Model.

J. The Contractor shall provide the Commissioner with all the necessary access to review the documents and interface with Contractor's team. Coordination meetings as per the coordination schedule shall occur between the Commissioner to ensure the correct development of the Construction Model.

K. The Contractor will insert relevant building element data as listed below in the As-Built Model. The data may also be provided to the Commissioner as a separate spreadsheet. The Commissioner to determine the Building Element Data as well as attributes for all MEP assets:

1) Asset name
2) Room name

3) Room number
4) Manufacturer
5) Model Number
6) Serial Number
7) Installation Date
8) Bar Code (if any)
9) Submittal Number
10) Link to O&M
11) System Served

L. Utilize the Construction Model to generate layout points for automated layout stations so the installation can be laid out and verified to ensure proper positioning per the coordinated Construction Model.

M. Allow real time access to the Construction Model by the Commissioner.

1. BIM applications will be provided by the Commissioner to the Contractor to be utilized for all BIM model submission and deliverables.
   a. Autodesk Revit 2019
   b. Bentley MicroStation
   c. AllPlan Nemetschek
   d. Or approved equal
2. Construction Model files for Coordination.
3. During the coordination phase weekly publish all clash reports and current versions of all Coordination Models, with clash views, in .nwd format to the collaboration website.

2.2 CONSTRUCTION MODEL BIM COORDINATOR

A. The Contractor shall identify an individual assigned to be the Construction Model BIM Coordinator. This individual shall have the appropriate level of relevant BIM experience required for the project complexity and acquisition delivery strategy. In general, responsibilities should include the following:

1. Overall responsibility for the Construction Model creation and information developed during construction.
2. Coordinates software and establishes protocol software for Construction Team for efficient delivery of project.
3. Acts as the main point of contact for BIM and related issues between the Contractor's Team, subcontractors, the Commissioner, the City of New York, and others as required.
4. Ensures that all personnel have the necessary hardware and software installed and accessible for project use.
5. Coordinates construction sequencing and scheduling activities, and assures they are integrated with the Construction BIM.
6. Facilitates use of composite trade models, provided by subcontractors, in construction coordination/clash detection meetings and provides detection reports by the identification and resolution of all hard and soft collisions.
7. Communicates with the Commissioner, coordinates the data extraction sets required by the construction trades and ensures that these requests are met.
8. Coordinates with the Commissioner to facilitate that design changes in the field have been documented and are updated in the Construction Model in a timely manner. Provides design team with hard copies of changes made in the field for future reference in confirming the as-built model.

9. Prior to approval and installation, works with their lead Fabrication Modelers to integrate 3D fabrication models with the Construction Model to ensure compliance with design intent.

2.3 CONSTRUCTION PHASE BIM PLAN

A. The Contractor shall develop a Construction Phase BIM Plan: Within 21 calendar days of Notice to Proceed, the Contractor shall submit, for Commissioner's Representatives review and approval, a Construction BIM Plan. The BIM Plan shall include at the minimum:
   1. General Requirements of Subcontractors
   2. Model Partitioning
   3. Common Coordinate System and Units
   4. File Naming and Versioning
   5. List of Construction Models to be developed
   6. Plan for achieving an LOD-400 in the Construction Models
   7. Organization Responsible for Each Construction Model
   8. Software and Version to be Used to Develop Each Construction Model
   9. Any Required Object Enablers
   10. Name and Contact Information for Each Organization's BIM Coordinator
   11. Coordination /Clash Detection Process
   12. Coordination /Clash Detection Schedule
   13. Clashes to be Run (e.g.: HVAC vs. Structure)
   14. Any Other Applications of the Construction Models (e.g.: 4D)
   15. Plan for achieving an LOD-400 As-Built Models and asset data
   16. Methodology for preparing the As-Built BIM Deliverables to the City of New York

2.4 ACCEPTABLE CONSTRUCTION MODELING FORMATS

A. All software proposed for model authoring and coordination shall be submitted for approval by the Commissioner.
B. All Software used shall be Version 2019 or above unless otherwise approved by the Commissioner.
C. The following software, or similar, is acceptable for authoring and coordination:
   1. Authoring
      a) Architecture:
         i. Autodesk Revit 2019
         ii. Bentley MicroStation
         iii. AllPlan Nemetschek
         iv. Or Approved Equal
      b) Structure:
         i. Autodesk Revit 2019
         ii. Tekla Structures
         iii. Bentley MicroStation
         iv. Or Approved Equal
      c) MEP Discipline Model:
         i. Autodesk Revit 2019
         ii. Trade 3D CAD
         iii. Bentley MicroStation
         iv. Or Approved Equal

2. Coordination
   a) Coordination Model:
      i. Autodesk Navisworks 2019
      ii. Bentley Navigator
      iii. BIM 360 Glue
      iv. Or Approved Equal

   b) As-Built Model:
      i. Autodesk Revit 2019
      ii. AutoCAD MEP
      iii. Bentley Navigator
      iv. Or Approved Equal

PART 3 - EXECUTION

3.1 EXECUTION REQUIREMENTS

A. Refer to DDC General Conditions for execution requirements.

3.2 BIM KICKOFF MEETING

A. The Commissioner shall schedule and conduct a BIM Kickoff Meeting. BIM Modeling work by the Contractor and its subcontractors shall not commence prior to the BIM Kickoff Meeting. The Meeting shall review BIM requirements, standards and responsibilities.

B. Attendees: Participants in the BIM Kickoff Meeting shall be familiar with the project and shall be authorized to conclude matters relating to the BIM work. At a minimum include representatives of the following parties or their designated representatives:
   1. Commissioner
   2. Construction Manager
   3. Construction Manager's BIM Coordinator
   4. Contractor's Project Manager
   5. Contractor's BIM Coordinator
   6. BIM Coordinators of all subcontractors producing Construction BIMs
   7. Project Coordinators of all subcontractors producing Construction BIMs

C. Agenda: Subjects for discussion shall include items significant to the effective use of BIM coordination techniques and correct production of Construction BIM, including but not limited to the following:
   1. BIM expectations and project goals
   2. Coordination process
   3. Review of BIM Plan, including Model contents and standards
   4. Requirement to deliver equipment data in electronic format
   5. Final BIM deliverables by the Contractor.

D. Reporting: The Commissioner shall distribute minutes of the meeting to each party present and to other concerned parties.

3.3 TRADE COORDINATION

A. The Contractor is required to utilize 3D Fabrication Modeling Software for all shop drawings and submittals (only submittals that will develop shop drawings are required to utilize 3D modeling). The Contractor is required to fully integrate the various BIM/3D shop drawings and submittals into Construction Model; perform full clash detection on the results of the integration. The Commissioner will not be responsible for integrating shop drawings or submittals into Design Intent Model nor the Construction Model.

B. Each Subcontractor is required to have access to the BIM software. The software is required to compile the multiple model drawings, and for the subcontractor to run their own clash detection analysis. It is also required that the coordination representative for each trade shall be equipped with a laptop and a associated license with which to attend coordination meetings. This subcontractor coordination representative shall be authorized and prepared to make live, real-time changes to the "Shop Model" in these coordination meetings, in order to review the finalized, signed off coordinated models prior to and during the fabrication/installation process.

C. Each Trade is required to review the clash detection report generated by the BIM Coordinator prior to each coordination meeting and attend each meeting prepared to address the unresolved clashes in a constructive manner.

D. Each Trade is required to collaborate with each other trades through e-mail, telephone, and in person, to resolve basic clashes outside of the Coordination meetings. Contractor to coordinate with Commissioner daily/weekly Coordination meetings are held to address work. At these meetings the resolution will be collectively agreed upon. This trade will adjust its respective model and repost it with enough time for other subcontractors to review prior to the upcoming meeting. All the remaining trades are responsible to update and post the changes agreed upon at the coordination meeting within 1 week or as directed by Commissioner.

E. The Commissioner shall review the progress of the Construction Model by the Contractor on a weekly basis to help assure that the Construction Model is maintained current throughout construction. Updates to the construction model shall include all RFI's, Change Orders, Bulletins, Commissioner's field staff reports, approved submittals, and other field reports. The Contractor shall retain responsibility for inspection and measurement.

F. The Commissioner will participate in 2D/3D-based submittal reviews and coordination work sessions. The Commissioner will work collaboratively with the Contractor who will turn over an As-Built Model for all building systems at construction completion which incorporates any contract design changes that impact the original design intent model and field conditions.

G. Approved programs will be used for model management. All clash reports and Coordination Models will be uploaded to the collaboration website.

H. There will be no compensation for improperly coordinated or uncoordinated installations; such work will be removed and replaced at the Contractor's expense.

3.4 CONTRACTOR SUBMISSION AND DELIVERABLES

A. It is the Contractor's responsibility to provide real time access to the Construction Model to Commissioner.

B. At the end of construction, the following deliverables shall be provided to the City
   1. All Discipline/Trade As-built models in editable format.
   2. Composite summary format.
   3. Facility asset data provided either in the model as element parameters or provided as a separate spreadsheet
   4. Final As-Built PDF for each floor and each trade with proper annotations
   5. Final As-Built DWG for each floor and each trade with proper annotations
   6. Final Civil 2D/3D Model and PDF depicting all Utilities

C. The Contractor is required to submit 3 copies of hard drives containing all the above deliverables.

END OF SECTION 01 32 34

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SECTION 01 43 39
Facade Mockup Testing and Samples

PART I – GENERAL

1.1 RELATED DOCUMENTS:

A. The following documents apply to all required work for the Project: (1) the Contract Drawings, (2) the Specifications, (3) the General Conditions, (4) the Addendum, and (5) the Contract (City of New York Standard Construction Contract).

B. LEED General Requirements

1. Refer to DDC General Conditions

a. Section 01 33 00 – Submittal Procedures.

b. Section 01 74 19 – Construction Waste Management and Disposal.

c. Section 01 81 13.04 – Sustainable Design Requirements for LEED v4 Buildings.

1.2 SUMMARY:

A. This Section includes descriptions of mockups and product Samples for the Building Facade Assemblies for the Project.

B. Mockups

1. Provide mockups as shown on Drawing EN1-004 for review.

2. Construct mockups at locations agreed to by the Commissioner. Mockups shall be representative of the finished work as required to simulate final conditions for the specific reviews listed herein.

a. Include supporting structure as required for each mockup.

3. Provide testing as specified for each mockup.

4. Replace unsatisfactory work as directed by the Commissioner, at no additional cost to the City of New York.

5. When directed by the Commissioner, demolish and remove full-size mockups.

C. Samples

1. Provide Samples as indicated in the Samples Matrix and described herein for review.

D. The work in this Section incorporates the work of the following Sections. Requirements specified in this Section are in addition to those in the following Sections:

1. Section 03 45 00 – Architectural Pre-Cast Concrete.

2. Section 07 00 01 – Rainscreen System.
3. Section 07 20 00 – Thermoplastic Membrane Roofing.
4. Section 07 42 14 – Metal Panels.
5. Section 07 62 01 – Facade Sheet Metal Flashings.
6. Section 08 40 01 – Glazed Storefronts and Curtain Wall System.
7. Section 08 63 01 – Aluminum-Framed Skylight System.
8. Section 08 80 00 – Exterior Glazing.
9. Section 08 90 00 – Louvers.

E. Reference Documents

1. Building Enclosure System Matrix: Refer to Drawing EN1-003.
2. Exterior Glass Type Matrix: Refer to Drawing EN1-003.
3. Samples Matrix: Refer to Drawing EN1-003.
4. New Building Facade Mockup: Refer to Drawing EN1-004.

1.3 SUBMITTAL PROCEDURES:

A. Refer to DDC General Conditions Section 01 33 00 – Submittal Procedures.

1.4 SUBMITTALS:

A. Mockups

1. Provide Shop Drawings, supporting calculations, and product data sheets as required for review and approval.
   a. Shop Drawings shall include all termination details including connections to the mockup chamber.
2. Proceed with fabrication of mockups only after acceptance of all applicable submittals.

B. Photographs for Documentation of Mockups

1. Take a minimum of three (3) photographs at each location and at intervals as required by the Commissioner.
2. Submit digital color images of mockup before, during, and after pre-construction testing.

C. Samples

1. Provide product data as required for review and approval.

2. Proceed with fabrication of Samples only after acceptance of all applicable submittals.

D. Testing Submittals

1. Provide documentation, including Shop Drawings, calculations, and product data sheets as required by the Independent Testing and Inspection Agency for approval, confirming that the pre-construction mockup specimens meet all testing requirements.

2. Submit a mockup testing program developed specifically for the Project's test specimen and requirements for review and approval.

3. Resubmit Shop Drawings to both the Independent Testing and Inspection Agency as well as the Commissioner with changes made to Work following testing to successfully complete mockup testing.

4. Contractor shall hire an Independent Testing and Inspection Agency that shall submit in-situ mockup test reports including, but not limited to, the following information:

a. Nature and objectives of the test, measurement, or chemical analysis.

b. Credentials of the organization undertaking the test including their accreditation for such testing, measurement, or analysis.

c. Dates, weather, and witnesses present.

d. Details of the samples, the method used, and the limits of accuracy.

e. A factual account of the results.

f. Observing mockup installation and dismantling.

g. Any variations to the details outlined in the mockup Shop Drawings.

h. Any change to the method statement submitted with the Shop Drawings.

i. Extent of air and water penetration into the system.

1) In the event of non-compliant air or water leakage, report what repairs were made to the system to make compliant.

j. Information gathered from the structural performance and robustness tests.

k. Evidence of damage or displacement revealed during the mockup testing or dismantling.

1.5 QUALITY ASSURANCE:

A. Refer to DDC General Conditions Section 01 40 00 – Quality Requirements.

B. Mockup Meetings

1. Prior to the start of construction of each mockup assembly at the test facility, and at the Commissioner's direction, meet to review methods and sequence of each mockup construction. Meeting shall include

all agenda requests made by the Commissioner. Attendees shall include the subcontractors for the portion of the Work related to each mockup, the Independent Testing and Inspection Agency, and any others whose work on the Project requires coordination with this work. Include in this meeting individuals supervising both the work of the mockups as well as the construction of the final Work on the Project.

C. Testing

1. Conduct tests of each specified mockup under the direction of an Independent Testing and Inspection Agency in the presence of the Contractor, Commissioner, Installer, and component manufacturers, and fabricators for each specified system to be mocked up and tested. Proceed with testing only after approval of the test program and procedures.

2. Contractor shall not pre-test mockups without prior approval from the Commissioner. If approval is granted, perform pre-testing only in the presence of the Commissioner.

3. Perform necessary corrections to the Work in the presence of the Commissioner.

D. Qualifications

1. Performance Mockup Testing Agency Qualifications

a. Testing laboratories shall be specifically qualified, and AAMA accredited, to conduct laboratory performance tests required by these Specifications and acceptable to the Commissioner.

1.6 IN-SITU PERFORMANCE MOCKUP TESTING AT THE PROJECT SITE:

A. Performance mockup construction and testing shall be constructed on the Project site with materials that will be incorporated into the final construction of the Project. Fabricators shall provide documentation that its equipment to be used on the Project site are capable of providing all required tests specified. An Independent Testing and Inspection Agency representative must be present to inspect construction and to observe testing procedures.

1. Schedule

a. Contractor shall provide detailed schedules for all mockups including expected dates of fabrication, erection, glazing, sealing, and testing a minimum of thirty (30) days prior to start of mockup fabrication, to permit the Commissioner to coordinate their monitoring and observation thereof.

b. Contractor shall allow for no less than three (3) mockup reviews at mutually predetermined points in the assembly of the mockup for the Commissioner to comprehensively review and evaluate materials, fabrication, workmanship, and assemblies. Complete mockup Engineering, construction, and testing (as applicable) in a timely manner to ensure there are no delays in completion of the Work for the Project.

2. Review, Evaluation, and Response

a. Conversations during mockup review evaluations are not final decisions unless specifically noted otherwise. After each on-site review, Contractor will distribute meeting minutes of

discussions held during the mockup evaluations and will distribute the same for record. Meeting minutes will provide direction for issues resolved on site and provide next steps or action items and responsibilities for work to be completed. Responses and direction for issues left unresolved on site will be addressed in writing by the Commissioner within fifteen (15) calendar days after meeting minutes noted above are issued.

b. For issues requiring replacement of mock-up components, the Contractor will, within seven (7) days of receipt of the Commissioner's response, provide a schedule indicating when the re-assembled mockup will be complete and ready for review and re-evaluation.

c. Fully document final decisions made during mock-up review on the Record Shop Drawings for each pre-construction mockup as required in the Submittals article of this Section. Any deviations indicated on the fabrication Shop Drawings from decisions made during mockup review shall be grounds for rejection of the same.

PART II – PRODUCTS

2.1 VISUAL EVALUATION MOCKUPS:

A. Provide and install mockups to the extent indicated and as required for evaluation. All required mockup submittals shall have been reviewed and received final approval from the Commissioner prior to construction of the mockups.

B. Use mockups as a standard for judging visual acceptability of the profiles, finishes, and workmanship of the Work for the Project. Replace unsatisfactory work as directed.

2.2 IN-SITU PERFORMANCE TESTING MOCKUPS:

A. Provide and install mockups to the extent indicated and as required for testing and evaluation by the Commissioner. All required mockup submittals shall be reviewed and receive final approval from the Commissioner prior to construction of the mockups.

B. Use testing mockups as a standard for judging visual, workmanship, and performance acceptability of work for the Project including the operation, maintenance, and replacement strategies for individual elements. Replace unsatisfactory work as directed.

C. Provide same personnel to construct the mockups and perform and supervise the actual work.

D. Fabricate components and construct assemblies as approved during submittal review to meet the Project's performance requirements.

1. Do not use special measures or techniques that are not representative of those used in the building.

2. Include all detailing, insulation, panels, back pans, access restraint fittings, externally fixed items, any penetrations, all connections to main structure, and all miscellaneous framing, flashings, and metal trim components with approved finishes all identical to the assembly proposed for the building and approved during Shop Drawing review.

E. Provide extra materials as may be required to replace any which fail during tests.

2.3 SAMPLES:

A. General

1. Provide material Samples of any component added to or modified on the pre-construction mockups as required to meet the specified performance requirements during laboratory testing and/or as required to meet the Project's Engineering intent as agreed upon during the review and evaluation period of pre-construction mockups.

2. Provide Samples in the types, quantities, and sizes specified in the Samples Matrix.

B. Glass

1. Provide Samples specified including all coatings, frit patterns, and interlayers from manufacturers able to meet the Project's Engineering intent and performance requirements.

2. Provide a range of Samples if variation in the color, material quality, or in tolerances can be expected in the products provided for the Project. Provide Samples showing the range of variables including primary and secondary sealant colors, spacer bar finishes, and ceramic frit colors.

3. Submit with Glass Samples the following measurements of the Samples in compliance with the Glazing requirements:

   a. Flatness, including bow and warp, roll ripple.

   b. Color.

C. Panels

1. Provide Samples specified including all coatings and finishes from manufacturers able to meet the Project's Engineering intent and performance requirements.

2. Provide a range of Samples if the color, material quality, or variation in tolerances can be expected in the products provided for the Project.

3. For Panel types where Samples are specified, provide three (3) additional Samples including an area of 10% with Panel finish removed and repaired according to the manufacturer's recommendations.

D. Framing

1. Provide Samples specified including all coatings, finishes, gaskets, hardware, and fasteners from manufacturers able to meet the Project's Engineering intent and performance requirements.

2. Provide a range of Samples if variation in the color, material quality, or in tolerances can be expected in the products provided for the Project.

3. For framing types where Samples are specified, provide three (3) additional Samples including an area of 10% with frame finish removed and repaired according to the manufacturer's recommendations.

4. Provide framing Samples for review concurrently with adjacent Panel Samples for that system.

PART III – EXECUTION

3.1 EXECUTION REQUIREMENTS:

A. Refer to DDC General Conditions for execution requirements.

3.2 WEATHER PERFORMANCE TESTING PROGRAM:

A. Perform testing in the following order and evaluate against the requirements outlined in the Specification Section for each system shown on the Mockup Drawings included in each mockup:

1. Static pressure air infiltration.
2. Static pressure water infiltration.
3. Dynamic pressure water infiltration.

B. If the mockup fails one portion of the test and corrective work is required, retest the mockup through all of the prior test steps unless Commissioner deems unnecessary.

END OF SECTION 01 43 39

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SECTION 01 80 00
Building Enclosure Contractor Performance Requirements

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

A. The following documents apply to all required work for the Project: (1) the Contract Drawings, (2) the Specifications, (3) the General Conditions, (4) the Addendum, and (5) the Contract (City of New York Standard Construction Contract).

B. LEED / Environmentally Preferable Purchase (EPP) General Requirements

a. Refer to DDC General Conditions.

1) Section 01 33 00 – Submittal Procedures.

2) Section 01 74 19 – Construction Waste Management and Disposal.

3) Section 01 81 13.04 – Sustainable Design Requirements for LEED v4 Buildings.

b. LEED requirements apply to all Phase II work with the exception of the Existing Building scope. EPP requirements apply to the Project's Existing Building scope only.

1.2 SUMMARY:

A. This Section describes the required Contractor performance for the building enclosure systems portion of the Project that are in addition to those listed in the Related Sections below. These requirements include portions of the Contract which require Engineering Services as well as prescriptive work.

B. Section Includes

1. Responsibilities

a. Engineer Work using performance requirements and design criteria indicated for each Referenced System.

1) This Section, together with the Related Sections and Architectural Drawings, define the scope and provide an indicative solution for the Work, including but not limited to:

a) Mandatory geometry of the building enclosure systems.
b) Performance parameters.
c) Minimum acceptable standards and the required regime for verification of engineering, fabrication, and installation processes.
d) Acceptable products.
e) Required fabrication and installation techniques.

2) The Contractor is responsible for executing the design based on the detailing and parameters set forth in the Drawings and Specifications and for the procurement,

fabrication, installation and verification of the Work Contractor shall provide all items required for proper completion of the Work.

3) It is the Contractor's responsibility to guaranty their Work, and to ensure that all materials and work meet the requirements of this Project.

b. Ensure that all people engaged in Engineering, fabrication, and installation of the Work are properly instructed, proficient, and experienced; where applicable they shall be approved by the manufacturer.

c. Coordinate Engineering, site, and trade interfaces of the Work with adjacent trades. All interfaces shall meet the requirements of the Contract Documents. Contractor for this Section is responsible for coordinating Engineering of interfaces between the Work of adjacent trades, including but not limited to the following:

1) Below-grade waterproofing systems.

2) Existing building enclosure systems.

3) External finishes and paving.

4) Internal finishes.

5) Structural elements and framing.

6) Mechanical services.

7) Electrical services.

8) Fire detection and extinguishing systems.

9) Security systems.

10) Lighting and electrical systems.

11) Lightning protection.

12) Gutters / drainage systems.

13) Miscellaneous metals.

d. Provide submittals as required in this Section and the Referenced Systems in accordance with the requirements of the DDC General Conditions.

e. Undertake pre-construction mockups as specified in Section 01 43 39 – Facade Mockup Testing and Samples.

f. Operate under a quality management system to achieve the quality assurance requirements for each Related Section. This shall include but not be limited to:

1) Manage all sequences and procedures for safety precautions and programs associated with the Work.

2) Materials and products procured prior to review and approval of the submittal are subject to rejection.

g. Attend meetings as required.

h. Survey condition and position of receiving structure, surfaces, and interfaces prior to installation and report any discrepancies or deficiencies.

i. Manage protection and cleaning as required by the DDC General Conditions.

j. Provide warranties as specified within each specification section for building enclosure systems and products.

2. Engineering Services Additional Requirements

a. For Work requiring Engineering Services, employ a Professional Engineer licensed in the State of New York who is specifically experienced in projects with systems similar to those referenced in this Section in material, design, and extent, to provide Engineering services, and to prepare, stamp and certify the Work.

1) Contractor's engineer shall provide evidence of its Engineering methodology, analysis, including all assumptions.

2) The same engineer shall prepare and stamp mockup Drawings and calculations as well as submittal Drawings and calculations for that portion of the Work.

3) Attend submittal review workshops and meetings as required.

3. Coordinate the work of this Section with the work of other Sections in these Specifications, including but not limited to:

a. Refer to DDC General Conditions.

b. Section 07 00 01 – Rainscreen System.

c. Section 07 20 00 – Thermoplastic Membrane Roofing.

d. Section 07 27 01 – Weather Resistive Barriers.

e. Section 07 42 14 – Metal Panels.

f. Section 07 62 01 – Facade Sheet Metal Flashings.

g. Section 07 92 01 – Exterior Joint Sealants.

h. Section 08 40 01 – Glazed Storefronts and Curtain Wall System.

i. Section 08 63 01 – Aluminum-Framed Skylight System.

j. Section 08 80 00 – Exterior Glazing.

4. Reference Documents

a. Building Enclosure System Matrix: Refer to Drawing EN1-003.

b. Exterior Glass Type Matrix: Refer to Drawing EN1-003.

1.3 DEFINITIONS:

A. Referenced System: Building enclosure system as specified by the Building Enclosure System Matrix.

B. The work described in this Section is referred to in this Section as the "Work."

C. The term Engineering Services, used in this Specification Section, signifies that the Contractor will provide signed and sealed, fully engineered Shop Drawings for the enclosure systems in entirety for confirmation of compliance with the performance and aesthetic criteria.

1.4 REFERENCE STANDARDS AND REGULATIONS:

A. Refer to DDC General Conditions.

B. The Contractor's Engineering, materials and workmanship shall comply with 2014 New York City Building Code. Comply with all appropriate national and local government regulations and obtain all necessary approvals from the statutory authorities. Where their recommendations or requirements are to a lower standard than required by this Contract Document, the Contract Documents shall take precedence.

C. Comply with applicable provisions and recommendations of the standards listed below. Where standards conflict or conflict with the provisions of these Specifications, the more stringent shall apply. Unless otherwise noted, the latest editions of the standards shall apply:

1. American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE)

   a. ASHRAE 90.1 – Energy Standards for Buildings Except Low-Rise Residential Buildings.

   b. ASHRAE Fundamentals Handbook.

2. ASTM International (ASTM)

   a. ASTM A123 – Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.

   b. ASTM A153 – Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.

3. American Welding Society (AWS)

   a. AWS D1.1/D1.1M – Structural Welding Code – Steel.

   b. AWS D1.2/D1.2M – Structural Welding Code – Aluminum.

   c. AWS D1.3/D1.3M – Structural Welding Code – Sheet Steel.

   d. AWS D1.6/D1.6M – Structural Welding Code – Stainless Steel.

4. National Fenestration Rating Council (NFRC)

a. NFRC 100 – Procedure for Determining Fenestration Product U-Factors.

b. NFRC 200 – Procedure for Determining Fenestration Product Solar Heat Gain Coefficient and Visible Transmittance at Normal Incidence.

1.5 SUBMITTAL PROCEDURES:

A. Refer to DDC General Conditions Section 01 33 00 – Submittal Procedures.

1.6 SUBMITTALS:

A. System Submittals

1. Submittals are to comply with requirements of this Section in addition to the specific requirements outlined in each associated building enclosure system Section.

2. System Drawings

a. Submit typical details for each proposed building enclosure system in the Work.

3. System Calculations: Where calculation submittals are required for the Work, provide the following proposal calculation submittals:

a. Provide preliminary structural calculations to support the submitted proposal Drawings.

b. Provide preliminary thermal calculations to support the submitted proposal Drawings.

4. System and Component Manufacturers

a. Provide project experience demonstrating capability of and capacity for manufacturing the proposed Work for the following:

1) Glass Panels.

2) Cladding materials.

3) Complete systems.

5. Building Information Modeling (BIM)

a. Show capabilities and Project plan on how BIM will be implemented as required by the City of New York.

6. Organization Chart

7. Material Samples, as specified.

8. Quality control plan.

9. Sample warranties.

B. Calculations

1. Provide calculations concurrently with relevant system Shop Drawings.

   a. Calculations shall be readable, comprehensively tabulated, and cross referenced. Maintain a calculation issue register listing the full set of calculations provided for the Project, dates of submission, and revision numbers.

   b. Perform calculations in accordance with the appropriate recognized standards, 2014 New York City Building Code and 2016 New York City Energy Conservation Code, codes of practice, and procedures, using diagrams and extracts from Drawings to explain what is being analyzed. Clearly state basic data used and all assumptions made. The engineer responsible for the calculations must be a Professional Engineer licensed in the state of New York, and have past experience performing similar calculations on successful projects. The contractor must check that the calculations match the intended construction..

2. For computer analyses, present the following information:

   a. A clear statement of the method of analysis.

   b. Program used and version number.

   c. Nature of the program, e.g., finite element, finite difference, flow, standard compliance, etc.

   d. Where used, a clear statement of whether analysis is linear or non-linear, static or dynamic.

   e. Input data including material properties, boundary conditions, loads, and program settings.

   f. All assumptions made and used.

   g. Output data.

   h. A clear statement of the method of interpretation of the results.

   i. Interpretation of the results.

3. Structural calculations shall include the following:

   a. All load cases, load factors, and combinations of load cases including dead loads, imposed loads, live loads, wind loads, thermal loads, snow and ice loads including the effects of ice buildup on elements, rain loads, impact loads, blast loads, seismic loads, and barrier loads as appropriate.

      1) Include the calculation of all loads assumed to apply to the Work using the required referenced codes and standards specified.

   b. Description or diagram of load paths to explain the structural system, which sets out the detailed structural calculations to follow. Calculations for all major elements of the system including stiffeners, connections, and fasteners used to join elements.

   c. Details of assumptions for stress limits for factored or unfactored loads as appropriate for different materials including references to 2014 New York City Building Code and 2016 New York City Energy Conservation Code giving such values.

d. Component utilization.

e. An assessment of overall stability and resistance to buckling and / or progressive collapse.

f. Deflection values and diagrams.

g. Thermal movements and stresses.

h. Tables of reactions.

i. Calculations for structural members, connections, accessories, and temporary components required for transportation and erection.

j. Calculations for all nominal, minimum, and maximum joint widths and movements allowing for all load combinations, building movements, fabrication, and erection tolerances.

1) Thermal movement calculations based on surface temperatures of materials due to both solar heat gain and night-time-sky heat loss.

2) Calculations for brackets and fasteners incorporating movement allowance anticipating the most onerous position for the application of loads.

k. Where finite element or difference analysis models are used, identification of restraint types, property types, axis systems, and applied loads. Checks are also required to demonstrate that global reactions are in accordance with the loading assumptions.

4. Thermal Calculations

a. General

1) Carry out heat transfer calculations in accordance with 2014 New York City Building Code and 2016 New York City Energy Conservation Code requirements and standards referenced by 2014 New York City Building Code and 2016 New York City Energy Conservation Code.

2) Where the 2014 New York City Building Code and 2016 New York City Energy Conservation Code do not reference specific standards to be followed, use ASHRAE 90.1 including its appendices as a standard.

a) For fenestration products, use NFRC standards and approved software unless otherwise noted. Where NFRC approved software is not suitable for providing analysis for complex elements, the Contractor may, subject to Commissioner's approval, use an alternative software program. This software program must be capable of modeling to the same level of detail and with the same methodology and inputs as the NFRC-approved programs. Provide sample, comparative results to NFRC-approved software to demonstrate compliance.

3) Contractor shall assess heat transfer through complex assemblies not explicitly defined by 2014 New York City Building Code and 2016 New York City Energy Conservation Code via two-dimensional or three-dimensional numerical analysis. Three-dimensional analysis is required for locations where significant thermal bridging occurs.

4) Develop heat transfer models so the specified boundary conditions are applied realistically. This requirement supersedes requirements provided by 2014 New York City Building Code and 2016 New York City Energy Conservation Code based standards. The Contractor shall:

a) Where the Work does not define the innermost or outermost surface, model additional construction layers to provide a surface to apply the appropriate boundary conditions.

b) Extend models to a plane of symmetry for application of adiabatic boundary conditions.

b. U-Value Calculations

1) Summarize as thermal transmittance (U-value) for the center of Panels, edge effects, and frame effects of each relevant system type. Calculate overall U-values for each relevant system type as a weighted average of constituent areas.

2) Where not specified by 2014 New York City Building Code and 2016 New York City Energy Conservation Code, determine U-value calculations according to ASHRAE 90.1 Appendix A film coefficients and NFRC 100 boundary temperatures.

a) Determine fenestration systems according to NFRC 100 boundary conditions.

3) Provide calculations to the extent that 95% (by area) of the Work is determined.

4) Include in calculations all thermal bridging elements including those that are discontinuous, such as fasteners and brackets.

c. Solar Heat Gain Coefficient (SHGC) Calculations

1) Summarize for all fenestration products the SHGC for the center of the Panels, edge effects, and frame effects of each relevant system type. Calculate overall SHGC for each relevant system type as a weighted average of constituent areas.

2) Where not specified by 2014 New York City Building Code and 2016 New York City Energy Conservation Code, determine SHGC calculations according to NFRC 200 standards.

3) Provide calculations to the extent that 95% (by area) of the Work is determined.

d. Visible Light Transmittance (VLT) Calculations

1) Summarize for all fenestration products as the VLT for the overall system, including effects of the center of Panels and framing of each relevant system type. Calculate overall VLT for each relevant system type as a weighted average of constituent areas.

2) Where not specified by 2014 New York City Building Code and 2016 New York City Energy Conservation Code, determine VLT calculations according to NFRC 200 standards.

3) Provide calculations to the extent that 95% (by area) of the Work is determined.

e. Condensation Resistance Calculations

1) Contractor to demonstrate by calculation that the Work resists condensation under the specified environmental conditions. Calculations must demonstrate the interior surface temperature (relative to the defined vapor barrier line) remains higher than the dewpoint temperature.

2) Determine calculations via heat transfer analysis to determine system section temperatures. The calculation methodology shall follow NFRC standards with the exception of the following conditions and where other clauses in this Section apply:

a) Boundary conditions for calculations shall be according to the internal and external temperatures and film coefficients specified in the corresponding system Section.
b) Use realistic model boundary conditions.

3) Present calculation results so the dewpoint temperature can be clearly seen with respect to the simulated section temperatures and vapor barrier line.

C. Shop Drawings

1. Refer to DDC General Conditions for Shop Drawing submittal requirements.

2. Submit Shop Drawings based on compliant solutions, calculations, Samples, and other supporting evidence.

a. For Work, include plans, erection plans, elevations, sections, full-size details, and attachments to other work. Submit details for all typical and non-typical conditions.

1) Submit Drawing list with detailed description of the Drawings included on the individual sheets.

2) Drawings shall illustrate the complete system including but not limited to supporting elements, fasteners and fixings, allowance for movements and tolerances, and the continuity of weatherproofing elements and insulation. Show sequencing, shape, and layering of all elements.

a) Show all weatherproofing elements including air and weather seals, membranes including vapor retarders waterproofing membranes and roofing membranes, drainage routes, and ventilation. Waterproofing elements shall have all terminations, tie-ins to walls roofs and below-grade systems, laps, corners, intersections of horizontal and vertical surfaces, and penetrations through the system.
b) Submit Drawings showing the location, elevation, and spacing of all penetrations through waterproofing systems.
c) Provide Drawings demonstrating how drainage will be accommodated, and standing water prevented, in wet zones of the Work.

3) Identify materials to be incorporated in the work, dimensions, thickness of each material and system, and relationships to adjacent construction. Show integration with all adjacent building enclosure systems.

4) Indicate welds by standard AWS symbols, distinguishing between shop and field welds. Show size, length, and type of each weld.

5) Indicate type, size, and length of bolts, distinguishing between shop- and field-installed bolts. Identify conventional and high-strength bolted connections.

6) Provide axonometric Drawings of special conditions and of areas requested by the Commissioner to clarify the Engineering.

7) Provide details for cuts, connections, splices, camber, holes, welds, bolts, surface preparation and finish, and other pertinent information. Indicate clearly components which will be fabricated or assembled on site.

8) Clearly identify all changes in resubmissions.

9) Date and identify each Shop Drawing issue and identify each Shop Drawing sheet by the same drawing number / name throughout the duration of the Project.

b. Approval of Shop Drawings is for size and arrangement of principal and auxiliary members, and conformance of connections. Approval does not relieve the Contractor's responsibility for dimensions, fabrications, and correct fitting of system components.

c. Manufacturer's standard data sheets and details or photocopies of the construction documents are not acceptable for Shop Drawings.

3. Coordination Drawings

a. Refer to DDC General Conditions for Coordination Drawing submittal requirements.

b. Prepare Coordination Drawings at the interfaces between different systems.

c. Prepare Coordination Drawings where careful coordination is needed for installation of products and materials fabricated by separate entities.

d. Prepare Coordination Drawings where limited space availability necessitates maximum utilization of space for efficient installation of different components.

e. Show the relationship of components shown on separate Shop Drawings.

f. Indicate required installation sequences.

g. Comply with requirements in building enclosure system Specifications.

4. Submit Drawings in no more than two batches per system. Provide supporting calculations and data sheets for initial system submissions.

5. Where prefabricated Panel systems are utilized for the Project, provide as part of the Drawing set a schedule for all Panels and glazing types:

a. Panel types including finishes for each type.

b. Glazing types including buildups and performance data for each type.

6. Produce and submit digital Building Information Model for coordination of trades as required by the City of New York.

D. Testing Reports

1. As required and specified in in building enclosure system Specifications.

E. Product Data

1. Manufacturer's technical and installation literature for all materials specified or proposed for use on the Project. Properly label and reference to the appropriate Related Section.

2. For each type of product indicated, include construction details, material descriptions, dimensions of individual components and profiles, and finishes.

3. Provide documentation from the different material and system manufacturers showing that all materials are compatible with all other materials with which they come into contact at the Project, or recommendations to provide separation between non-compatible materials.

4. Provide test reports showing that the materials and systems meet the performance criteria established by these Specifications.

F. Samples.

G. Quality Control Plan

1. Project specific, demonstrating how quality management will be implemented from Award to Final Completion.

H. Submit the following informational submittals in time to allow for review by the Commissioner and for resubmittals, if needed, without delaying the work. Informational submittals include product data, calculations, graphical information, and physical samples that do not require Commissioner's responsive action.

I. Qualification Data

1. Provide documentation from the different material and system manufacturers that the Contractor is instructed by the manufacturer to install the specified materials and systems.

2. Provide project experience demonstrating the capability and capacity to complete the Work for each of the following:

a. Fabricators and manufacturers for the following:

1) Framing systems.

2) Cladding Panels.

3) Glass Panels.

4) Weatherproofing products.

5) Finishing products.

b. Independent Testing and Inspection Agencies.

J. Welding Certificates

1. Welding Qualifications: Where required by Work, qualify procedures and personnel according to the following:

a. AWS D1.1/D1.1M – Structural Welding Code – Steel.

b. AWS D1.2/D1.2M – Structural Welding Code – Aluminum.

c. AWS D1.3/D1.3M – Structural Welding Code – Sheet Steel.

d. AWS D1.6/D1.6M – Structural Welding Code – Stainless Steel.

K. Welding procedure Specifications and test reports including, but not limited to the following:

1. Qualification Test Reports

a. For each class of weld to be incorporated into the Work.

2. Mill Test Reports

a. Signed by manufacturers approving that the following products comply with the following:

1) Structural steel including chemical and physical properties.

2) Bolts, nuts, and washers including mechanical properties and chemical analysis.

3) Tension-control, high-strength bolt-nut-washer assemblies.

3. Galvanizing

a. Two copies of and the original coating applicator's notarized Certificate of Compliance that the hot-dip galvanized coating meets or exceeds the specified requirements of ASTM A123 or ASTM A153 as applicable.

L. Product Test Reports

1. Indicating compliance with performance requirements. All reports must be current (less than 4 yrs old and not expired).

M. Product Data

1. Include Material Safety Data Sheets (SDS) for each material where appropriate.

N. Field Quality Control Reports

1. Provide field reports from manufacturer's representatives for all materials and systems noting work that does not meet their installation and/or warranty requirements with recommendations for corrective action.

O. Maintenance Manual

1. For the Work, specify the interval and regime required to maintain each component, material, assembly, and system, in order for the Work to meet the design life performance requirement. Identify the following materials and components that are:

   a. Maintainable. Under normal service conditions, these items will meet the service life of the cladding (without loss of performance below that specified in this Section) with routine service and maintenance. Provide comprehensive recommendations for the servicing and maintenance of these items.

   b. Non-Maintainable. Under normal service conditions, these items will meet the service life of the cladding (without loss of performance below that specified) but are inaccessible for servicing and maintenance.

   c. Replaceable. Under normal service conditions, these items cannot meet the specified service life. Engineer these elements to be replaceable and provide details of the method of replacement.

P. As-Built Drawings

1. Provide Drawings meeting the requirements of Shop Drawings that show the as-built condition.

2. Include a finalized Building Information Model.

Q. Completion of Work

1. Upon substantial completion of Work, submit written certification that the Manufacturer's representative has supervised the work of this Section and that materials they observed are installed in accordance with the manufacturers' requirements.

R. Warranties

1. Submit all Project specific documentation.

1.7 QUALITY ASSURANCE:

A. Refer to DDC General Conditions Section 01 40 00 – Quality Requirements.

B. Comply with applicable provisions of the following specifications:

1. AISC 303 – Code of Standard Practice for Steel Buildings and Bridges.

2. AISI S202 – Code of Standard Practice for Cold-Formed Steel Structural Framing.

3. The Aluminum Association Specification for Aluminum Structures. Chapters M and N.

C. Qualifications

1. Field Testing Agency: Engage an independent third-party qualified Testing and Inspection Agency to perform field tests.

a. Field water testing shall be performed by an AAMA accredited agency.

D. Product Options

1. Information on Drawings and in Specifications establishes requirements for aesthetic effects and performance characteristics of assemblies. Aesthetic effects are indicated by dimensions, arrangements, alignment, and profiles of components and assemblies as they relate to sightlines, to one another, and to adjoining construction.

2. Do not revise intended aesthetic effects, as judged solely by Commissioner, except with Commissioner's approval. If revisions are proposed, submit comprehensive explanatory data for Commissioner's review.

3. Certification of Materials: Prior to commencement of fabrication, obtain certification from the manufacturer of each material that the material is of the correct grade, strength, size, finish, etc., and that all applied coatings, finishes, and the like have been applied to the relevant standards specified herein. Provide copies of all such certification to the Commissioner for inspection.

E. Availability of Shop Drawings: Provide a copy of all applicable Drawings, including Shop Drawings, and Specifications at the site during all referenced system work.

F. Notification: Notify the Commissioner in writing at least 72 hrs prior to the initial installation of the Work.

G. Inspections: Provide site access to the authorized representative(s) including inspectors, the Commissioner, and manufacturers' for inspection of the Work.

1. The fabricator's engineer will organize and direct the test and inspection program. All inspection and test reports shall be submitted to the Contractor and Commissioner. The Contractor shall be responsible for understanding the test and inspection program and notifying the Testing Agency and the Special Inspector when work is ready for tests and/or inspections. The Contractor will provide access to the Special Inspector and the Commissioner. Inspections and tests of the Program of Structural Tests and Inspections will not relieve the Contractor of responsibility for supervision, testing, and inspection for quality control of the work.

2. The Contractor will provide testing and inspection reports to the Commissioner. Upon substantial completion of the construction, the independent Special Inspector will make a final report on the satisfactory completion of the Program for Structural Tests and Inspections to the Commissioner.

1.8 PROJECT CONDITIONS:

A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit installation according to manufacturer's written instruction and warranty requirements, and in compliance with the specific requirements of Work.

1.9 COORDINATION AND SEQUENCING:

A. Fully coordinate construction and installation sequences with all adjacent trades.

B. Provide as specified for referenced system and in DDC General Conditions.

PART 2 - PRODUCTS

NOT USED

PART 3 - EXECUTION

3.1 EXECUTION REQUIREMENTS

A. Refer to DDC General Conditions for execution requirements.

3.2 FABRICATION:

A. General

1. As required by the Submittal Section, the Contractor shall prepare general arrangement, component, and assembly Drawings and method statements and submit them for Commissioner's review.

2. Fabricate the Work in accordance with the Contract Documents, Drawings and method statements, and manufacturer's requirements modified as necessary, to meet the requirements of the Contract Documents. The Contractor's fabrication team shall be involved with the product Engineering development.

3. Select fabrication methods used to achieve the specified performance. Base methods used on the use of suitable equipment and experienced operators.

4. Carry out assembly of components to the extent possible in a factory environment.

5. Contractor shall check components for compliance with Drawings and method statements that have been reviewed by the Commissioner, prior to assembly in accordance with their quality procedures.

6. Do not modify the reviewed Drawings and method statements without the written consent of the Commissioner. All changes shall be recorded on a master set of documents and shall be included in the Operations and Maintenance Manual as a record of the as-built work.

3.3 INSPECTION:

A. Operate an inspection system to verify that all materials, workmanship, and completed work conform to the performance criteria and minimum requirements. This includes, but is not limited to, a system for identifying the inspection status at all stages of manufacture and testing.

3.4 MARKING OF PREFABRICATED COMPONENTS:

A. After fabrication, clearly mark components to identify their locations in Project according to Shop Drawings to identify strong points for lifting, permit assembly or installation in a particular sequence; or where interlocks occur; or where confusion could arise among components critically different from one another. Marks shall be concealed when installed or made in such a way as not to affect the performance of the work upon removal.

3.5 EXAMINATION:

A. Verify all site conditions and dimensions by field measurements for compliance with requirements for installation tolerances and other conditions affecting performance of the work prior to ordering materials or

starting work. Do this in consideration of the special conditions associated with the alteration of existing construction and reconstruction. Notify the Commissioner of any discrepancies between Drawings and field conditions, and of any elements that require restoration. The Commissioner will determine what modifications or additional restoration are necessary.

B. Verify that site conditions are ready to receive Work.

C. Beginning work indicates Contractor's acceptance of Project conditions.

3.6 DELIVERY, STORAGE, AND HANDLING:

A. General

1. Contractor shall provide a method statement detailing proposed methods of storage and handling, including transportation. Statement will clearly demonstrate that all possible steps have been taken to minimize the risk of damage to materials and fabricated components. The method statement shall include:

   a. Details of manufacturer's requirements for the correct storage of materials and components, in the factory and on site prior to installation, and protection at all times.

   b. Details of temporary support arrangements for the assemblies, both on and off site.

   c. Details of lifting arrangements.

   d. Transportation arrangements.

2. Undertake inspection in line with the agreed quality procedures for elements and components prior to their use. Record all damage and remedial procedures agreed upon with the Commissioner, prior to incorporation into the work.

B. Delivery

1. Do not deliver materials to the Project site before the time of installation.

C. Storage

1. Store materials in original, undamaged packaging with manufacturer's labels and seals intact, unless the manufacturer requires packaging be removed during storage. Clearly label materials with the manufacturer's brand name, batch number, and expiration date, where appropriate.

2. Store all materials according to manufacturer's recommendations, in a dry, enclosed area, off the ground and blocked, and away from all possible contact with water, ice, or snow.

3. Protect and store materials, assembled units, elements of framing and all components of the permanent work in such a manner according to manufacturer's written instructions to prevent damage, distortion, uneven weathering, or degradation. Separate all materials on site from surface of ground. Members bent or buckled from handling or storing are liable to rejection. Prevent damage to glass and glazing materials from condensation, temperature changes, direct exposure to sun, or other causes.

4. Supply bolts, nuts, and washers in grit-free containers and stored in watertight premises. Reject burred, damaged, corroded, or otherwise unserviceable bolts.

5. Clearly label all elements and components for identification and traceability.

6. Store materials in a neat and safe manner so as not to exceed the allowable live load of the storage area.

7. Store materials, including liquids such as adhesives, thinners, and primers, in areas away from sparks, open flames, and excessive heat, and in a dry condition.

D. Handling

1. Handle materials carefully in order to avoid damage or breakage.

2. Do not expose materials to detrimental conditions or physical damage. Store materials out of the weather in clean and dry areas. Do not allow materials to become wet or soiled or covered with ice or snow. Remove materials exposed to detrimental conditions from the job site and do not incorporate into the Work. If incorporated into the Work, remove and replace, up to and including the time of substantial completion, at no additional cost to the City of New York .

3. Do not open packages or containers until all preparatory work is complete and installation is to begin immediately.

3.7 TRIAL INSTALLATION:

A. Provide for review, initial installation of Work noted in the referenced system for installation quality, fit, and finish.

B. Notify Commissioner of the proposed area for trial installation a minimum of two (2) weeks prior to the start of trial installation.

C. Approved trial installation mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

D. Approval of trial installation does not constitute approval of deviations from the Contract Documents contained in mockups unless Commissioner specifically approves such deviations in writing.

3.8 INSTALLATION:

A. Do not install damaged materials or components.

3.9 QUALITY CONTROL PROCEDURES:

A. Implement a clear system to track information flow and to check that work is being engineered and installed to the most up-to-date revisions of Specifications, Drawings, and Coordination Drawings.

B. Documented procedures shall cover but are not necessarily limited to the following:

1. Names of the Quality Manager and team.

2. Quality assessment.

3. List of Engineering development Drawings required and the rate at which they will be produced.
4. Inspection and test procedures to be adopted in checking the Work.
5. Stages at which checklists will be used and Samples of those checklists.
6. Statements on work procedures on the correct use of materials and components, both off site and on site.
7. List of product information with latest revisions.
8. Trade Subcontractors appointed by the Contractor that are involved in the work.
9. Contractor's quality systems and details of their checklists.
10. Engineering, procurement, material checking, fabrication, storage, handling, transport, and protection requirements.
11. Procedure for checking compliance with the Contract Documents and with accepted good practice.
12. Procedure for registering and reporting non-compliance.
13. Procedure for ensuring that non-compliance does not recur.
14. Calibration records of measuring equipment.
15. Certification that the Work is considered complete by the Contractor and is ready for Commissioner's inspection.
16. Checklist register to ensure that all items have been inspected by the Contractor and non-compliance discharged.
17. Protection of work in progress and work completed, including primary brackets, seals, and fire stops.

C. During fabrication, checklists shall include inspection requirements for all components, seals, and finishes that cannot be inspected at later stages in manufacture, assembly, or erection of components.

D. During installation, checklists shall include such items as survey spot checks of primary brackets, condition of components and assemblies, finishes, joint cleaning, backer rod and sealant installation, membrane installation, and fire stopping.

E. Inform the Commissioner in writing on a daily basis of any conditions detrimental to the installation of the Work. State the specific location of each condition.

F. Completed quality checklists shall accompany the components at all stages of production up to the final erection on site and be available for inspection at any stage.

G. Detailed method statements referenced in this Contract Document are required before the work commences.

H. Contractor must provide all coordination, reviews, and manufacturer involvement to qualify the installation for the manufacturer's warranty.

3.10 REPLACEMENT:

A. Restore or replace components out of tolerance and/or exhibiting scratches, stains, or other defects at no additional cost to the City of New York.

1. Restoration is subject to review to evaluate the intended performance and aesthetic effects, as judged solely by Commissioner. Replacement is required where restoration does not meet the aesthetic intent.

2. Remove and replace brittle materials that are broken, chipped, cracked, or abraded or that are damaged from natural causes, accidents, and vandalism, during construction period.

3.11 CLEANING AND PROTECTION:

A. Protect all components of the Work from detrimental weather and damage until construction operations are completed and acceptable to the Commissioner.

B. Work which cannot, for reasons acceptable to Commissioner, be covered with complete construction system before onset of weather detrimental to the Work shall be completely covered and protected so as to deflect water and weather from the installation without damaging adjacent work.

C. Protect finishes from damage immediately after installation. Do not apply markers to exposed surfaces and remove nonpermanent labels immediately after installation.

D. Protect finishes from contact with contaminating substances resulting from construction operations. If, despite such protection, contaminating substances do come into contact with the Work, remove substances immediately as recommended in writing by the manufacturer.

E. Do not store construction or waste material or equipment on installed waterproofing or roofing membranes without protection and approval from the manufacturer.

F. Examine finished surfaces adjacent to or below exterior concrete and other masonry surfaces at frequent intervals during construction, but not less than once a month, for buildup of dirt, scum, alkaline deposits, or stains; remove as recommended in writing by the manufacturer.

G. Wash all external surfaces as recommended by manufacturer in each area of Project not more than four (4) days before date scheduled for inspections that establish date of Substantial Completion. Wash Work as recommended in writing by the finish manufacturer. Thoroughly clean surfaces free of oil, grease, and other foreign matter.

3.12 CLEAN UP:

A. Upon completion of the Work, Contractor shall remove all equipment, material, and debris from the work and storage areas, and leave those areas in an undamaged and acceptable condition.

END OF SECTION 01 80 00

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SECTION 02 01 01
Petroleum Bulk Storage Tank Removal

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

A. The following documents apply to all required work for the Project: (1) the Contract Drawings, (2) the Specifications, (3) the General Conditions, (4) the Addendum and (5) the Contract [City of New York Standard Construction Contract].

B. LEED / Environmentally Preferable Purchase (EPP) General Requirements:

1. Refer to DDC General Conditions and the Addendum to the General Conditions
2. LEED requirements apply to all Phase II work with the exception of the Existing Building scope. EPP requirements apply to the project's Existing Building scope only.

C. The following documents have been prepared for the rehabilitation project and are included with the Contract Documents:

1. 22 June 2018 Phase I Environmental Site Assessment (ESA), prepared by Louis Berger & Associates., P.C. (Louis Berger)
2. 12 October 2018 Phase II Environmental Site Investigation (ESI) Report, prepared by Louis Berger
3. 09 December 2019 DSNY Landfill Infrastructure Modifications, prepared by Langan
4. 22 October 2018 Geotechnical Engineering Report, prepared by Langan

D. Related Sections

Sections containing requirements related to this Section include, but are not limited to:

1. Section 02 61 13 – Excavation, Handling, Transportation, and Disposal of Contaminated Materials
2. Section 31 00 00 - Earthwork
3. Section 31 50 00 – Excavation Support and Protection

1.2 GENERAL REQUIREMENTS

A. The Contractor shall furnish all labor and materials, equipment and incidentals required for the proper decommissioning, removal, and closure of on-site petroleum bulk storage tanks and associated piping. If

identified, removal and off-site disposal of petroleum-contaminated soil and concrete should follow Specification 02 61 13 – Excavation, Handling, Transportation, and Disposal of Contaminated Materials.

B. Contractor shall be responsible for excavation of any contaminated soil or liquids as directed by the Commissioner and City of New York and for loading, transportation and disposal of petroleum-impacted materials and of impacted concrete that may be encountered during the tank removal. Contractor's work shall include all labor and equipment required to complete this scope and shall be inclusive of any waste classification sampling and disposal facility coordination for removal and disposal of soil, liquids and concrete. Any excavation must be supported to accommodate tank removal, excavation of soil and fluids, as necessary.

C. If needed, Contractor shall provide all equipment, labor and material required to backfill and compact the underground storage tank (UST) excavation subsequent to UST removal to replace the tank system void.

D. Contractor is responsible for health and safety of their employees and subcontractors that are required to complete the scope of work. The Contractor must implement any required health and safety measures and provide trained personnel in accordance with 29 CFR 1910.120(e) and 29 CFR 1919.146(g) for completion of work specified herein.

1.3 SCOPE OF WORK

A. The general scope of work will include cleaning, inerting, excavation, removal, waste characterization, transportation and disposal of the tanks, tank enclosures, tank system piping that may be encountered, and any product, water, sludge or other materials (including concrete, sand) contained in the tanks.

B. The Contractor shall obtain all necessary permits, provide proper notification to all city and state agencies, at a minimum per Title 6 of the New York Codes, Rules, and Regulations (6 NYCRR) Part 613-1.9, and utility companies; and furnish all labor, materials, equipment and incidentals required for the proper decontamination, decommissioning, and removal of the tanks and associated electrical, structural, process piping and product equipment. This includes, but is not limited to, concrete, anchor straps, manways, pumps, remote fill lines, supply and return lines, vent lines, remote fill ports, etc.

C. The Contractor also shall be responsible for providing tank closure documentation (i.e., manifests, bills of lading, New York City Fire Department [FDNY] Affidavit for proper tank closure) to the City of New York in accordance with existing New York State Department of Environmental Conservation (NYSDEC) guidance and regulatory policy. Copies of FDNY certifications shall be provided to the City of New York and Commissioner. The Commissioner will be responsible for any change in registration status and closure reporting as required by NYSDEC, including submission of the NYSDEC Petroleum Bulk Storage (PBS) Registration/Renewal form documenting the updated status of the tanks. The City of New York will be responsible for any fees required for change in NYSDEC PBS registration status. Other than the PBS permitting noted above, the Contractor is responsible for all permits and associated costs.

D. Any asbestos-containing material (ACM) present on the tank piping shall be removed and disposed prior to tank and piping removal in accordance with 15 RCNY Chapter 1.

E. The Contractor shall be responsible for the excavation, segregation, stockpiling, transportation, and disposal of all materials (soil, sludge, debris, concrete, etc.) within and including any enclosures, the tank contents, piping, and for pumping, testing, and disposal of free phase product and water removed from the excavation (if applicable).

F. The Contractor shall be responsible for continuously monitoring the work area. This includes, but is not limited to, monitoring for the presence of flammable, toxic, or oxygen deficient atmospheres prior to and during removal of the tank system.

G. The Contractor shall be responsible for demolition, removal and disposal of concrete associated with tank enclosures, retaining walls, bottom pads, and anchor straps, and any underlying contaminated material, as directed by the Commissioner. Any petroleum-contaminated concrete removed from the excavation shall not be disposed of at a recycling facility or other facility permitted to accept clean concrete or construction debris. All petroleum-contaminated concrete must be handled and disposed as petroleum-impacted material.

H. The Contractor shall conduct all required testing for disposal classification of any contaminated materials including, but not limited to, oil, sludge, water or water containing oil or separate phase product, rock, concrete or concrete products, brick, and other ancillary tank system related materials such as piping, conduit, wiring, tank fill facilities, and monitoring devices, to be removed from the Site.

I. All post-excavation endpoint soil samples will be collected by the Commissioner. The Contractor shall assist the Commissioner with collection of post-excavation endpoint soil samples from the excavation bottom and sidewalls of the excavation.

J. The Contractor shall be responsible for any necessary support of excavation required to stabilize the sidewalls of the excavation and other structures, utilities, etc. adjacent to the work area. This shall be done accordance with New York City Building Code, OSHA regulations, and the Contract Documents. All permits required to conduct such work will be the responsibility of the Contractor to obtain and any costs incurred to install such shall be the responsibility of the Contractor.

K. The Contractor shall prepare all necessary plans, obtain all necessary permits, and provide all necessary plans, notifications and submittals to New York City (i.e. FDNY, NYCDOB), State of New York (i.e. NYSDEC PBS) and City of New York and Commissioner before, during, and after performance of the removal work.

L. No work shall be performed under this Contract without the direct, on-site supervision of the Commissioner.

M. All work shall be performed in accordance with the Contract Documents.

1.4 REGULATORY COMPLIANCE

A. The Contractor shall comply with NYCDEP regulations for discharges to the sewer system, United States Environmental Protection Agency (USEPA), NYSDEC, and State Department of Transportation regulations for shipping of regulated substances to off-site disposal facilities, and meet all regulatory requirements imposed by the Treatment, Storage and Disposal Facility. If the Contractor ships materials for disposal through other states, they shall also comply with the regulations and guidance of other states. Regulations pertaining to the

transport and disposal of regulated substances/materials and tank system removal procedures include, but are not limited to the following:

1. USEPA Regulation 40 CFR Part 280, Underground Storage Tanks: Technical Requirements Final Rule and Office of Emergency and Remedial Response, Standard Safety Guides, PB92-983414.
2. New York City Fire Department, FP Directive 3-73 Division of Fire Protection, NYCAC Title 27, New York City Fire Prevention Code, Chapter 4 et seq., and Rule 21-02 of the City of New York.
3. NYS Uniform Fire Prevention and Building Code (UFPBC) 1164.5.
4. NYS Department of Environmental Conservation (DEC)-Subdivision 6 NYCRR Part 613.9 (b) (DEC's Petroleum Bulk Storage – PBS Regulation.
5. 6 NYCRR Part 360, Solid Waste Management Facilities, September 5, 2017.
6. 6 NYCRR Part 364, Waste Transporter Permits, September 5, 2017.
7. 6 NYCRR Part 371, Identification and List of Hazardous Waste, July 1, 1986.
8. NYSDEC Commissioner's Policy #51 (CP-51) Soil Cleanup Guidance, October 1, 2010.
9. NYSDEC Program Policy DER-10 / Technical Guidance for Site Investigation and Remediation, 3 May 2010.
10. NYSDEC Subpart 375-6: Remedial Program Soil Cleanup Objectives, 11 December 2006.
11. Rule 21-02 of the City of New York.
12. New York City Building Code.
13. 29 CFR 1910 – Federal Occupational Safety and Health Administration (OSHA) standards.
14. NIOSH Occupational Safety and Health Guidance manual for Hazardous Waste Site Activities.
15. 29 CFR 1926 – Safety and Health Regulations for Construction.
16. Resource Conservation and Recovery Act, 40 CFR Parts 260-265, Safe Entry and Cleaning of Petroleum Storage Tanks.
17. National Fire Prevention Association, Volume 30, "Flammable and Combustible Liquids Code.", Revised 2015
18. National Fire Prevention Association, Volume 327, "Cleaning or Safeguarding Small Tanks and Containers without Entry."
19. US Department of Transportation (US DOT) 49 CFR Section 172.500 et seq.

20. American Petroleum Institute, API-2015A, "A Guide for Controlling the Lead Hazard Associated with Tank Entry and Cleaning."
21. American Petroleum Institute, API-2217A, "Guidelines for Work in Inert Confined Spaces in the Petroleum Industry."
22. American Petroleum Institute, API-2015, "Requirements for Safe Entry and Cleaning of Petroleum Storage Tanks."
23. American Petroleum Institute, API-2016, "Guidelines and Procedures for Entering and Cleaning Petroleum Storage Tanks."
24. American Petroleum Institute, API-1604, "Closure of Underground Petroleum Storage Tanks."
25. American National Standard Institute, ANSI 22882, "Standard Practice for Respiratory Protection."
26. American Society of Testing Materials, ASTM D 5088 (1990), Decontamination of Field Equipment Used at Non-radioactive Waste Sites.
27. National Institute for Occupational Safety and Health, NIOSH, "Working in Confined Space."
28. New York City Department of Transportation Requirements.

B. Any transporter of contaminated/hazardous materials shall be licensed at a minimum in New York State.

C. Comply with Occupational Safety and Health Administration (OSHA) Standards and Regulations contained in Title 29 CFR Part 1910.120 "Hazardous Waste Operations and Emergency Response."

D. The provisions of the New York City Building Code relating to Site earthwork and backfill shall govern the work of this section.

1.5 QUALITY ASSURANCE

A. Refer to DDC General Conditions Section 01 40 00 "Quality Requirements".

1.6 SUBMITTAL PROCEDURES

A. Refer to DDC General Conditions Section 01 33 00 "Submittal Procedures".

1.7 SUBMITTALS

A. The Contractor shall provide the required submittals to Commissioner during the specific phases of the project as described below.

1. Pre-Mobilization Submittals – The following shall be provided to Commissioner for review no later than seven calendar days prior to the start of any field activities.

   a. Proof of the completion of health and safety training in accordance with 29 CFR 1910.120(e) and 29 CFR 1919.146(g) as specified in Part 3.2.
   b. Copies of permits or licenses for the Contractor's selected disposal facility or reclaimer. A letter of commitment and detailed listing of the disposal facility's or reclaimer's required analytical testing for proper manifesting and disposal shall also be provided.
   c. Copies of all permits required for UST removal.
   d. A detailed project schedule.
   e. Details for relocation of existing utilities away from work, if necessary.
   f. Confirmation that all Site utilities in the work area have been identified and work shall be performed in a manner to protect these utilities from damage. Confirmation that all Site utilities directly associated with the work, including, but not limited to, electrical, steam, product supply and return lines, or other utility lines within the proposed work area have been identified, marked, locked, and tagged out.
   g. A Excavated Material Disposal Plan which includes the following information:

      i. The name and address of the company(ies)/ facility(ies) that shall accept the contaminated materials and liquids, including free product, remaining contents of the tanks, and all free product and contaminated water collected during tank and pipe cleaning, and from the excavation following tank removal.
      ii. The name and address of the licensed tank disposal facility that shall accept the tanks and piping.
      iii. Copies of permits or licenses for the Contractor's selected disposal facility.
      iv. Written confirmation shall be submitted from each of the disposal or recycling facilities indicating that they shall accept the tank and piping, and remaining product or sludge, and other excavated materials to be removed as part of this work.
      v. A copy of certification that the Contractor removing the underground storage tank is certified for the work by the FDNY.

   h. All pertinent information relating to the transport of materials specified herein. For transporters to be considered, the following information, at a minimum, shall be submitted:

      i. Name, telephone number, address, and contact name for all transporters.
      ii. USEPA identification number and license expirations date, where applicable.
      iii. Proof of permit, license or authorization to transport waste in all affected states.

   i. Obtain and submit all applicable NYSDEC, USEPA, and NYSDOT permits required for the transport and disposal of all excavated materials resulting from the performance of the work. The licenses and permits that may apply include, but are not limited to, NYSDEC Part 364 permits and hazardous waste transporter permits issued under 6 NYCRR Part 372.3.

j. Information on each USEPA and state-approved off-site disposal facility that is proposed to receive contaminated materials and hazardous wastes, if applicable, 14 calendar days prior to the disposal of any waste stream. For each proposed facility, the following information shall be submitted:

i. Name, address, and location of the facility, including the name, address, telephone number, and fax number and the contact person at the facility.
ii. The USEPA identification number, as applicable
iii. The amounts and types of contaminated material and/or hazardous wastes that shall be accepted at the facility on a daily basis.
iv. Facility testing requirements and acceptance criteria.
v. The USEPA region, state regulatory agency, and the local regulatory agency for which permits are required.
vi. Copies of valid, current, operating permits for the facility from the applicable regulatory agencies.
vii. Relevant audit packages and insurance certificates

k. Submit a site-specific Environmental, Health, and Safety Plan.

B. Post-UST Removal Submittals – The following shall be submitted 21 calendar days after completion of field work.

1. Copy of Tank Removal Affidavit signed by a FDNY-licensed New York City Tank Contractor and verification that such affidavit has been provided to the FDNY

2. Certification from the disposal facility that the tank has been properly disposed and all scrap steel has been property disposed or recycled.

3. Copies of fully executed (i.e., signed by transporter and accepting disposal facility) waste disposal documentation including manifests and bill of lading for all product, sludge, water, soil and debris transported from the site.

1.8 QUALIFICATIONS

A. The Contractor shall be approved by the Commissioner and City of New York, and shall be a FDNY-licensed tank Contractor. The Contractor shall be any person or persons, corporation, or proprietorship deemed competent and experienced to perform work involving the closures of UST, and the hauling, disposal, transportation, or abatement of hazardous and non-hazardous materials. For the purposes of this contract, the Contractor shall possess the following:

1. A valid "Part 364" permit for waste transport and disposal of petroleum-impacted material

2. Facilities to handle, dispose, and/or abate hazardous or non-hazardous material

3. FDNY licensing for tank closure, OSHA certification for confined space entry, and accordingly trained personnel

4. Labor and materials to immediately execute work under this contract

5. Experience directly related to work under this contract
6. A comprehensive understanding of all the regulations and requirements governing this contract
7. Any item pertinent to work described in this contract
8. When it is necessary for the Contractor to utilize the services of a subcontractor to perform work, the Contractor shall be responsible for supplying the identification and contact information of the subcontractor.
9. The subcontractor's personnel shall possess valid 40-hour OSHA HAZWOPER certifications, per 29 CFR 1910.120(e).

1.9 PROJECT CONDITIONS

A. The Department of Sanitation garage rehabilitation project (site) is located at the northwest corner of Muldoon Avenue (private) and West Shore Expressway service road in Staten Island, New York (the Site) and is identified as Block 5900, Lot 500 on the Staten Island Tax Map. The Site occupies an area of approximately 680,000 square feet and is improved with the existing Staten Island District 3 repair garage, recycling area, wastewater treatment facility, and asphalt-paved and gravel-topped parking lots. According to the 29 March 2018 topographical survey prepared by Langan, the grade fronting the Site along Muldoon Avenue slopes down from about el. 23 feet (north) to el. 10 feet (south), and the grade in front of the site along the West Service Road slopes down from about el. 32 feet (northeast) to el. 10 feet (south). All elevations are referenced to the North American Vertical Datum of 1988 (NAVD88).

B. Based on the findings of the 22 June 2018 Phase I ESA prepared by Louis Berger, the Site contains nine active underground storage tanks (USTs) and two active aboveground storage tanks (ASTs), which are used for waste oil, hydraulic oil, motor oil, No. 2 fuel oil, and biodiesel. The Contractor is responsible for removal of product and sludge from the tanks, inerting the tanks to allow for removal and dismantling, removal of the tanks and all associated piping, and loading, transportation and disposal of the tanks, piping, and tank contents for proper disposal – including any sampling required for disposal of the tank contents. Contractor must also include removal of any concrete or other vaulted structures that may enclose or support the tanks.

C. The City of New York and Commissioner make no predictions or representations regarding the character or extent of soil, obstructions or other subsurface conditions to be encountered during the Work. The Contractor shall make their own deductions of the subsurface conditions that may affect the methods or cost of construction of the Work hereunder, and they agree that they will make no claims for damages or compensations, except as are provided under the agreement, should they find conditions during the progress of the Work different from those as calculated and/or anticipated by them. Other exploratory operations may be performed by the Contractor, at the Contractor's option and following the City of New York's approval. No change in the Contract Sum will be authorized for such additional exploration undertaken by the Contractor.

D. The Contractor, by careful examination, shall inform themselves as to the nature and location of the Work; the conformation of the ground and the nature of the subsurface conditions; the locations of the groundwater table; the character, quality and quantity of the materials to be encountered; the character of the equipment and

facilities needed preliminary to and during the execution of the Work; and all other matters which can in any way affect the Work.

E. The Contractor shall investigate the conditions of public thoroughfares and roads as to availability, clearances, loads, limits, restrictions, and other limitations affecting transportation to, ingress and egress of the Work Site. The Contractor shall conform to NYSDOT, USEPA, and NYSDEC regulations in regard to the transportation of materials to and from and at the job Site.

F. Existing Utilities: Locate existing underground utilities in and beyond the areas of work. If utilities are indicated to remain in place, provide adequate means of support and protection during the Work.

1. Should uncharted, or incorrectly charted, piping or other utilities be encountered during excavation, consult utility owner immediately for directions. Cooperate with City of New York and utility companies in keeping respective services and facilities in operation. Restore damaged utilities to satisfaction of utility owner.

2. Coordinate with utility companies for shutoff of services prior to the removal of any on-site utilities.

G. Examine drawings to determine the sequence of operations in relation to the work of other trades, if they are present. Start of work will signify acceptance of field conditions and will acknowledge coordination with other trades.

1.10 NOTIFICATION

A. Refer to DDC General Conditions Section 01 73 00 "Execution" subsection 3.5 "Examination" for details on utility notification and mark-out.

B. The Contractor shall notify all utilities prior to the work, and arrange for mark-outs of underground utilities, as needed.

C. The Contractor shall notify any city or state agencies as required (i.e., FDNY, NYSDEC PBS) prior to initiation of UST system removal.

1.11 PROTECTION

A. Refer to DDC Standard General Conditions Section 01 35 26 "Safety Requirements Procedures" subsection 3.2 "Protection of Personnel"

B. All Contractor personnel shall wear personal protective equipment and protective clothing consistent with the levels of protection required for this Work as specified by OSHA and the Contractor's Environmental Health, and Safety Plan [HASP].

C. The Contractor shall maintain safe sidewall slopes. Excavations shall meet all applicable New York City Department of Building Codes and OSHA requirements, including 29 CFR 1926.

D. Monuments, bench marks and other reference features on streets bounding this project, shall be protected. Should these be disturbed in any manner, the Contractor shall have them replaced at their own expense.

E. In order to prevent damage, injury or loss, the Contractor's actions shall include, but not be limited to, the following:

1. Storing apparatus, materials, supplies, and equipment in an orderly and safe manner that shall not unduly interfere with the progress of the work.

2. Providing suitable storage facilities for all materials.

3. Placing upon the work or any part thereof only such loads as are consistent with the safety of that portion of the work.

4. Handling of all refuse, rubbish, scrap materials, and debris caused by on-site operations. The Site work shall be conducted in a safe, orderly fashion and maintain a work-man-like appearance at all times.

F. The Contractor shall not enter or occupy other areas with people, tools, materials or equipment, except on areas approved by the Commissioner, after written consent is obtained from the proper parties.

G. Dust, dirt, odor and vapor control shall be implemented at the direction of the Commissioner. The Contractor shall respond immediately to nuisance odors or dust, as directed by the Commissioner.

1.12 ALLOWANCE AND PAYMENT

A. An allowance for the Contractor has been established for this work, to be utilized when ordered and authorized in writing by the Commissioner.

B. The Contractor will be paid on a time and materials (T&M) basis under this allowance. Labor will be paid based on the Contractor's Certified Payrolls, all other expenses will be paid on an invoice basis. A markup of 12% for overhead and 10% for profit will be allowed, except that no markup will be allowed on Payroll Taxes or on the premium portion of overtime pay or on sales and personal property taxes.

PART 2 - PRODUCTS

2.1 MATERIALS

A. All reused soil must meet the requirements specified in Section 026113 – Excavation, Handling, Transportation, and Disposal of Contaminated Materials.

B. The product(s)/materials listed below shall be submitted to the Commissioner for approval.

1. The use of imported recycled concrete aggregate or crushed stone as general fill shall be permitted provided it meets the requirements of NYSDEC DER-10 Section 5.4(e)5, Section 31 00 00 Earthwork and NYCDEP Specification Section 40.06 Environmental Requirements.

2. The use of imported soil as general fill shall be permitted provided it meets the requirements of Part 2.1-B(1).

3. Excavated petroleum-impacted soil that may be derived from the tank removal excavation or the concrete enclosure shall not be re-used on-site. Excavation, transport, and disposal are addressed in in Section 02 61 13 – Excavation, Handling, Transportation, and Disposal of Contaminated Materials.

4. Management of any soil excavated in conjunction with tank removal must be conducted in accordance with the requirements of Section 02 61 13 – Excavation, Handling, Transportation, and Disposal of Contaminated Materials and Section 31 00 00 – Earthwork.

PART 3 – EXECUTION

3.1 EXECUTION REQUIREMENTS

A. Refer to DDC General Conditions for execution requirements

3.2 GENERAL REQUIREMENTS

A. Disposal of tanks, lines, sludge, residual liquids and contaminated soils shall be in accordance with the requirements of this specification and shall be the responsibility of the Contractor.

B. Prior to removal of the UST, all liquids and accumulated sludge shall be removed from the tanks, to the extent possible, in accordance with the National Fire Protection Association Flammable and Combustible Liquids Code (NFPA-30) and any other applicable requirements.

C. Prior to removal from its location, all liquids will be removed, the tank interior will be inerted and void of flammable or explosive vapors, and any lines, wires or pipes will be disconnected from the tank and plugged. The basic procedures for meeting these requirements are defined in the NYSDEC Petroleum Bulk Storage regulatory programs.

D. The Contractor shall continuously test the tank atmosphere and the excavation area for percent oxygen and combustible gas during the tank excavation and removal operations.

3.3 SAFETY

A. Personnel working inside and in the general vicinity of the tanks shall be trained and thoroughly familiar with the safety precautions, procedures and equipment required for controlling the potential hazards associated with this work. Personnel shall use proper protection and safety equipment during work in and around the tanks.

B. Completion of an initial 40-hour Hazardous Waste Operations and Emergency Response (HAZWOPER) training program (or its equivalent) as detailed in OSHA's 29 CFR 1910.120(e) is required for all employees who will perform activities associated with UST removal. Annual 8-hour refresher training is also required.

C. Training in accordance with OSHA's 29 CFR 1910.146(g) is required for all employees who will enter a confined space.

D. The Contractor shall maintain safe sidewall slopes or shall provide adequate shoring. The excavation shoring shall comply with New York City Department of Building Codes, including Subchapter 19.

E. Cutting of steel by thermal methods shall at all times, occur in a non-explosive environment. During such work, explosive atmospheres in the tank, piping and of the surrounding atmosphere shall be continuously monitored. The Contractor shall note that residual pockets of fuel or residues may exist in some of the pipelines and the Contractor shall exercise care to prevent harm to employees or the public resulting from the potential explosive nature of the contained materials. Provide and maintain an adequate supply of fire extinguishers and other required safety equipment in close proximity to all demolition activity.

F. All soil and tank removal operations shall be conducted in a manner as required to prevent the spread of dust per observation by the Commissioner. If deemed necessary by the Commissioner, the Contractor shall provide dust control with a water truck or other means approved by the Commissioner.

G. The Commissioner shall conduct ambient air monitoring in the work zone in the immediate vicinity of the excavation area for fugitive dust emissions and organic vapors. If these readings are unacceptable, the Contractor shall institute measures to minimize dust and/or organic vapors. The measures utilized are subject to the approval of the Commissioner.

3.4 PREPARATION

A. The Contractor shall perform all necessary Site preparation, restoration, security and control including but not limited to temporary fencing, backfilling and shoring as necessary to protect structures, workers and public.

B. The Contractor shall inspect the condition of the tanks, and remote fill, if present, to the extent required for safe work performance.

C. Assure that electrical power to the tanks and their ancillary equipment has been deactivated and the actual wiring properly dismantled at the circuit breaker.

D. The Contractor shall remove the audible and visible overfill alarm system, and dismantle the UST leak detection systems, if present.

3.5 CLEANING AND REMOVAL OF UST SYSTEM

A. The Contractor shall disconnect associated product, vapor recovery and vent lines and drain the remaining liquid inside the product lines into the tanks. The Contractor shall proceed with caution to ensure no product is spilled during this process.

B. The Contractor shall pump all residual waste from the tank via a temporary closed system into USDOT approved drums, containers or vacuum truck. If drums or containers are used, seal the drums or containers, identify contents and store the containers on pallets underlain by 12 mil plastic sheeting.

1. Drums or containers shall be labeled as follows:

   a. Specific work site (e.g. Muldoon Avenue (private) and West Shore Expressway service road in Staten Island, New York)
   b. FMS Project ID No. S136-367
   c. Drum (container) number (in increasing sequence as filled)
   d. Contents (e.g. rinse water from tank cleaning)
   e. Date filled

2. The Contractor shall maintain a written inventory of drums and containers.

C. The Contractor shall clean and vent all associated product, vapor recovery and vent lines before disconnecting from the tank.

D. The Contractor shall clean the inside of the tanks in accordance with API-2015 using high-pressure water rinse. The Contractor shall pump rinse water via a temporary closed system into USDOT approved drums, containers or vacuum truck. If drums or containers are used, seal the drums or containers, identify contents and store the containers on pallets underlain by 12 mil plastic sheeting. Drums or containers shall be labeled as described in Article 3.05 B.

E. The Contractor shall purge the tank of all flammable vapors and oxygen by displacement with inert gas using one of the following methods:

1. Displacement with bottled, inert gas (e.g. carbon dioxide)

2. Displacement with dry ice (minimum 15 lbs. per 1,000 gallon tank volume). The dry ice shall be crushed and distributed evenly over the greatest possible area to ensure rapid sublimation. All available tank openings shall be open to the atmosphere during this procedure to ensure rapid dissipation of the dry ice.

F. To evaluate the effectiveness of the dry ice procedure, the Contractor shall use an explosimeter to determine if the resultant vapor mixture within the tank(s) exceeds ten percent of the Lower Explosive Limit (LEL). Readings shall be taken throughout the tank's depth wherever access is possible. If the vapors within the

tanks exceed ten percent of the LEL, the displacement procedure shall be repeated followed by a recheck of the LEL until the vapors are less than 10 percent of the LEL.

G. The Contractor shall remove the tank and all piping, including, but not limited to, supply piping, return piping, petrometer, heat piping, remote fill piping, vent piping and the vent riser, from the excavation.

H. The Contractor shall remove any tank foundations or tie down slabs, cradles, retaining walls, etc., if present and transport and dispose off-site at an approved facility.

I. The Contractor shall make provisions for leaving the excavation open until the Commissioner deems the work complete.

3.6 CLEANING AND PREPARATION FOR DISPOSAL

A. The Contractor shall use an approved biodegradable cleaning solution, suitable for removal of petroleum, to clean all residual material and soil from the interior and exterior surfaces of the piping. (Note that solutions containing chlorinated solvents or volatile organic compounds are not acceptable. The Contractor shall submit applicable Safety Data Sheets (SDS) to the Commissioner and obtain approval for the cleaning solution in advance.).

B. Cleaning shall be done in an area specifically set up by the Contractor for that purpose, curbed, and lined with an impermeable membrane, to contain the used cleaning solution, including any overspray, and any contaminated debris removed during the cleaning process. All cleaning related materials and operations, and disposal of used cleaning solution and associated contaminated debris, shall be provided and performed by the Contractor at no additional cost to the City of New York.

C. The integrity of the tank and piping shall be inspected for signs of corrosion, cracks, structural damage, staining or any other evidence of leakage. Tank inspection shall be documented in writing and by photographs, with particular emphasis on any evidence of corrosion, cracks, structural damage, or leakage.

D. Tank may be reduced in size, if necessary, for removal and disposal. If tanks are not cut into pieces, they shall be perforated or in some other manner rendered unusable.

E. The tank API identification numbers shall be removed from tank surfaces by the Contractor.

F. The tank shall be properly labeled in accordance with NYSDOT regulations. The Contractor shall permanently and legibly label both sides of the exterior shell of the tank with letters in orange spray paint not less than 2 inches high as follows:

TANK HAS CONTAINED (LIST TANK CONTENTS)

NOT VAPOR FREE, DO NOT ENTER

DATE OF REMOVAL (month, day, and year)

G. The tank shall be removed from the Site as promptly as possible after cleaning, rendering inoperable, dismantling and labeling procedures are completed. Tanks shall not be stored on-site after they are removed.

3.7 TANK AND WASTE DISPOSAL

A. The fluid wastes generated and collected as a result of the tank emptying, tank cleaning, and limited dewatering, as necessary, shall be sampled and classified by the Contractor in accordance with the approved disposal facilities' requirements. The Contractor shall provide the Commissioner with a copy of the analytical results, the facility information required in the Submittal section, prior to transporting to the approved disposal facility. Any petroleum-impacted soil that may be generated during the tank excavation shall be sampled and classified by the Commissioner in accordance with the approved disposal facilities' requirements. Waste characterization requirements for non-hazardous contaminated and hazardous materials are addressed in Section 02 61 13 – Excavation, Handling, Transportation, and Disposal of Contaminated Materials, Article 1.6-3.

B. Once classified and accepted by the approved facility in accordance with the facility permit, the Contractor shall provide the Commissioner with a copy of any required hazardous or non-hazardous waste manifests, if applicable. The Contractor shall obtain all permits necessary to conform to these regulations. The Contractor shall identify, in writing, the facility at which this material shall be disposed.

C. The Contractor shall be responsible for loading the removed tank, transporting and disposing of the tanks at an approved and permitted disposal facility.

D. The Contractor shall provide the Commissioner with all waste disposal documentation, including permits, manifests and bills of lading for soil, liquids, and the tanks.

E. The Contractor is responsible for registering and/or deregistering the tank with the NYSDEC Petroleum Bulk Storage (PBS) unit.

F. The Contractor shall be responsible for the collection and analysis of all samples of tank contents, for waste characterization as required by the disposal facility. All lab testing conducted for this project shall be performed by an NYSDOH Environmental Laboratory Approval Program (ELAP)-certified laboratory. The Contractor shall provide to the Commissioner in the Procedural Plan, the testing requirements of the disposal facility(ies) it intends to use.

G. All transport vehicles shall be inspected, prior to leaving the Site, by the Contractor to ensure that no material adheres to the wheels, undercarriage, tailgates, covers or other areas of transport vehicles. All vehicles shall be cleaned by washing tires, undercarriage, and any other contaminated parts prior to leaving the Site using a high-pressure water and/or steam spray. Contractor shall collect all wash water for treatment and disposal as required.

H. The Contractor shall transport and deliver material only to the approved disposal facilities. Disposal facilities must be reviewed and approved by the Commissioner prior to transporting waste off-site.

I. The Contractor shall be responsible for appropriate measurement of unit quantity of material removed from the Site. The Contractor shall coordinate vehicle inspection and recording of quantities leaving the Site. The Contractor shall keep an accurate record (log) of the contaminated material transported off-site and fill imported to the Site, and maintain a file of all facility-signed (completed) manifests for all materials leaving the Site and documentation for all fill entering the Site. These quantities shall be compared to recorded quantities received at the disposal facilities. The Contractor shall immediately resolve any discrepancies that occur and determine the probable cause for the discrepancy. Daily logs shall be submitted to the Commissioner daily. Manifests and fill documentation shall be submitted to the Commissioner when received.

J. The Contractor shall be solely responsible for any and all actions necessary to remedy situations involving material spilled in transit or disposed of at an incorrect location.

K. The Contractor shall have access to back-up vehicles and equipment to ensure that there is no downtime in connection with soil transport operations.

L. The disposal containers shall be ISO type, dump trailers, or approved equal, constructed of sufficient metal, have watertight bodies and sealed tailgates equipped with positive locking devices and provisions for control of free liquids. No liquid shall leak from any part of the loaded container or trailer. The Contractor shall furnish and install a metal or tarpaulin cover on each container immediately after the container is full. The cover shall be secured in an approved manner and shall remain in place until the container has reached the disposal facility.

M. The Contractor shall be responsible for transportation safety. All vehicles shall be properly maintained, driven properly, follow all rules and regulations, observe all speed limits, etc. The on-site speed limit shall be five miles per hour. All vehicles shall be inspected before every trip as part of Contractor's preventive maintenance program. The Contractor shall inspect each vehicle to ensure that all doors, covers, etc. are secure and that no material can spill or otherwise be released or leak. Each vehicle shall bear, at a minimum, the name and phone number of the Contractor plainly visible on both cab doors. Each vehicle shall be uniquely numbered in lettering at least four inches high and shall be placarded in accordance with USEPA and NYSDOT requirements. Likewise, each trailer or container shall be so labeled on both sides and the tailgate if possible.

N. The Contractor shall submit a copy of the completed manifest and scale tickets for each container to document the proper transportation of disposed material to an approved permitted facility by permitted vehicles within thirty calendar-days of the completion of field operations. No payments shall be made until copies have been furnished.

O. All trucks leaving the Site containing solid material for off-site disposal will be covered with tight-fitting covers, and will be checked to ensure that the cargo is not leaking. Excavated soil supersaturated with water will be dried, dewatered or mixed with a drying compound (e.g. quick lime) prior to loading into a transport vehicle for off-site disposal.

3.8 DECONTAMINATION OF EQUIPMENT AND MATERIALS

A. All decontamination procedures for equipment and materials shall conform to the requirements of applicable USEPA and NYSDEC regulations, as appropriate.

B. All recoverable equipment and materials which have been in contact with excavated soil shall be decontaminated prior to removal from the Site. As used herein "recoverable" shall mean all items which are non-absorptive in nature and which can be successfully decontaminated. All items for which decontamination is difficult or uncertain shall be considered non-recoverable, as determined by the Commissioner.

C. Decontamination shall be completed within a specifically prepared Decontamination Area, preferably adjacent to the contaminated stockpile. A minimum 12 mil plastic, non-porous barrier membrane of appropriate size shall be laid down under items being decontaminated. The side boundaries of the Decontamination Area shall be bermed to catch and hold rinse fluids and protect adjacent grade area. This barrier membrane and the rinse fluids shall be considered non-recoverable.

D. Recoverable Contractor-owned equipment and materials shall be decontaminated with pressurized steam. Do not utilize any detergent agents. Decontamination liquids shall be collected and pumped into USDOT containers/drums and disposed of properly.

E. Deposit non-liquid non-recoverable materials into USDOT containers as directed by the Commissioner and dispose off-site properly.

F. Mark and placard drummed decontamination materials and place in the contaminated stockpile area. The decontamination waste shall be sampled and classified by the Contractor in accordance with the approved disposal facilities' requirements. Once classified and accepted by the approved facility, the Contractor shall provide the Commissioner with a photocopy of any required manifests.

3.9 GENERAL BACKFILL

A. Upon approval by the Commissioner, excavations shall be backfilled promptly with controlled fill per NYCDEP Specification Section 40.06 - Backfilling.

B. Controlled, imported fill and in-kind surface cover replacement (i.e., concrete, asphalt, etc.) shall be used to backfill the excavation to pre-excavation grade.

C. Contractor backfill shall be performed in accordance with the contract documents and as detailed in NYCDEP Specification Section 40.06 - Backfilling.

END OF SECTION 02 01 01

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SECTION 02 01 02
Vapor Barrier Installation

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

A. The following documents apply to all required work for the project: (1) The Contract Drawings, (2) The Specifications, (3) The General Conditions, (4) The Addendum And (5) The Contract [City Of New York Standard Construction Contract].

B. LEED / Environmentally Preferable Purchase (EPP) General Requirements:

1. Refer to DDC General Conditions and the Addendum to the General Conditions
2. LEED requirements apply to all Phase II work with the exception of the Existing Building scope. EPP requirements apply to the project's Existing Building scope only.

C. The following documents have been prepared for the rehabilitation project and are included with the Contract Documents:

1. 22 June 2018 Phase I Environmental Site Assessment (ESA), prepared by Louis Berger & Associates., P.C. (Louis Berger)
2. 12 October 2018 Phase II Environmental Site Investigation (ESI) Report, prepared by Louis Berger
3. 09 December 2019 DSNY Landfill Infrastructure Modifications, prepared by Langan
4. 22 October 2018 Geotechnical Engineering Report, prepared by Langan

D. Related Sections

Sections containing requirements related to this Section include, but are not limited to:

1. Section 31 00 00 – Earthwork
2. Section 312116 – Submembrane Depressurization System

1.2 GENERAL REQUIREMENTS

A. The Contractor is responsible for the proper and complete installation of a continuous vapor barrier membrane under the concrete slab and along the vertical subgrade walls in accordance with the Contract Documents.

B. The selected Contractor shall furnish all labor, materials, equipment, and incidentals required to conduct the work of this Section.

C. Where there is discrepancy between this specification and the other Contract Documents, the most stringent requirements shall be followed by the Contractor.

1.3 SCOPE OF WORK

A. Install a vapor barrier membrane under the concrete slab and along the vertical subgrade walls as indicated, specified and required by the Contract Documents.

B. The vapor barrier membrane is not acceptable as a replacement product for waterproofing. If both waterproofing and vapor proofing products are used, the Contractor shall ensure that the products are compatible and follows manufacturer's recommendation and guidance for sealing the products together at intersections.

C. The vapor barrier membrane shall be applied to create a continuous vapor tight barrier beneath enclosed sections of the basement, with durable seals to every grade beam, pile cap and penetration to ensure a single impermeable membrane.

D. The vapor barrier membrane shall be applied horizontally and vertically to all subsurface pits and sumps forming a barrier on all sides and bottoms of pits and sumps in accordance with the Manufacturer's specifications.

E. Perform and certify results of inspections and tests as specified.

F. Installation of accessories, including sealers, flashings, fasteners, tapes, reglets, liquid membranes and similar accessories.

G. The Contractor shall furnish all labor, materials, equipment, and incidentals required to conduct the work of this Section.

H. No work shall be performed under this specification section without oversight by the Commissioner.

I. Worker health and safety monitoring is the responsibility of the Contractor.

1.4 REGULATORY REQUIREMENTS AND REFERENCE STANDARDS

A. ASTM D412 – Tensile Strength Properties of Rubber and Elastomers-Tension

B. ASTM D413 – Standard Test Methods for Rubber Property-Adhesion to Flexible Substrate

C. ASTM D543 – Standard Practices for Evaluating the Resistance of Plastics to Chemical Reagents

D. ASTM D751 – Standard Test Methods for Coated Fabrics

E. ASTM D903 – Standard Test Method for Peel or Stripping of Adhesive Bonds

F. ASTM 3767 – Standard Practice for Rubber – Measurements of Dimensions

G. ASTM C836 – Standard Specification for High Solids Content, Cold Liquid-Applied Elastomeric Waterproofing Membrane for Use with Separate Wearing Course

H. ASTM D1434 – Standard Test Method for Determining Gas Permeability Characteristics of Plastic Film and Sheeting

I. ASTM E96 – Standard Test Methods for Water Vapor Transmission of Materials

J. ASTM E154 – Standard Test Methods for Water Vapor Retarders Used in Contact with Earth Under Concrete Slabs, on Walls, or as Ground Cover

K. ASTM E1643 – Installation of Water Vapor Retarders Used in Contact with Earth or Granular Fill Under Concrete Slabs

L. ASTM D1693 – Standard Test Method for Environmental Stress-Cracking of Ethylene Plastics

M. ASTM E1745 – Water Vapor Retarders Used in Contact with Soil or Granular Fill Under Concrete Slabs

N. ASTM D1970 – Standard Specification for Self-Adhering Polymer Modified Bituminous Sheet Materials Used

as Steep Roofing Underlayment for Ice Dam Protection

O. ASTM D4068 – Standard Specification for Chlorinated Polyethylene (CPE) Sheeting for Concealed Water-Containment Membrane

P. ASTM D4833 – Index Puncture Resistance of Geotextiles, Geomembranes and Related Products Section

1. American Concrete Institute (ACI), ACI 302.1R-96 Addendum Vapor Retarder Location

1.5 QUALITY ASSURANCE

A. Refer to DDC General Conditions Section 01 40 00 "Quality Requirements".

B. Manufacturer Qualifications:

1. The manufacturer providing the material or equipment specified in this Section must have been regularly engaged in the manufacture of material or equipment similar in type to that required for this project.

2. Obtain gas vapor barrier system and auxiliary components from a single Manufacturer.

C. Materials: For each type of material required for the work of this Section, provide primary materials which are the products of one manufacturer.

D. Installer Qualification: Engage an experienced installer, who is certified in writing by the vapor barrier system Manufacturer, to install specified gas vapor barrier system. A smoke test will be performed by the installer to ensure there are no breaks or holes in the vapor barrier.

E. Field Quality Control: The installation of the vapor barrier membrane and smoke test will be inspected by a qualified Professional Engineer licensed in the State of New York.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to site as specified by Manufacturer and in original unbroken packages bearing Manufacturer's label showing brand, type, weight, volume, batch number, date of manufacture, shelf life, and directions for storing and mixing with other components.

B. Store materials at the site in strict compliance with Manufacturer's instructions. Store in a clean, dry, protected location and within the temperature range required by Manufacturer. Protect stored materials from direct sunlight. Do not allow materials to freeze in containers.

C. Remove and replace material that cannot be applied within its stated shelf life at no cost to the City of New York.

D. Protect materials during handling and installation to prevent damage. Replace any damaged materials at no cost to the City of New York unless the damaged material can be repaired in accordance with the Manufacturer's requirements such that vapor protection is not compromised.

1.7 PROJECT CONDITIONS

A. The Department of Sanitation garage rehabilitation project (site) is located at the northwest corner of Muldoon Avenue (private) and West Shore Expressway service road in Staten Island, New York (the Site) and is identified as Block 5900, Lot 500 on the Staten Island Tax Map. The Site occupies an area of approximately 680,000 square feet and is improved with the existing Staten Island District 3 repair garage, recycling area,

wastewater treatment facility, and asphalt-paved and gravel-topped parking lots. According to the 29 March 2018 topographical survey prepared by Langan, the grade fronting the Site along Muldoon Avenue slopes down from about el. 23 feet (north) to el. 10 feet (south), and the grade in front of the site along the West Service Road slopes down from about el. 32 feet (northeast) to el. 10 feet (south). All elevations are referenced to the North American Vertical Datum of 1988 (NAVD88).

B. Based on the findings of the 22 June 2018 Phase I ESA prepared by Louis Berger, the Site contains chlorinated volatile organic compounds (VOCs) at concentrations which the New York State Department of Health (NYDOH) Guidance for Soil Vapor Intrusion in the State of New York, recommends mitigation as the recommended action. Concentrations of methane were also detected above background concentrations that would be mitigated from intruding into the new building.

C. The City of New York and Commissioner make no predictions or representations regarding the available information. No information derived from the referenced documents will, in any way, relieve the Contractor from the responsibility of making its own evaluations, inspections, and determinations with respect to the vapor barrier installation.

D. The Contractor shall investigate the conditions of public thoroughfares and roads as to availability, clearances, loads, limits, restrictions, and other limitations affecting transportation to, ingress and egress of the Work Site. The Contractor shall conform to NYSDOT, USEPA, and NYSDEC regulations in regard to the transportation of materials to and from and at the job Site.

E. Examine drawings to determine the sequence of operations in relation to the work of other trades, if they are present. Start of work will signify acceptance of field conditions and will acknowledge coordination with other trades.

1.8 SUBMITTAL PROCEDURES

A. Refer to DDC General Conditions Section 01 33 00 "Submittal Procedures".

1.9 SUBMITTALS

A. Product Data: The Contractor shall submit to the Commissioner the Manufacturer's printed instructions for evaluating and preparing the substrate. Submit Manufacturer's product data for each gas vapor barrier system component, including technical data and tested physical and performance properties. Indicate and interpret test results for compliance of vapor barrier system with requirements indicated, as applicable.

B. Shop Drawings: Submit Shop Drawings showing locations and extent of vapor barrier system, including details for overlaps, penetrations, and other termination conditions.

C. Samples: Submit representative samples of all vapor barrier system components for approval. System components may include, but are not limited to:

1. Vapor barrier membrane
2. Top protective layer/protection materials
3. Base fabric
4. Other auxiliary materials as required for the vapor barrier system, such as seam sealers, reinforcing strips, mastics, sheet flashing, geotextiles, etc.

D. Certifications:

1. Submit Manufacturer's Certification of Compliance indicating that materials delivered and used in the work are in strict compliance with specified requirements of this Section.

2. Submit certificates signed by Manufacturer certifying that the Installer complies with requirements under the Quality Assurance Article 1.5.

E. Submit Manufacturer's and Installer's Warranties as required in Article 1.10 of this Section.

F. Submit Manufacturer's Resume of Professional Engineer, licensed to practice in the State of New York, to perform milestone inspections, and certify proper installation of vapor barrier system.

G. Documentation of successful Quality Control testing completion as required by the Manufacturer's specifications and in Article 3.4 of this Section.

H. Report on Contractor's Professional Engineer's inspection and approval of the work of this Section. The Professional Engineer shall provide a certification, signed and sealed, stating that all work was performed in accordance with the requirements of this Section, the manufacturer's specifications, and the Contract Drawings. The certification shall explicitly state that the Professional Engineer supervised inspections of tests which demonstrated installation of a gas-tight barrier for preventing intrusion of vapors into the entire building.

1.10 WARRANTIES

A. Submit a warranty, signed by the Manufacturer of the vapor barrier system and auxiliary components, agreeing to replace/repair defective materials including all work required to correct leakage of vapors within warranty period. The warranty period is twenty years after date of "Substantial Completion."

B. Submit a separate guarantee, signed by the Installer of the vapor barrier system, agreeing to replace/repair defective materials and workmanship, including leakage of vapor within guaranty period. The Installer's guaranty period is one year after date of "Substantial Completion." The Installer shall comply with the Contract Documents, including this Section, the manufacturer's specifications and the Drawings, for installation requirements.

PART 2 – PRODUCTS

2.1 MATERIALS

A. General: Provide complete vapor barrier system. Ensure auxiliary components and installation accessories are approved for use with the vapor barrier system by the Manufacturer.

B. Vapor Barrier Membrane: A minimum thickness of 20 mils, or minimum thickness required by Manufacturer, whichever is greater, is required. Typical gas vapor barrier physical properties:

PROPERTIES	TEST METHOD	VALUE
Soil Burial	ASTM D4068	Passed
Methane Permeability	ASTM D1434	Passed

PROPERTIES	TEST METHOD	VALUE
Oil Resistance Test	ASTM D543	Passed
Heat Aging	ASTM D4068	Passed
Environmental Stress Cracking	ASTM D1693	Passed
Water Vapor Permeability	ASTM E96	0.21 to 0.24 perms
Water Vapor Transmission	ASTM E96	0.026 to 0.10 grains/h-ft^2
Hydrostatic Head Resistance	ASTM D751	26 to 60 p.s.i
Elongation without reinforcement	ASTM D412	1,332% to 4,140%
Elongation with reinforcement (e.g., base fabric, protection course)	ASTM D412	45% to 100%
Tensile Strength without reinforcement	ASTM D412	32 to 58 p.s.i.
Tensile Strength with reinforcement (e.g., base fabric, protection course)	ASTM D412	196 to 662 p.s.i.

C. Auxiliary and Installation Materials: All auxiliary and installation materials must be approved for use with the vapor barrier membrane by the Manufacturer.

D. Manufacturers/Systems:

1. Drago Wrap Vapor Intrusion Barrier as manufactured by Stego Industries, LLC
2. Stego Wrap 20-mil Vapor Barrier as manufactured by Stego Industries, LLC
3. Preprufe Gas Mitigation System (GMS) Membrane as manufactured by GCP Applied Technologies.
4. Or approved equal.

PART 3 – EXECUTION

3.1 EXECUTION REQUIREMENTS

A. Refer to DDC General Conditions for execution requirements.

3.2 GENERAL

A. Pre-installation Meeting: Arrange for and convene a pre-installation meeting prior to the start of work of this Section to review installation procedures, protection, and coordination with other work. Attendance of parties directly affecting work of this Section, including the Commissioner, Contractor, and Contractor's Installer shall be required.

B. Furnish all labor and materials, equipment and incidentals required for the proper and complete installation of the vapor barrier membrane.

C. Examine conditions of substrates and other conditions under which this work is to be performed and notify the Commissioner, in writing, of circumstances detrimental to the proper completion of the work. Do not proceed with work until unsatisfactory conditions are corrected.

D. All work shall be performed in accordance with the Contract Documents and manufacturer's specifications.

3.3 SAFETY

A. Health and Safety Plan (HASP)

1. Develop a site-specific HASP to protect their employees.
2. HASP shall address the methods to be utilized for personal protection during the installation of the vapor barrier membrane.
3. The HASP shall contain the name and certification of Contractor's Health and Safety Officer.
4. The HASP shall address the presently known conditions identified in the Contract Documents, drawings, or previous reports provided by the City of New York.
5. The HASP shall be compliant with OSHA requirements.
6. Trade-specific health and safety requirements should be developed by the Contractor based on the anticipated contact with contaminated soil. Training, medical surveillance, and exposure monitoring requirements should be addressed.
7. The HASP shall contain specific methods of providing protection for the site workers and the general public to prevent all personnel from coming into contact with contaminated materials.
8. Personnel handling hazardous materials shall be trained and certified according to Occupational Health and Safety Administration Regulations Hazardous Waste Operations and Emergency Response (HAZWOPER) requirements contained in 29 CFR 1910.120.
9. All Subcontractors to the Contractor shall be required to implement the Contractor's HASP. The Contractor shall submit to the Commissioner a letter from the Subcontractor indicating knowledge of the HASP requirements prior to the start of the Subcontractor's work.
10. The Contractor's HASP shall be bound by any and all other pertinent and relevant sections of the Contract Documents including, but not limited to, those included in Article 1.2 General Requirements.

B. Personnel working inside and in the general vicinity of the work shall be trained and thoroughly familiar with the safety precautions, procedures and equipment required for controlling the potential hazards. Personnel shall use proper protection and safety equipment during work.

C. The Contractor shall be responsible for the safety of their workers and Subcontractors, their operation, and for any damage that may result from the Contractor's work. They shall erect and properly maintain at all times, as required by the conditions and progress of the work, proper safeguards for the protection of workers and the public and shall post danger warnings as required by law or otherwise required by the Contract Documents against hazards created by the Contractor's operation. The Contractor shall furnish, install and remove after completion of the work, all signs, lights, barricades, fencing and other equipment as may be necessary for the safe execution of the work.

D. Prior to ending operations on any working day or at any time the Contractor is not on-site, the Contractor shall secure all areas of work in a safe manner in accordance with all regulatory agencies and to the satisfaction of

the Commissioner. This shall include, but not be limited to, ensuring that adequate erosion control measures (hay bales, silt fencing, etc.) are in-place, ensuring stockpiles are on and covered by plastic sheeting, and ensuring that the site is secure.

E. Provide and maintain an adequate supply of fire extinguishers and other required safety equipment in close proximity to all activity.

3.4 INSTALLATION

A. Soil substrates below the vapor and methane mitigation layer shall be well compacted to produce an even, solid substrate. Remove loose aggregate or sharp protrusions. Concrete substrates shall be smooth or broom finished and monolithic. Remove standing water prior to membrane applications.

B. Installation shall be in accordance with manufacturer's instructions and ASTM E1643, including but not limited to, the following:

1. Base Layer:

   a. Roll out base layer on subgrade as specified by the Manufacturer. Apply succeeding sheets by overlapping the previous sheet a minimum of 6 inches, or as specified by the Manufacturer, whichever is greater. Lay base layer tight at all inside corners.

   b. Minimize the use of nails to secure the base layer to the subgrade. Remove all nails before applying membrane, if possible. Nails that cannot be removed from the subgrade are to be patched as specified by the Manufacturer.

   c. Secure seams between the overlapped sheets as specified by the Manufacturer. Visually verify no gaps in seams. Repair any gaps in seams prior to application of vapor barrier membrane, as specified by the Manufacturer.

2. Vapor Barrier Membrane:

   a. Apply vapor barrier membrane according to Manufacturer's recommendations to obtain a seamless membrane that is free of entrapped gases.

   b. Apply vapor barrier membrane to prepared wall terminations, penetrations, and to the base layer.

   c. Apply vapor barrier membrane to achieve a minimum 20 mil thickness, or as specified by the Manufacturer, whichever is greater.

   d. Do not penetrate membrane. Keep membrane free of dirt, debris, and traffic until a protective cover is in place. It is the responsibility of the Contractor to ensure that the membrane and the protection system are not penetrated.

   e. After membrane has been checked and approved by the Contractor's Professional Engineer for proper thickness and flaws, install protection material pursuant to Manufacturer's instructions. All testing or inspection is to be performed prior to placing protection course.

   f. Schedule work such that membrane will not be left exposed to weather for longer than that recommended by the Manufacturer.

3. Sealing at Terminations:
   a. Terminations should extend a minimum of 6 inches or as specified by Manufacturer, whichever is greater, onto termination surface. If job-specific conditions prevent a 6-inch termination, contact the vapor barrier membrane designer and Manufacturer for recommendations.
   b. Reinforce and seal at all terminations in accordance with the Manufacturer's details and specifications.
4. Sealing around Penetrations:
   a. Clean all penetrations. Sand all metal penetrations with emery cloth.
   b. Reinforce and seal at all penetrations in accordance with the Manufacturer's details and specifications.
   c. After placement of appropriate reinforcements and sealing agents, place cable tie around the finished penetration, 2 inches above the base of penetration or as specified by the Manufacturer guidance. Cable tie should be snug but not overly tight so as to slice into the finished seal.
5. Protection Course Top Installation:
   a. Install protection course as recommended by the Manufacturer before starting subsequent construction operations.
   b. Overlap seams as recommended by the Manufacturer.
   c. Secure protection course seams as recommended by the Manufacturer.
6. Concrete Placement:
   a. Place concrete within 30 days. Inspect membrane and repair any damage.

3.5 FIELD QUALITY CONTROL

A. General:
   1. Installers are to check their own work for coverage, thickness, and all around good workmanship before calling for inspections by the Commissioner.
   2. When thickness or integrity is in question, the membrane should be tested in the proper manner as described below. However, over-sampling defeats the intent of inspections. Inspectors should always use visual and tactile measurement to guide them. Areas suspected of being too thin to the touch should be measured with the gauges to determine the exact thickness.

B. Smoke Test: Vapor barriers shall be Smoke Tested in accordance with the following protocol:
   1. The vapor membrane shall be visually inspected. Any apparent deficiencies and/or installation problems shall be corrected prior to Smoke Testing.
   2. Smoke Testing of the vapor barrier system to be conducted by Installer and observed by the Commissioner.
   3. The date, time, testing reference area, temperature, wind speed/direction, and cloud cover shall be recorded on the Smoke Testing Record. The ambient air temperature at the time of testing should be in excess of 45° Fahrenheit and the wind speed at ground level should be 15 miles per hour (mph) or less since visual identification of leaks becomes more difficult with increasing wind speed.

4. Delineate a Smoke Testing area of 2,000 to 5,000 square feet (maximum). Assemble and situate Smoke Testing system to inject smoke beneath membrane. Only inert, non-toxic smoke is to be utilized for membrane Smoke Test.
5. Designate testing control areas by cutting openings in an "X" pattern (minimum 4 inch by 4 inch) in the membrane at selected locations. Mark testing control areas for identification prior to conducting the Smoke Test.
6. Activate smoke generator / blower system (nominal 150 – 950 cubic feet per minute [cfm]). Apply sufficient pressure as to ensure that smoke will permeate the designated testing area. For verification, ensure that smoke is leaking through testing control areas.
7. Pump smoke beneath the membrane for a minimum 1 to 2 minutes. Observe for leaks in the membrane. Reduce pressure / flow rate if excessive lifting of the membrane occurs.
8. Thoroughly inspect entire membrane surface within area delineated for testing. Use marking device as approved by the Manufacturer to mark any leak locations. Mark leak locations on floor plan and corresponding testing reference area.
9. Repair leak locations in accordance with the Manufacturer's recommendations and specifications.
10. Repeat steps as necessary to confirm integrity of the membrane.
11. Readings shall be recorded on the Smoke Testing Log by the Contractor's Professional Engineer. Once the membrane has passed the Smoke Test inspection, the successful completion shall be documented and signed off by the Contractor's Professional Engineer and approved by the Commissioner.

3.6 PROTECTION AND CLEANING

A. Clean spillage and soiling from adjacent construction using cleaning agents and procedures recommended by Manufacturer of affected construction.

B. The vapor barrier system shall be protected in accordance with Manufacturer's recommendations to prevent disturbance, damage, or deterioration by work of other trades or environmental conditions. Protect vapor barrier system from damage during installation of reinforcing steel and utilities and during placement of concrete slab or granular materials. Sharp angular backfill materials shall not be placed immediately against the vapor barrier membrane.

C. Commissioner shall visually inspect the condition of the vapor barrier membrane immediately prior to placing the overlying protective layer or below-grade wall backfill. All damage to the installed vapor barrier membrane shall be repaired at the Contractor's expense prior to placement of concrete or backfill.

D. Ensure there is no moisture entrapment by vapor barrier membrane due to rainfall or ground water intrusion. If moisture entrapment is present Contractor shall implement procedures for removal of moisture and to prevent re-occurrence. Contractor's Professional Engineer's approval of drying procedures shall be required prior to implementation.

E. Protect vapor barrier system from damage until covered by finish wall, floor, etc.

F. Immediately repair damaged vapor barrier membrane and components of vapor barrier system in accordance with Manufacturer's instructions. Contractor's Professional Engineer's approval of repair procedures shall be required prior to implementation.

END OF SECTION 02 01 02

SECTION 02 61 13
Excavation, Handling, Transportation, and Disposal of Contaminated Materials

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

A. The following documents apply to all required work for the Project: (1) the Contract Drawings, (2) the Specifications, (3) the General Conditions, (4) the Addendum and (5) the Contract [City of New York Standard Construction Contract].

B. LEED / Environmentally Preferable Purchase (EPP) General Requirements:
   1. Refer to DDC General Conditions and the Addendum to the General Conditions
   2. LEED requirements apply to all Phase II work with the exception of the Existing Building scope. EPP requirements apply to the project's Existing Building scope only.

C. The following documents have been prepared for the rehabilitation project and are included with the Contract Documents:
   1. 22 June 2018 Phase I Environmental Site Assessment (ESA), prepared by Louis Berger & Associates., P.C. (Louis Berger)
   2. 12 October 2018 Phase II Environmental Site Investigation (ESI) Report, prepared by Louis Berger
   3. 20 December 2018 DSNY Landfill Infrastructure Modifications, prepared by Langan
   4. 5 March 2019 (Revised) Geotechnical Engineering Report, prepared by Langan

D. Related Sections

   Sections containing requirements related to this Section include, but are not limited to:
   1. Section 31 00 00 Earthwork
   2. Section 31 10 00 Site Clearing, Removals and Preparation
   3. Section 31 25 00 Soil Erosion and Sediment Control
   4. Section 31 50 00 Excavation Support and Protection

1.2 SUMMARY

A. The Department of Sanitation garage rehabilitation project (site) is located at the northwest corner of Muldoon Avenue (private) and West Shore Expressway service road in Staten Island, New York (the Site) and is identified as Block 5900, Lot 500 on the Staten Island Tax Map. The Site occupies an area of approximately 680,000 square feet and is improved with the existing Staten Island District 3 repair garage, recycling area, wastewater treatment facility, and asphalt-paved and gravel-topped parking lots. According to the 29 March 2018 topographical survey prepared by Langan, the grade fronting the Site along Muldoon Avenue slopes down from about el. 23 feet (north) to el. 10 feet (south), and the grade in front of the site along the West Service Road slopes down from about el. 32 feet (northeast) to el. 10 feet (south). All elevations are referenced to the North American Vertical Datum of 1988 (NAVD88).

B. The Contractor shall furnish all labor, materials, equipment, and incidentals required to conduct the work of this Section, including but not limited to the following:
   1. Excavation, segregation, stockpiling, loading, transporting, handling and off-site disposal of all

excavated non-hazardous and hazardous contaminated soil and groundwater, as well as petroleum underground storage tanks. Contaminated material is hereby defined as material regulated as solid waste under Title 6 of the New York Codes, Rules, and Regulations (NYCRR) Part 360 or soil exceeding the 6 NYCRR Part 375-6.8(b) Restricted Use Commercial Soil Cleanup Objectives (SCOs), whichever is more stringent.

2. Vehicle and equipment decontamination.
3. Handling and off-site disposal of dewatering and waste fluids.
4. Implementation of dust, vapor and odor control measures for the duration of the work.
5. Coordination with and obtaining of approvals from licensed or permitted soil disposal or recycling facilities and payment for all permits required to perform the work.
6. Supplemental sampling and analytical testing - Relevant reports prepared for the project are summarized in Article 1.4. The data provided can be used by the selected Contractor to assist in securing disposal facility commitments. The Contractor may have to obtain additional soil quality data, which shall be at its own expense. Use of these data by the Contractor in no way makes The City of New York or Commissioner responsible for any aspect of soil and fill characterization, delineation, handling, transport and/or disposal.
7. Recordkeeping and submittal of manifests and scale tickets for each soil disposal container/truck to document the proper transportation of excavated contaminated and hazardous materials.
8. The Contractor shall furnish all labor and materials, equipment and incidentals required for proper decontamination, removal and closure of the known underground storage tanks (UST) and any additional USTs, if encountered.

C. All work shall be performed in accordance with (1) the Contract Documents for the project and (2) all specifications, documents, and plans referenced in this Section. Where there is discrepancy between this specification, the other Contract Documents, and applicable regulations, the most stringent requirements shall be followed by the Contractor.

1.3 PROJECT CONDITIONS

A. No guarantee is expressed or implied for the information given in the referenced documents. No information derived from such documents will, in any way, relieve Contractor from the responsibility of making its own evaluations, inspections, and determinations with respect to the conditions and excavation and material handling requirements at the Site.

B. The Contractor, by careful examination, shall inform themselves as to the nature and location of the work; the conformation of the ground, the nature of the surface and subsurface conditions; the locations of the groundwater table; the character, quality and quantity of the materials to be encountered; the character of the equipment and facilities needed preliminary to and during the execution of the work; and all other matters which can in any way affect the work.

C. The Contractor shall investigate the conditions of public thoroughfares and roads as to availability, clearances, loads, limits, restrictions, and other limitations affecting transportation to, ingress and egress of the Site of the work. The Contractor shall secure in advance permits that may be required for the transportation of materials to and from and at the Site and at a minimum, conform to Title 6 of the New York Codes Rules and Regulations (6 NYCRR) Part 360 Solid Waste Management Facilities.

D. The Contractor shall locate existing underground utilities in and beyond the areas of work, and will provide adequate means of support and protection during the work.

E. Should uncharted, or incorrectly charted, piping or other utilities be encountered during excavation; the Contractor shall consult the utility owner immediately for directions, cooperate with the Commissioner and utility companies in keeping respective services and facilities in operation, and restore damaged utilities to the satisfaction of the utility owner.

F. The Contractor shall examine drawings to determine sequence of operations, and relation to work of other trades. Start of work shall signify acceptance of field conditions and shall acknowledge coordination with other trades.

1.4 QUALIFICATIONS

A. The Contractor shall be or have access to a tank contractor licensed by the New York Fire Department (FDNY). The Contractor shall be any person or persons, corporation, or proprietorship deemed competent and experienced to perform work involving the remediation of petroleum spills, including closures of underground storage tanks (USTs), and hauling, disposal, transportation, or abatement of hazardous and non-hazardous materials. For the purposes of this contract, the Contractor shall possess the following:

1. Access to a valid 6 NYCRR Part 364 permit for transport and disposal of oil/petroleum waste, hazardous and non-hazardous contaminated soil, and other waste streams as defined by 6 NYCRR Part 364 (Replacement effective 4 November 2017 applies to any transporter of fill material and C&D debris)
2. Access to facilities to handle, transport, characterize and dispose, and/or abate hazardous or non-hazardous material
3. Access to documented, certified personnel for tank closure, spill responses, hazardous waste operations, and confined space entry
4. Licensed FDNY inspector who can provide an affidavit of UST closure upon completion
5. Labor and materials to immediately execute work under this contract
6. Experience directly related to work under this contract
7. An adequate understanding of all the regulations and requirements governing this contract
8. Any item pertinent to work described in this contract

B. The Contractor shall perform their work and supervise their employees in accordance with all applicable federal, state, and city rules and regulations. All persons who manage, perform, or provide support for construction projects shall conduct operations in compliance with the requirements identified in The City of New York Department of Design and Construction Safety Requirements, dated February 2019. The Contractor shall prepare and adhere to requirements of the Site Safety Plan and Safety Program that addresses known and reasonably anticipated contaminants at the Site.

1.5 SUBMITTAL PROCEDURES

A. Refer to DDC General Conditions Section 01 33 00 "Submittal Procedures".

1.6 SUBMITTALS

A. Pre-Construction Submittals – The Contractor shall submit to the Commissioner the following for review a minimum 2 weeks prior to start of the work.

1. Confirmation of the Contractor's and any subcontractor's applicable qualifications, licenses, permits, and items listed in Article 1.4 of this Section

2. A detailed project schedule showing sequence and critical path of all environmental and earthwork operations

3. For fill and soil disposal, the Contractor shall submit the following information:

   a. A Material Handling Plan that includes:

      i) The name, address, permit number, telephone number, and transporter permits of the company(ies)/facility(ies) that shall transport and accept the contaminated and hazardous materials and liquids

      ii) A description of the analytical and non-analytical requirements and sampling frequency requirements of proposed disposal facilities

      iii) A map and summary that describes the area to be excavated in accordance with the specifications, divided into distinct vertical and horizontal grids/areas (if needed) - For each grid/area, the Plan shall identify the characterization data associated with the volume of soil or fill represented.

   b. A Field Sampling Plan that includes:

      i) A scaled map of the Site showing the proposed excavation limits and proposed new sampling locations, if characterization data is not sufficient to meet disposal facility requirements. The map shall also show an identification number for each sampling location and sampling depth intervals. A description of the sampling methodology, sampling equipment, decontamination procedures, and field quality and laboratory assurance and quality control (QA/QC) procedures to be implemented during the sampling event shall be included in the Plan.

      ii) Name and address of analytical laboratory(ies) and copy of ELAP certification to be used by the Contractor

      iii) Listing of all analyses to be performed, by sample identification number

      iv) Description of QA/QC samples required by the disposal facility(ies)

   c. Approval letters shall be issued by the disposal facility on disposal facility letterhead prior to transporting the material off the Site. The letter shall reference the analytical waste characterization data (by sample ID and report number), relevant depths or elevations, and the total volume of material being accepted in accordance with the approval.

   d. Copies of valid, current, operating permits or licenses for the facility from the applicable regulatory agencies - This includes information on each USEPA and/or State approved off-site disposal facility that is proposed to receive contaminated materials and hazardous wastes (as required).

   e. Procedure for addressing additional waste characterization (sampling, etc.) if required, and for excavating, stockpiling, loading and off-site transport

4. For import of backfill, the Contractor shall submit the following information prior to importation of backfill:

   a. The name and address of the company(ies)/facility(ies) that shall supply the import material - Any permits associated with the material or beneficial use of the material shall be submitted.

   b. Each borrow fill facility or company shall issue a letter stating that the import fill is native or virgin material that has not been comingled with any other material. They shall also state in the letter that the material was not sourced from or stored at any environmentally impacted/contaminated properties. The letter shall be issued prior to transporting the material on to the Site. The letter shall reference any characterization data (by sample ID and report number). Maps shall be provided by the Contractor that show the location of the clean fill facility, location of the stockpile at the facility and location of the sample(s) collected from the stockpile.

   c. The Contractor shall provide ELAP-certified laboratory analytical data for samples collected of the proposed import material by an environmental professional using standard sample collection practice. Samples shall be collected at a frequency in accordance with 6 NYCRR Part 360 Table 1: Minimum Analysis Frequency for Fill Material. Sample results shall be submitted to the Commissioner for review and approval prior to importing material to the Site. Once sampled, the stockpile must remain isolated and dedicated to import to this project and may not be comingled with any other material.

5. All pertinent information relating to the transport of non-hazardous and hazardous contaminated materials. The information submitted shall include, but not be limited to:

   a. The name and address of the company(ies) that shall transport the contaminated materials and liquids

   b. All local, state and federal permits required for the transport of excavated materials resulting from the performance of the work - The licenses and permits that apply include, but is not limited to: 6 NYCRR Part 364 permits, hazardous waste transporter permits issued under 6 NYCRR Part 372.3 (if applicable), vehicle and hauling permits.

   c. USEPA and/or New York State identification number and license expirations date (as required)

   d. Proof of permit, license or authorization to transport waste, as required by 6 NYCRR Part 360 (New York State)

6. The Contractor shall submit a Site-specific Site Safety Plan to the Commissioner prior to the Contractor's mobilization to the Site. The Site Safety Plan shall at a minimum adhere to the requirements specified in Article 3.3 and federal, state and local regulations and guidance documents.

B. On-Going Submittals – The Contractor shall submit the following to the Commissioner promptly after completion of each task:

1. All manifests, bills of lading, weight tickets and analytical data for all hazardous and non-hazardous contaminated material exported from the Site

2. All manifests, bills of lading, weight tickets and analytical data for any borrow fill material imported to the Site

3. Confirmation that: a) all utilities, including but not limited to, electrical, steam, product supply and return lines, or other utility lines in the work area have been identified, marked, locked, and tagged out, and b) work shall be performed in a manner to protect these utilities from damage.

C. Dewatering Submittals– The Contractor shall submit the following promptly after completion of each task:

1. The Contractor shall retain the services of a Professional Engineer, licensed in the State of New York with a minimum of three (3) years of experience, if a dewatering system is required for construction. The Contractor shall submit a dewatering plan prepared by a Professional Engineer licensed in the State of New York to the Commissioner and to the appropriate regulatory agency (NYCDEP or NYSDEC). The design plan must be reviewed and approved by the Commissioner at least 30 calendar days before the scheduled start date for dewatering.

2. The Contractor shall submit all regulatory permits obtained for the construction dewatering, including but not limited to:

   a. NYCDEP Discharge Permit (if applicable), including a completed Wastewater Quality Control Application, Letter of Approval from the Inspection & Permitting Section, Industrial Pollution Prevention (IPP) Program, Division of Pollution Control and Monitoring, Bureau of Wastewater Treatment (BWT), Letter of Approval from the Division of Connection and Permitting, Bureau of Water & Sewer Operations (BWSO), and NYC DEP Bureau of Customer Service Permit;

   b. NYSDEC State Pollutant Discharge Elimination System (SPDES) Discharge Permit (if applicable) for dewatering effluent or stormwater discharges from construction activities; and

   c. NYSDEC Water Withdrawal Permit (if applicable).

3. The Contractor shall provide to the Commissioner the following additional documentation:

   a. The name, address and telephone number of the contact for the Contractor's proposed chemical laboratory, as well as the laboratory's regulatory approval certifications.

   b. The name, address and telephone number of the contact for the Contractor's proposed independent Environmental Consultant.

D. UST Submittals – The Contractor shall submit the following information:

1. A copy of the tank removal affidavit signed by a FDNY-licensed tank contractor
2. The name and address of the licensed tank disposal or recycling facility that shall accept the tanks and piping should they be encountered
3. Verification that a tank removal affidavit signed by a licensed New York City Tank Contractor has been provided to the NYC Bureau of Fire Protection - A copy shall be provided to the Commissioner.
4. All documentation required for the preparation of a written report by the Commissioner
5. Certification from disposal facility that all excavated materials, including scrap steel, demolition debris, waste oil, tank cleaning supplies, etc., have been properly disposed of or recycled
6. Copies of completed and disposal facility signed waste bills of lading and manifest forms

1.7 QUALITY ASSURANCE

A. Refer to DDC General Conditions Section 01 40 00 "Quality Requirements".

B. The Contractor shall comply with all the federal, state, and local laws, ordinances, codes, rules and regulations applicable to the work specified herein. The Contractor shall meet NYSDEC spill cleanup requirements, USEPA and State Department of Transportation regulations for shipping of regulated substances to off-site disposal facilities, and meet all regulatory requirements imposed by the treatment, storage and disposal

facility. Regulations pertaining to the excavation, transport and disposal of USTs and their contents and regulated substances/materials include, but are not limited to the following:

1. USEPA Regulation 40 CFR Part 280, Underground Storage Tanks: Technical Requirements Final Rule and Office of Emergency and Remedial Response, Standard Safety Guides, PB92-983414.
2. USEPA 40 CFR 136 (41 FR 52779).
3. USEPA 40 CFR 262 and 761.
4. Resource Conservation and Recovery Act (RCRA).
5. 29 CFR 1910 – Federal Occupational Safety and Health Administration (OSHA) standards.
6. 29 CFR 1926 – Federal Construction Standards.
7. Resource Conservation and Recovery Act, 40 CFR Parts 260-265, Safe Entry and Cleaning of Petroleum Storage Tanks.
8. National Fire Prevention Association, Volume 30, "Flammable and Combustible Liquids Code."
9. National Fire Prevention Association, Volume 327, "Cleaning or Safeguarding Small Tanks and Containers without Entry."
10. Department of Transportation (US DOT) 49 CFR Section 172 through 179.
11. Department of Transportation 49 CFR 387 (46 FR 30974).
12. Department of Transportation DOT-E 8876.
13. American Petroleum Institute, API-2015A, "A Guide for Controlling the Lead Hazard Associated with Tank Entry and Cleaning."
14. American Petroleum Institute, API-2217A, "Guidelines for Work in Inert Confined Spaces in the Petroleum Industry."
15. American Petroleum Institute, API-2015, "Requirements for Safe Entry and Cleaning of Petroleum Storage Tanks."
16. American Petroleum Institute, API-2016, "Guidelines and Procedures for Entering and Cleaning Petroleum Storage Tanks."
17. American Petroleum Institute, API-1604, "Closure of Underground Petroleum Storage Tanks."
18. American National Standard Institute, ANSI 22882, "Standard Practice for Respiratory Protection."
19. ASTM International, ASTM D 5088 (1990), Decontamination of Field Equipment Used at Non-Radioactive Waste Sites.
20. NIOSH Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities.
21. NIOSH, "Working in Confined Space."
22. NYSDEC DER-10, Technical Guidance for Site Investigation and Remediation, 2010.
23. NYSDEC-Subdivision 6 NYCRR Part 613.9 (b) (NYSDEC Petroleum Bulk Storage [PBS] Regulation).
24. NYSDEC Technical & Operational Guidance Series (TOGS) Ambient Water Quality Standards (AWQS) and Guidance Values and Groundwater Effluent Limitations and associated errata and

addendums.

25. NYSDEC Site Assessment at Bulk Storage Facilities, August 1, 1994, SPOTS Memo No 14.
26. NYSDEC Petroleum-Contaminated Soil Guidance Policy, August 1992, STARS Memo No. 1.
27. NYSDEC CP-51 / Soil Cleanup Guidance dated October 21, 2010.
28. 6 NYCRR Part 360, Solid Waste Management Facilities, September 5, 2017 (Effective November 4, 2017).
29. 6 NYCRR Part 364, Waster Transporter Permits, September 5, 2017 (Effective November 4, 2017)
30. 6 NYCRR Part 371, Identification and List of Hazardous Waste, July 1, 1986.
31. 6 NYCRR Part 375 Environmental Remedial Programs, December 14, 2006.
32. NYS Uniform Fire Prevention and 2014 Building Code (UFPBC) 1164.5.
33. Rule 21-02 of the City of New York.
34. New York City Department of Environmental Protection (NYCDEP), Rules of the City of New York (RCNY), Title 15, Chapter 19, Use of the Public Sewers.
35. NYCDEP, Limitations for Effluent to Sanitary or Combined Sewers.
36. NYCDEP, Dewatering Sampling and Testing Requirements.
37. New York City Fire Department, FP Directive 3-73 Division of Fire Protection, NYCAC Title 27, New York City Fire Prevention Code, Chapter 4 et seq., and Rule 21-02 of the City of New York.

C. Any transporter of non-hazardous and hazardous contaminated soils/materials shall be licensed in the state in which handling and transportation shall take place in accordance with all applicable regulations, including but not limited to 6 NYCRR Part 364 for transport and disposal of solid waste. Effective November 4, 2017, 6 NYCRR Part 364 Waste Transporters applied to any transporter of fill material and construction and demolition (C&D) debris.

D. Contractor shall comply with Occupational Safety and Health Administration (OSHA) Standards and Regulations contained in Title 29 CFR Part 1910.120 "Hazardous Waste Operations and Emergency Response."

E. American Society for Testing and Materials (ASTM) -latest edition:

1. D422 – Method for Particle Size Analysis of Soils
2. D1557 – Test for Moisture-Density Relations of Soils Using 10-lb (4.5 Kg) Hammer and 18-inch (457 mm) Drop (Modified Proctor)
3. D2216 – Laboratory Determination of Content of Soil
4. D2487 – Classification of Soils for Engineering Purposes
5. D2922 – Tests for Density of Soil and Soil- Aggregate in Place by Nuclear Methods (Shallow Depth)
6. D3017 – Test for Moisture Content of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth)
7. D4318 – Test for Plastic Limit, Liquid Limit, and Plasticity Index of Soils

F. American Association of State Highway and Transportation Officials (AASHTO)- latest edition

1. T88 Mechanical Analysis of Soils

G. New York City 2014 Building Code
1. The provisions of the New York City 2014 Building Code relating to earthwork and backfill shall govern the work of this section.

1.8 NOTIFICATION

A. Refer to DDC General Conditions Section 01 73 00 "Execution" subsection 3.5 "Examination" for details on utility notification and mark-out.

B. The Contractor shall notify the Commissioner at least 2 weeks prior to excavation activity, UST closure activities, transport of material off-site for disposal, and import of material to the Site.

C. In accordance with 6 NYCRR Part 360 (effective November 4, 2017), if material is transported off-site for beneficial use at a site in New York State, Contractor shall notify NYSDEC at least five days in advance of movement of solid waste.

1.9 PROTECTION

A. Refer also to DDC Standard General Conditions Section 01 35 26 "Safety Requirements Procedures" subsection 3.2 "Protection of Personnel"

B. To prevent damage, injury or loss, the Contractor's actions shall include, but not be limited to, the following:

1. Storing apparatus, materials, supplies, and equipment in an orderly and safe manner that shall not unduly interfere with the progress of the work.

2. Providing suitable storage facilities for all materials.

3. Placing upon the work or any part thereof only such loads as are consistent with the safety of that portion of the work.

4. Handling of all refuse, rubbish, scrap materials, and debris caused by on-Site operations. The Site work shall be conducted in a safe, orderly fashion and maintain a work-man-like appearance at all times.

C. The Contractor shall furnish signs, lights, barricades, fencing, and other equipment as may be necessary for the safe execution of the work and remove these after completion of the work.

D. The Contractor shall not enter or occupy other areas with people, tools, materials or equipment, except on areas approved by the Commissioner, after written consent is obtained from the proper parties.

E. The Contractor shall assume full responsibility for the preservation of all public and private property. If any direct or indirect damage is done by or on account of any act, omission, neglect or misconduct in the execution of the work by the Contractor, it shall be restored promptly by the Contractor, at his expense, to a condition equal to that existing before the damage was done. The Contractor may take photographs to document damage which existed prior to work.

1.10 ALLOWANCE AND PAYMENT

A. An allowance for the Contractor has been established for this work, to be utilized when ordered and authorized in writing by the Commissioner.

B. The Contractor will be paid on a time and materials (T&M) basis under this allowance. Labor will be paid based on the Contractor's Certified Payrolls, all other expenses will be paid on an invoice basis. A markup of

12% for overhead and 10% for profit will be allowed, except that no markup will be allowed on Payroll Taxes or on the premium portion of overtime pay or on sales and personal property taxes.

PART 2 – PRODUCTS

2.1 MATERIALS

A. The Contractor must provide containers as specified in the United State Department of Transportation (USDOT) regulations.

B. The Contractor must provide polyethylene sheeting, which is to be placed under (20 mil. thickness minimum) and over (10 mil. thickness minimum) soil piles.

C. The Contractor must assure that the waste transporter's appropriate choice of vehicles and operating practices are fitted to prevent spillage or leakage of contaminated material during transportation.

D. The Contractor must provide, install, and maintain any temporary stockpiling or loading facilities on site as required until completion of material handling activities. The location and design of any such facilities must be included in the Material Handling Plan.

E. All proposed reuse of on-site fill or imported borrow fill must be reviewed by the Commissioner prior to use/import.

F. Suitable borrow fill material shall be free of organic, unsatisfactory soils and other deleterious material and shall have a maximum particle size no greater than 4 inches. Borrow fill shall contain no industrial byproducts (e.g., ash, coal, slag).

G. Excavated material may be reused on Site , per the 6 NYCRR Part 360.13(c) exemption for on-site reuse, provided it: 1) meets the 6 NYCRR Part 375-6.8(b) Restricted Use Commercial Soil Cleanup Objectives 2) is not visibly contaminated (stained or odorous) or exhibiting photoionization detector [PID] readings, 3) is not a hazardous waste, 4) meets the appropriate criteria in the Contract Documents, 5) is acceptable to the Commissioner, and 6) is in accordance with New York State solid waste regulations, including 6 NYCRR Part 360.

H. Imported materials shall meet the requirements set forth in Article 3.8 of this Section.

I. Suitable borrow fill material proposed for import shall also meet the requirements set forth in Section 31 00 00 Earthwork.

PART 3 – EXECUTION

3.1 EXECUTION REQUIREMENTS

A. Refer to DDC General Conditions for execution requirements.

3.2 EXECUTION

A. The Contractor shall accept the Site "as-is" and shall be deemed to have inspected the Site and reviewed all drawings, reports and documents applicable to this work.

B. The Contractor is responsible for the characterization, management and disposal of soil and liquids during excavation, grading, and foundation construction work. The Contractor is responsible for establishment of a

waste disposal grid or area system, laying out and surveying a grid system prior to excavation, tracking soils removed from each grid, manifesting soil removed from the Site, and arranging transport and disposal of waste. The Contractor shall maintain area or grid demarcations throughout the excavation process to allow excavated soil/material to be accurately tracked. The Contractor shall maintain visible demarcation of the grids or areas. The proposed grid system requires review by the Commissioner prior to implementation. If waste characterization sampling is required by the selected disposal facility, it is the responsibility of the Contractor. At the Commissioner's request, the Contractor shall sign manifests on behalf of the City of New York for any waste leaving the Site.

C. The Contractor shall furnish all labor and materials, equipment and incidentals required for the proper excavation, stockpiling, transportation, reuse, and disposal of soil. The Contractor shall also furnish all labor and materials, equipment and incidentals required for proper decontamination, removal, and closure of known USTs, as well as associated piping and accessories.

D. The Contractor shall be responsible for any necessary sloping, shoring and sheeting or support of excavation required to stabilize the sidewalls of the excavation and other structures, utilities, etc. adjacent to the work area. This shall be done in accordance with the Contract Documents.

E. Disposal of tanks, lines, sludge, residual liquids, hazardous and non-hazardous soils, and petroleum-impacted soils, if encountered, shall be the responsibility of the Contractor. All work shall be in accordance with the requirements of this Section and the Contract Documents.

F. The Contractor shall prepare all necessary plans, obtain all necessary permits, and provide all necessary plans, notifications and submittals to the Commissioner, City of New York and the State of New York (as necessary) before, during, and after performance of the site work.

G. Excavation operations shall be conducted in a manner as required to prevent the spread of dust, odor, and vapor. If deemed necessary by the Commissioner, the Contractor shall provide dust, vapor and odor control with water, foam or other means acceptable to the Commissioner. Contractor shall prevent the detection of dust, odor, or vapor at the perimeter of the Site by controlling work methods or applying appropriate mitigation methods.

H. All work shall be performed in accordance with the Contract Documents.

I. The Contractor shall be responsible for establishing and following procedures for spill prevention and control.

J. All excavation and other intrusive work shall be observed and documented by the Commissioner. The Commissioner shall be allowed time and safe means to observe and screen excavated soils. The Commissioner will document soil management practices in relation to this specification and advise on any observed discrepancies. Noted discrepancies shall be immediately remedied by the Contractor.

3.3 SAFETY

A. Scope of Work

It is the Contractor's responsibility to stage and conduct the Contractor's work in a safe manner. The Contractor must implement a Health and Safety Plan (HASP) for contaminated/hazardous soil intrusive activities as set forth in OSHA Standards 1910.120 and 1926.650-652. The Contractor must ensure that all workers have at a minimum hazard awareness training. The Contractor must segregate contaminated work area in secured exclusion zones. These zones must limit access to Contractor personnel specifically trained to enter the work area. The exclusion zone must be set up to secure the area from the public and untrained personnel. The project health and safety program will apply to all construction personnel including persons entering the work area. In addition, the Contractor must protect the public from on-site hazards, including

subsurface contaminants associated with on-site activities. The HASP must be signed off by a Certified Industrial Hygienist and reviewed and approved by OEGS.

Work must include, but not be limited to:

1. Implementation of a baseline medical program.
2. Providing safety equipment and protective clothing for site personnel, including maintenance of equipment on a daily basis; replacement of disposable equipment as required; decontamination of clothing, equipment and personnel; and providing all other health and safety measures.
3. Providing, installing, operating and maintaining on-site emergency medical first aid equipment as specified in this section for which payment is not provided under other pay items in this Contract.
4. Providing, installing, operating, maintaining and decommissioning all equipment and personnel decontamination facilities specified within this section, including, but not limited to, the decontamination pad, decontamination water supply, decontamination water collection equipment and all other items and services required for the implementation of the health and safety requirements for which pay items are not provided elsewhere in this Contract.
5. Provide the minimum health and safety requirements for excavation activities within the limits of this Contract.
6. Implement and enforce a HASP: The HASP as presented in these specifications is dynamic with provisions for change to reflect new information, new practices or procedures, changing site environmental conditions or other situations which may affect site workers and the public. The HASP will also address measures for community protection, accident prevention, personnel protection, emergency response/contingency planning, air monitoring, odor control and hazardous chemicals expected on site. Providing a Confined Space Entry Program as defined in the Occupational Safety and Health Act, Confined Space Entry Standard, 29 CFR 1910.146.

B. Environmental Consulting Services

1. The Contractor must retain an independent Environmental Consultant to obtain all permits and perform all field screening, air monitoring, community air monitoring, soil and water sampling, and health and safety services.
2. If conditions within the exclusion zone are deemed hazardous, then the Contractor and its independent Environmental Consultant must ensure that all personnel working within identified exclusion zones and/or involved (direct contact) with the handling, storage or transport of hazardous and contaminated materials must have completed a minimum of forty (40) hours of Health and Safety Training on Hazardous Waste Sites in accordance with 29 CFR 1910.120(e). The training program must be conducted by a qualified safety instructor. If conditions in the exclusion zone are deemed to be non-hazardous, the independent Environmental Consultant must provide site specific training.
3. The Contractor must ensure that on-site management and supervisors directly responsible for or who supervise employees engaged in hazardous waste operations must receive the training specified in above and at least eight (8) additional hours of specialized training on managing such operations at the time of job assignment.

C. Submittals

1. The Contractor must submit a written HASP, as specified herein, to OEGS for review and approval. The written HASP must be submitted, within thirty (30) calendar days after the availability of analytical results of the soil and groundwater testing. The Contractor must make all necessary revisions required by OEGS and resubmit the HASP to OEGS for acceptance. Start-up work for the project will not be permitted until written acceptance has been issued by OEGS.
2. Daily safety logs must be maintained by the Contractor and must be submitted to the Commissioner either on request or on completion of the work. Training logs must be maintained by the Contractor and submitted to the Commissioner either on request or on completion of the work. Daily logs on air monitoring during excavation activities must be prepared and maintained by the Contractor and submitted to the Commissioner either on request or upon completion of the work.
3. A closeout report must be submitted by the Contractor to the Commissioner upon completion of the work within the defined exclusion zones. This report must summarize the daily safety and monitoring logs and provides an overview of the Contractor's performance regarding environmental and safety issues. The report must carefully document all areas where contamination has been found including pictures, addresses of locations, and potential sources.
4. Medical Surveillance Examinations: The Contractor must submit to the Commissioner the name, office address and telephone number of the medical consultant utilized. Evidence of baseline medical examinations together with the evidence of the ability to wear National Institute for Occupational Safety and Health (NIOSH) approved respirators (as specified in American National Standards Institute (ANSI) Z88.6) must be provided to the Commissioner for all construction personnel who are to enter the exclusion zones.
5. Accident Reports: All accidents, spills, or other health and safety incidents must be reported to the Commissioner.

D. Health and Safety Plan

The HASP must comply with OSHA regulations 29 CFR 1910.120/1926.65. This document must at a minimum contain the following:

1. Description of work to be performed
2. Site description
3. Key personnel
4. Worker training procedures
5. Work practices and segregation of work area
6. Hazardous substance evaluation
7. Hazard assessment
8. Personal and community air monitoring procedures and action levels
9. Personal protective equipment
10. Decontamination procedures
11. Safety rules
12. Emergency procedures

13. Spill prevention and control, as well as spill reporting procedures
14. Dust control, vapor/odor suppression procedures
15. Identification of the nearest hospital and route
16. Confined space procedures
17. Excavation safety procedures

3.4 PREPARATION

A. The Contractor shall perform all necessary site preparation, utility clearance, security and control, temporary fencing, flagging and marking of structures to be protected, and backfilling and shoring as necessary to protect structures, workers, the public, and the environment.

3.5 EXCAVATION, STOCKPILING, AND EROSION CONTROL

A. Different soil types shall be handled and stockpiled separately. Hazardous waste (if encountered), visibly contaminated (stained or odorous) soil (if encountered), and soil exhibiting photoionization detector (PID) readings (if encountered) shall be directly loaded for off-site disposal. If direct-loading is not practicable, the hazardous waste, visibly contaminated (stained or odorous) soil, and soil exhibiting PID readings above background shall be segregated and stockpiled on plastic sheeting at least 20-mil-thick (or 2 layers of 10 mil) and covered securely by minimum of 10 mil polyethylene sheeting to protect against cross-contamination, airborne dust, leaching or runoff of contaminants into the subsurface, groundwater, or stormwater. The sheeting shall be weighted or secured by appropriate means and the seams sealed, as approved by the DDC to prevent tearing or removal by wind or weather. Grade surrounding surface to provide for positive drainage away from pile. Each stockpile must not exceed 500 cubic yards. The Contractor shall assist the Commissioner in screening excavated soil/material during excavation and prior to loading or stockpiling, per the Commissioner's discretion.

B. Reusable soil and fill shall be segregated and stockpiled separately from unusable fill, concrete and other debris. All stockpiles shall be securely kept covered with 6-mil-thick plastic sheeting, which shall be anchored firmly in place by weights, stakes, or both. The Contractor shall maintain the plastic sheeting to prevent any dust generation, wind erosion, and surface water runoff from the stockpiles. Stockpiled soil and/or fill may be uncovered when soil is being added or removed.

C. The Contractor shall locate stockpiled material, especially contaminated material, in areas away from the Site surface drainage features and a minimum of 100 feet away from any water bodies or wetlands and a minimum of 800 feet away from sensitive receptors. The Contractor shall plan construction to control surface drainage from stockpiles, staging and other work areas and prevent erosion and sedimentation. The Contractor will provide the appropriate equipment to contain all runoff associated with stockpiled material. All runoff from excavated soil/material, unless visibly contaminated, will be controlled and allowed to drain back into the open excavation. Visibly contaminated runoff (i.e., sheen, free product) shall be collected and containerized, and handled and disposed of in accordance with Article 3.9 of this Section.

D. The amount of stockpiled soil uncovered and exposed at any one time shall be minimized.

E. The Contractor shall install and maintain silt fence around the perimeter of the work area, as necessary, to control erosion and in accordance with Section 31 25 00 (Soil Erosion and Sediment Control).

F. The Contractor must segregate in stockpiles any soil encountered that appears to contain unknown contaminants (based on visual, odor, or other observation), or that varies substantially from the material originally identified, and the Commissioner must be promptly notified.

G. If dewatering of any water including surface and stormwater runoff and groundwater seeping into the excavation is deemed necessary, it shall be handled in accordance with Article 3.9.

H. The Contractor shall inspect Site entrances and exits daily for evidence of off-site sediment tracking. The existing conditions of the adjacent city streets shall be maintained free of sediment and site material. If necessary, Contractor shall clean adjacent streets within 100 feet of the Site entrance/exit as directed by the Commissioner.

3.6 EXCAVATED MATERIAL DISPOSAL

A. The Contractor shall develop, layout, mark-out, and maintain a disposal grid. The Contractor will use grid references on all disposal documentation referenced in this Article.

B. The Contractor shall provide the Commissioner with all waste disposal documentation, including acceptance letters, permits, analytical data, manifests and bills of lading for soil, fill, and liquids.

C. The Contractor shall be responsible for the collection and analysis of all soil, fill, and liquid samples for soil or fill reuse purposes and as required by the disposal or recycling facility. All lab testing conducted for this project shall be performed by an ELAP-certified laboratory that is also certified by the state at which the disposal facility is located and shall be collected at a frequency specified by the selected disposal facility.

D. The Contractor must only use the transporter(s) identified in the approved Material Handling Plan for the performance of work. A revised Material Handling Plan or an addendum to the original approved Material Handling Plan must be submitted to OEGS for review and approval at no additional cost to the City of New York for any use of substitute or additional transporters.

E. All transport vehicles shall be inspected, prior to leaving the Site, by the Contractor to ensure that no material adheres to the wheels, undercarriage, tailgates, covers or other areas of transport vehicles. As required, vehicles shall be cleaned by washing tires, undercarriage, and any other contaminated parts prior to leaving the Site using a high-pressure water and/or steam spray. Contractor shall collect all wash water for treatment and disposal as required.

F. The Contractor shall transport and deliver material only to the approved disposal facilities. Only NYSDEC Part 364-permitted trucks shall be used to transport excavated material off-site. Approval letters from the disposal facilities must be provided to the Commissioner prior to transporting any material off-site. The letter must reference the site address, laboratory report numbers and sample identifications that are the basis of the facility's approval.

G. The Contractor shall be responsible for appropriate measurement of unit quantity of material removed from the Site. The Contractor shall coordinate vehicle inspection and recording of quantities leaving the Site. The Contractor shall keep an accurate record (log) of the contaminated material transported off-site, borrow fill imported to the Site, and on-site soil to be reused, and maintain a file of all facility-signed (completed) manifests and weigh slips for all materials leaving the Site and documentation for all borrow fill entering the Site. These quantities shall be compared to recorded quantities received at the disposal facilities. The Contractor shall immediately resolve any discrepancies that occur and determine the probable cause for the discrepancy. Logs shall be submitted to the Commissioner daily. Manifests and borrow fill documentation shall be submitted to the Commissioner when received.

H. The Contractor shall be solely responsible for any and all actions necessary to remedy situations involving material spilled in transit. The Contractor shall be solely responsible for and all costs associated with the refusal of the disposal facility to accept waste loads that, for whatever reason, does not meet the facility's acceptance criteria. The Contractor shall be solely responsible for remedying any situation involving material disposal at an incorrect facility; involving, but not limited to, excavation/handling at the disposal facility, endpoint sampling, and engineering fees.

I. The Contractor shall have access to back-up vehicles and equipment to ensure that there is no downtime in connection with soil transport operations.

J. The disposal containers shall be ISO type, dump trailers, or approved equal, constructed of sufficient metal, have watertight bodies and sealed tailgates equipped with positive locking devices and provisions for control of free liquids. No liquid shall leak from any part of the loaded container or trailer. The Contractor shall furnish and install a metal or tarpaulin cover on each container immediately after the container is full. The cover shall be secured in an approved manner and shall remain in place until the container has reached the disposal facility.

K. The Contractor shall be responsible for transportation safety. All vehicles shall be properly maintained, driven properly, follow all rules and regulations, observe all speed limits, etc. The on-Site speed limit shall be five miles per hour. All vehicles shall be inspected before every trip as part of Contractor's preventive maintenance program. The Contractor shall inspect each vehicle to ensure that all doors, covers, etc. are secure and that no material can spill or otherwise be released or leak. Each vehicle shall bear, at a minimum, the name and phone number of the Contractor plainly visible on both cab doors. Each vehicle shall be uniquely numbered in lettering at least four inches high and shall be placarded in New York State DOT requirements (or other applicable transportation requirements). Likewise, each trailer or container shall be so labeled on both sides and the tailgate if possible.

L. The Contractor shall submit to the Commissioner a copy of the completed manifest and associated scale tickets for each load of excavated material/waste transported off-site to document the proper transportation of disposed material to an approved permitted facility by permitted vehicles within four (4) business days following shipment, and within three (3) business days after notification of receipt of the facility. Any manifest discrepancies must be reported immediately to the Commissioner and be resolved by the Contractor to the satisfaction of the Commissioner. No payments shall be made until copies have been provided to the Commissioner.

M. All trucks leaving the Site containing solid material for off-site disposal shall be covered with tight-fitting covers, and will be checked to ensure that the cargo is not leaking. Excavated soil supersaturated with water will be dried, dewatered or mixed with a drying compound (e.g. quick lime) prior to loading into a transport vehicle for off-site disposal.

3.7 IMPORT OF MATERIAL FROM OFF-SITE SOURCES

A. Imported soil and fill material shall meet geotechnical requirements defined in Section 31 00 00 Earthwork, and comply with the requirements of 6 NYCRR Part 360.

B. Imported soil for use as backfill will be obtained from a Part 360 permitted facility and meet the General Fill criteria shown in Part 360 Table 2 (i.e., the lower of Part 375.6.8(b) Restricted Use Residential and Protection of Groundwater SCOs).

C. Soil and fill material proposed for import as backfill shall not contain any C&D debris (including, but not limited to, concrete, brick, asphalt, wood), combustible materials, stumps, roots, and other organic matter

subject to decay or disintegration, as well as ash, petroleum, and other oils, exhibit any observable indicators of contamination (i.e., petroleum-staining and odors), or have been in contact with a spill of petroleum, hazardous waste or industrial waste. Material from industrial sites, spill sites, environmental remediation sites, or other potentially contaminated sites shall not be imported to the site.

D. The Contractor shall retain a qualified environmental professional (QEP) to screen the soil and fill material proposed for import for visual, olfactory, and instrumental (PID) evidence of contamination. Proposed soil for import will be sampled according to Part 360 Table 1: Minimum Analysis Frequency for Fill Material, prior to transport from the source facility.

E. Clean recycled concrete aggregate (RCA) and recycled clean stone will not require analytical sampling if it is from a registered or permitted NYS facility and has less than 10% by weight passing through a No. 80 sieve.

F. Clean stone will not require analytical sampling if it is from a virgin quarry and has less than 10% by weight passing through a No. 80 sieve.

G. No material shall be imported to the Site until the Contractor has submitted the required fill documentation to the Commissioner and the Commissioner has completed their review of the proposed import material.

3.8 WATER MANAGEMENT

A. The Contractor must be solely responsible for the proper disposal or discharge of all contaminated water generated at the Site. The Contractor will have the option of treating water on-site for discharge to the sewer system or removing contaminated water for off-site disposal. The Contractor must be responsible to choose a method compatible to the construction work and will be compensated on a per day basis regardless of method employed. The Contractor will be compensated for only those days where the system is in full operation.

B. The Contractor must retain a dewatering/water treatment Specialist (hereinafter the "Specialist") and laboratory to conduct any testing that may be required for disposal of impacted water.

C. The dewatering/water treatment Specialist is responsible to obtain all permits; perform all water sampling, testing; and provide ancillary services related to dewatering and water treatment. The Specialist must at a minimum provide documentation to OEGS demonstrating the minimum requirements as set forth below:

1. The Specialist must demonstrate that it has, at a minimum, three (3) years' experience in the design of dewatering plans. The Specialist should demonstrate expertise dealing with issues associated with contaminated water. During that three (3) year period, the Specialist must demonstrate that it provided dewatering and water treatment systems as a routine part of its daily operations.
2. The Specialist must be experienced in work of this nature, size, and complexity and must have previous experience in working with the NYCDEC.
3. The Specialist must furnish a project listing identifying the location, nature of services provided, owner, owner's contact, contact's telephone number, project duration and value for at least five (5) projects within the last three (3) years of a similar nature, size, and complexity to this one.
4. If conditions within the exclusion zone are deemed hazardous, then the Contractor and its independent Environmental Consultant must ensure that all personnel working within identified exclusion zones and/or involved (direct contact) with the handling, storage or transport of hazardous and contaminated material must have completed a minimum of forty (40) hours of Health and Safety Training on Hazardous Waste Sites in accordance with 29 CFR 1910.120(e). The training program must be conducted by a qualified safety instructor. If conditions in the exclusion zone are deemed to be non-hazardous, the Specialist will be responsible to provide site-specific training to its employees and other affected personnel.

5. The Contractor must ensure that on-site management and supervisors directly responsible for or who supervise employees engaged in hazardous waste operations must receive the training specified in above and at least eight (8) additional hours of specialized training on managing such operations at the time of job assignment.
6. The Contractor must document all operations associated with the handling, sampling and disposal of contaminated water, and ensure that they are in compliance with applicable Federal, State and Local statutes and regulations.
7. The Contractor must supply all labor, equipment, transport, plant, material, treatment, and other incidentals required to conduct the specified work of this section.
8. If water will be disposed of into the sewer system, the Contractor must ensure the Specialist treats the water to comply with the New York City Department of Environmental Protection (NYCDEP) Sewer Effluent Limit concentrations prior to discharge. The Contractor is responsible for providing settling or filtering tanks and any other apparatus required by NYCDEP. Alternatively, the Contractor can provide a plan for transport and disposal at an off-site waste disposal facility.
9. Within forty-five (45) calendar days after award of Contract, the Contractor must submit to OEGS for review and approval, a Water Handling Plan (WHP). The WHP must be approved by OEGS prior to the Contractor's commencement of work. The Contractor must maintain a complete, up to date copy of the WHP on the job site at all times.

D. For each disposal method the Contractor proposes to utilize (disposal to sewer or off-site disposal), the WHP must include the information required below, as appropriate.

1. On-site treatment and discharge into New York City sewers.

a) Regulations: The Contractor must comply with all applicable regulations. This includes but may not be limited to Title 15-New NYCDEP Sewer Use Regulations.

b) Permits: The Contractor is solely responsible to obtain all necessary and appropriate permits and approvals, and will be responsible for performing all and any system pilot tests required for permit approval, including but not neccessarily limited to:

(i) Industrial waste approval for the New York City sewer system.

(ii) Groundwater discharge permit for the New York City sewer system (NYCDEP Division of Sewer Regulation and Control), if discharge to sewer exceeds 10,000 gallons per day.

(iii) Compliance with NYCDEC State Pollutant Discharge Elimination System (SPDES) Permit Number GP-0-10-001, General Permit for Stormwater Discharges.

(iv) Wastewater quality control application, NYCDEP.

c) The WHP for this portion of the work must include the following at a minimum:

(i) Identification and design of Contractor's proposed treatment to assure that the water meets the NYCDEP sewer use guidelines prior to discharge to the sewer, including identification of all materials, procedures, settling or filtering tanks, filters and other appurtenances proposed for treatment and disposal of contaminated water.

(ii) The name, address and telephone number of the contact for the Contractor's proposed chemical laboratory, as well as the laboratory's New York State approval certifications.

(iii) The name, address and telephone number of the contact for the Contractor's proposed

independent Environmental Consultant.

(iv) Copies of all submitted permit applications and approved permits the Contractor has received.

d) The Contractor must supply all settling or filtering tanks, pumps, filters, treatment devices and other appurtenances for treatment, temporary storage and disposal of contaminated water. All equipment must be suitable for the work described herein.

e) Execution

(i) The Contractor is solely responsible for disposal of all water.

(ii) The Contractor is solely responsible for any treatment required to assure that water discharged into the sewer is in compliance with the above-described permits.

(iii) The Contractor is solely responsible for the quality of the water disposed of into the sewers.

(iv) The Contractor is responsible for sampling and testing of water for the NYCDEP Sewer Effluent Limit concentrations. The quality of the data is the Contractor's responsibility.

(v) The Contractor will be responsible to maintain the discharge rate to the sewer such that all permit requirements are met, the capacity of the sewer is not exceeded and no surcharging occurs downstream due to the Contractor's actions.

(vi) The Contractor will be responsible for disposal or recycling of treatment media. The Contractor must provide the Commissioner with all relevant documentation concerning the disposal of treatment media, including manifests, bills of lading, certificates of recycling or destruction and other applicable documentation.

2. Off-Site Disposal

a) The following must be submitted to the Commissioner prior to initiating any off-site disposal:

(i) Name and waste transporter permit number

(ii) Address

(iii) Name of responsible contact for the waste transporter

(iv) Any and all necessary permit authorizations for each type of waste transported

(v) Previous experience in performing the type of work specified herein

b) General information for each proposed treatment/disposal facility and at least one backup treatment/disposal facility

(i) Facility name and USEPA identification number

(ii) Facility location

(iii) Name of responsible contact for the facility

(iv) Telephone number for contact

(v) Unit of measure utilized at facility for costing purposes

c) A listing of all permits, licenses, letters of approval and other authorizations to operate, which are currently held and valid for the proposed facility as they pertain to receipt and management of the wastes derived from this Contract.

d) A listing of all permits, licenses, letters of approval and other authorizations to operate which have been applied for by the proposed facility but not yet granted or issued. Provide dates of application(s) submitted. Planned submittals must also be noted.

e) The Contractor must specify and describe the disposal/containment unit(s) that the proposed facility will use to manage the waste and provide dates of construction and beginning of use, if applicable. Drawings may be provided. The Contractor must identify the capacity available in the units and the capacity reserved for the subject waste.

f) The Contractor must provide the date of the proposed facility's last compliance inspection.

g) A list of all active (unresolved) compliance orders, agreements, enforcement notices or notices of violations issued to the proposed facility must be submitted. The source and nature of the cause of violation must be stated, if known. If groundwater contamination is noted, details of the facility's groundwater monitoring program must be provided.

h) Description of all sampling and field/laboratory analyses that will be needed to obtain disposal facility approval.

i) All vessels for temporary storage and transport to an off-site disposal facility must be as required in DOT regulations.

j) Execution

(i) The Contractor must organize and maintain the required material shipment records/manifests. The Contractor must include all bills of lading, certificates of destruction, recycling or treatment and other applicable documents.

(ii) The Contractor must coordinate the schedule for truck arrival and material deliveries at the Site to meet the approved project schedule. The schedule must be compatible with the availability of equipment and personnel for material handling at the Site.

(iii) The Contractor must inspect all vehicles leaving the project site to ensure that contaminated liquids are not spilling and are contained for transport.

(iv) The Contractor must obtain letters of commitment from the waste haulers and the treatment, disposal or recovery facility to haul and accept shipment. The letter must indicate agreement to handle and accept the specified estimated quantities and types of material during the time period specified in the project schedule and any time extension as deemed as necessary.

(v) The Contractor must verify the volume of each shipment of water from the site.

(vi) The Contractor is responsible for sampling and testing of water for off-site disposal. The quality of the data is the Contractor's responsibility.

(vii) The Contractor is responsible for any additional analyses required by the disposal facility, and for the acceptance of the water at an approved disposal facility.

(viii) The Contractor must not deliver waste to any facility other than the disposal facility(ies) listed on the shipping manifest.

(ix) The Contractor must coordinate manifesting, placarding of shipments, and vehicle decontamination. All quantities must also be measured and recorded upon arrival at the disposal facility(ies). If any deviation between the two records occurs, the matter is to be reported immediately to the Commissioner and must be resolved by the Contractor to the satisfaction of the Commissioner.

(x) The Contractor will be responsible for any and all actions necessary to remedy situations involving material spilled in transit or mud and dust tracked off-site. This cleanup must be accomplished at the Contractor's expense.

(xi) The Contractor will be responsible for inspecting the access routes for road conditions, overhead clearance and weight restrictions.

(xii) The Contractor must only use the transporter(s) and disposal facility(ies) identified in the WHP for the performance of work. Only a transporter with a current Part 364 Waste Transporter Permit from NYCDEC may transport this material. Any use of substitute or additional transporters or facility(ies) must have previous written approval from the Commissioner and OEGS at no additional cost to the City of New York.

(xiii) The Contractor must develop, document, and implement a policy for accident prevention.

(xiv) The Contractor must not combine waste materials from other projects with material from this project.

(xv) The Contractor must obtain for the Commissioner or City of New York a hazardous waste generator identification number and will sign the manifest as the generator, if necessary.

(xvi) No material must be transported until approved by the Commissioner. (x

(xvii) The Contractor will be responsible for acceptance of the material at an approved disposal facility, for ensuring that the facility is properly permitted to accept the stated material, and that the facility provides the stated storage and/or disposal services.

(xviii) The City of New York reserves the right to contact and visit the disposal facility and regulatory agencies to verify the agreement to accept the stated material and to verify any other information provided. This does not in any way relieve the Contractor of the Contractor's responsibilities under this Contract.

(xix) In the event that the identified and approved facility ceases to accept the stated materials or the facility ceases operations, it is the Contractor's responsibility to locate an alternate approved and permitted facility(ies) for accepting materials. The Contractor is responsible for making the necessary arrangements to utilize the facility(ies), and the alternate facility(ies) must be approved in writing by the Commissioner in the same manner and with the same requirements as for the original facility(ies). This must be done with no extra cost or delay to the City of New York.

(xx) The Contractor must design and construct a portable decontamination station to be used to decontaminate equipment and vehicles exiting the exclusion zone.

3.9 DECONTAMINATION OF EQUIPMENT AND MATERIALS

A. All decontamination procedures for equipment and materials shall conform to the requirements of applicable USEPA and NYSDEC regulations, as appropriate.

B. All recoverable equipment and materials that have been in contact with excavated soil shall be decontaminated prior to removal from the Site. As used herein "recoverable" shall mean all items which are non-absorptive in nature and which can be successfully decontaminated. All items for which decontamination is difficult or uncertain shall be considered non-recoverable, as determined by the Commissioner.

C. The Contractor must design and construct a portable decontamination station to be used to decontaminate equipment and vehicles that have been used to handle contaminated soil.

D. The Contractor shall use an approved biodegradable cleaning solution, suitable for removal of petroleum, to clean all residual material and soil from the interior and exterior surfaces of the recoverable equipment. Solutions containing chlorinated solvents or volatile organic compounds are not acceptable. The Contractor shall submit applicable safety data sheets (SDS) to the Commissioner and obtain approval for the cleaning solution in advance.

E. Cleaning shall be done in an area specifically set up by the Contractor for that purpose, preferably adjacent to the contaminated soil/fill stockpile. The decontamination areas shall be curbed, and lined with an impermeable membrane, to contain the used cleaning solution, including any overspray, and any contaminated debris removed during the cleaning process. All cleaning related materials and operations, and disposal of used cleaning solution and associated contaminated debris, shall be provided and performed by the Contractor at no additional cost to the City of New York.

F. Properly dispose of decontamination fluids in drums or through treatment systems.

G. Mark and placard containerized decontamination materials and place in the contaminated stockpile area. The waste shall be sampled and classified by the Contractor in accordance with the approved disposal facilities' requirements. Once classified and accepted by the approved facility, the Contractor shall provide the Commissioner with a photocopy of any required manifests.

END OF SECTION 02 61 13

SECTION 028013 – GENERAL CONTRACTOR WORK
NOVEMBER 2017 VERSION

ALLOWANCE FOR INCIDENTAL ASBESTOS ABATEMENT

1.01 SCOPE FOR ASBESTOS ABATEMENT WORK

A. The "General Conditions" apply to the work of this Section.

B. The asbestos abatement contractor shall remove asbestos containing materials as needed to perform the other work of this Contract when discovered during work. When required, the asbestos abatement contractor shall replace the ACM with non-asbestos containing materials. An allowance of **$30,000.00** for the **General Contractor** is herein established for this incidental work when so ordered and authorized by the Commissioner.

C. All work shall be done in accordance with the applicable provisions of the rules and regulations of the asbestos control program as promulgated by Title 15 Chapter I of RCNY and New York State Department of Labor Industrial Code Rule 56 cited as 12 NYCRR Part 56, whichever is more stringent as per latest amendments to these laws and as modified herein by these specifications.

D. All disposal of asbestos contaminated material shall be per Local Law 70/85.

E. The asbestos abatement contractor's attention is directed to the fact that certain methods of asbestos abatement are protected by patents. To date, patents have been issued with respect to "negative pressure enclosure" or "negative-air" or "reduced pressure" and "glove bag".

F. The asbestos abatement contractor shall be solely responsible for and shall hold the Department of Design and Construction and the City harmless from any and all damages, losses and expenses resulting from any infringement by the asbestos abatement contractor of any patent, including but not limited to the patents described above, used by the asbestos abatement contractor during performance of this agreement.

G. "Asbestos" shall mean any hydrated mineral silicate separable into commercially usable fibers, including but not limited to chrysotile (serpentine), amosite (cumingtonite-grunerite), crocidolite (riebeckite), tremolite, anthrophyllite and actinolite.

H. Prior to starting, the asbestos abatement contractor must notify the Commissioner of the Department of Design and Construction if he/she anticipates any difficulty in performing the Work as required by these Specifications. The asbestos

abatement contractor is responsible to prepare and submit all filings, notifications, etc. required by all City, State and Federal regulatory agencies having jurisdiction.

The asbestos abatement contractor is responsible for submitting the Asbestos Project Notification Form (ACP-7 Form) to the Department of Environmental Protection, Asbestos Control Program, as per Title 15, Chapter I of RCNY and to the NYSDOL as per Industrial Code Rule 56.

The asbestos abatement contractor is responsible for preparing and submitting Asbestos Variance Application (ACP-9). If a Variance is required, the asbestos abatement contractor is responsible to retain a NYSDOL Asbestos Project Designer, as defined in Title 15, Chapter 1 of the RCNY to prepare and submit the required variance.

The general contractor is responsible for preparing and submitting an Asbestos Abatement Permit and/or Work Place Safety Plans (WPSP) that may be required for the completion of the Contract or incidental work. If such plans are required, the general contractor is responsible for retaining a registered design professional as defined in Title 15, Chapter 1 of the RCNY to prepare and submit the required plans.

The asbestos abatement contractor is responsible for the submission of all required documents to the NYCDEP to acquire the appropriate Asbestos Project Conditional Closeout (ACP-20) and/or Asbestos Project Completion Forms (ACP-21) on a timely basis for the completion of the incidental work encountered under this contract.

The asbestos abatement contractor will be required to attend an on-site job meeting with the Construction Project Manager prior to the start of work to examine conditions and plan the sequence of operations, etc.

The asbestos abatement contractor shall have a NYSDOL/NYCDEP Asbestos Supervisor onsite to oversee the work and conduct a final visual inspection as required by both Title 15, Chapter 1 of the RCNY and NYSDOL Industrial Code Rule 56.

I. All work shall be done during regular working hours unless the asbestos abatement contractor requests authorization to work in other then regular working hours and such authorization is granted by the Commissioner. (Regular work hours are those hours during which any given facility, in which work is to be done, is customarily open and functioning, normally between the hours of 8:00 A.M. and 4:00 P.M. Monday - Friday.) If such work schedule is authorized by the Commissioner, the work shall be done at no additional cost to the City.

J. The Commissioner may order that work be done in other than regular working hours as herein by defined and this order may require the asbestos abatement

contractor to pay premium or overtime wages to complete the work. If the Commissioner orders work in other than regular working hours, the asbestos abatement contractor shall multiply the unit price for that portion of the work requiring premium wages by 1.50 when computing payment in accordance with Paragraph 1.09. All requests for premium payment must be supported by certified payroll sheets and field sheets approved by the Construction Project Manager.

1.02 QUALIFICATIONS OF ASBESTOS ABATEMENT CONTRACTOR

A. Requirements: The asbestos abatement contractor must be approved through the Department's Request for Subcontractor Approval, administered by the Agency Chief Contracting Office (ACCO), Vendor Integrity Unit. The asbestos abatement contractor must demonstrate compliance with the special experience requirements set forth in subparagraphs (1) through (6) below. Such documentation shall include without limitation, all required licenses, certificates, and documentation.

1. The asbestos abatement contractor must, whether an individual, corporation, partnership, joint venture or other legal entity, demonstrate for the three-year period prior to the work that it has been licensed by the New York State Department of Labor (NYSDOL), as an "Asbestos Abatement Contractor". The asbestos abatement contractor shall submit copies of the asbestos abatement contractors NYSDOL License for the past three years

2. The asbestos abatement contractor must, for the three-year period prior to the work, have been in the business of providing asbestos abatement services as a routine part of its daily operations.

3. The asbestos abatement contractor proposing to do asbestos abatement work must be thoroughly experienced in such work and must submit a list of five (5) asbestos abatement projects of similar size and complexity. The aggregate cost of these projects must be at least $1,000,000 in each of the three years.

4. For each project submitted to meet the experience requirements set forth above, the asbestos abatement contractor must submit the following information for the project; name and location of the project; name title and telephone number and email address of the owner or the owner's representative who is familiar with the asbestos abatement contractor's work; brief description of the scope of work completed as a prime or sub-asbestos abatement contractor; amount of contract or subcontract and the date of completion.

5. The asbestos abatement contractor must demonstrate that it has the financial resources, certified supervisory personnel and equipment

necessary to carry out the work and to comply with the required performance schedule, taking into consideration other business commitments. The asbestos abatement contractor must submit such documentation as may be required by the Department of Design and Construction to demonstrate that it has the requisite capacity to perform the required services of this contract. The Department may also conduct an inspection of the asbestos abatement contractor's facility to verify if the contractor has equipment and staffing to perform the work.

6. The asbestos abatement contractor must submit a copy of their Corporate Health and Safety Plan for review and acceptance. A Job Hazard Analysis (JHA) for the specific work conducted must be included.

B. Throughout the specifications, reference is made to codes and standards which establish qualities and types of workmanship and materials, and which establish methods for testing and reporting on the pertinent characteristics thereof. Provide materials or workmanship that meet or exceed the specifically named codes or standards where required by these specifications.

C. Site Investigation: Asbestos abatement contractor shall inspect all the specifications and related drawings and will investigate and confirm the site conditions affecting the work, including, but not limited to (1) through (5) below. The asbestos abatement contractor will attend a walkthrough site inspection with the department's Project Manager and the Third-Party Air Monitor prior to the work. Such walkthrough will be scheduled at the Department's convenience.

1. Physical considerations and conditions of both the material and structure. These considerations include any obstacles or obstructions encountered in accessing or removing the material.

2. Handling, storage, transportation and disposal of the material.

3. Availability of qualified and skilled labor.

4. Availability of utilities.

5. Exact quantities of all materials to be disturbed and/or removed

1.03 ASBESTOS ABATEMENT CONTRACTOR RESPONSIBILITIES

The asbestos abatement contractor will visit the subject location within one (1) working day of notification to ascertain actual work required. If the project is identified as being "urgent", then work shall commence no later than 48 hours from the time of notification. In this event, the asbestos abatement contractor shall immediately notify when applicable EPA NESHAPS Coordinator, NYSDOL Asbestos Control Bureau and NYCDEP

Asbestos Control Program of start of the work and file the necessary Asbestos Notifications and any applicable Variance Applications with the regulatory agencies cited above.

If the project is not classified as "urgent" the asbestos abatement contractor shall notify the EPA NESHAPS Coordinator, NYSDOL and NYCDEP by submitting the requisite asbestos project notification forms, postmarked 10 days before activity begins if 260 linear feet or more and/or 160 square feet or more of asbestos containing material will be disturbed.

The following information must be included in the notification:

A. Name and address of building City or operator;

B. Project description:

1. Size - square feet, number of linear feet, etc;

2. Age - date of construction and renovations (if known);

3. Use - i.e., office, school, industrial, etc.

4. Scope - repair, demolition, cleaning, etc.

C. Amount of asbestos involved in work and an explanation of techniques used to determine the amount;

D. Building location/address, including Block and Lot numbers;

E. Work schedule including the starting and completion dates;

F. Abatement methods to be employed;

G. Procedures for removal of asbestos-containing material;

H. Name, title and authority of governmental representative sponsoring project.

1.04 WORK INCLUDED IN UNIT PRICE

The asbestos abatement contractor will be paid a basic unit price of **$25.00** per square feet for the removal and disposal of asbestos containing material and replacement of the same with non-asbestos containing materials.

Unit price shall include all costs necessary to do the work of this Contract, including but not limited to: labor, materials, equipment, utilities, disposal, insurance, overhead and profit.

1.05 AIR MONITORING – ASBESTOS ABATEMENT CONTRACTOR

A. "Air Sampling" shall mean the process of measuring the fiber content of a known volume of air collected during a specific period. The procedure utilized for asbestos follows the N1OSH Standard Analytical Method 7400 or the provisional transmission electron microscopy methods developed by the USEPA and/or National Institute of Standard and Technology which are utilized for lower detectability and specific fiber identification.

B. Air monitoring of asbestos abatement contractor's personnel will be performed in conformance with OSHA requirements, (All costs associated with this work are deemed included in the unit price.).

C. Qualifications of Testing Laboratory:

The industrial hygiene laboratory shall be a current proficient participant in the American Industrial Hygiene Association (AIHA) PAT Program. The laboratory identification number shall be submitted and approved by the City. The laboratory shall be accredited by the AIHA and New York State Department of Health Environmental Laboratory Approval Program (ELAP).

Note: Work area air testing and analysis before, during and upon completion of work (clearance testing) will be performed by a Third Party Air Monitor under separate Contract with the City.

1.06 THIRD PARTY MONITORING AND LABORATORY

A. The NYCDDC, at its own expense, will employ the services of an independent Third-Party Air Monitoring Firm and Laboratory. The Third-Party Air Monitor will perform air sampling activities and project monitoring at the Work Site.

B. The Laboratory will perform analysis of air samples utilizing Phase Contrast Microscopy (PCM) and/or Transmission Electron Microscopy (TEM).

C. The Third-Party Air Monitoring Firm and the designated Project Monitor shall always have access to all areas of the asbestos removal project and shall continuously inspect and monitor the performance of the asbestos abatement contractor to verify that said performance complies with this Specification. The Third-Party Air Monitor shall be on site throughout the entire abatement operation.

D. The NYCDDC will be responsible for costs incurred with the Third-Party Air Monitoring Firm and laboratory work. Any subsequent additional testing required due to limits exceeded during initial testing shall be paid for by the asbestos abatement contractor.

1.07 PAYMENT REQUEST DOCUMENTATION

B. The following information shall be included for each payment request:

1. Description of work performed.
2. Linear footage and pipe sizes involved.
3. Square footage for boiler & breaching insulation removed.
4. Square footage of non pipe and boiler areas removed, patched, enclosed, sealed, or painted.
5. Square footage of encapsulation, sealing, patching, and painting involved.
6. Total cost associated with compliance with the assigned task.
7. Architectural, Electrical, HVAC, Plumbing, etc. work incidental to the Asbestos Abatement Work.
8. A certified copy (in form 4312-39) to the Comptroller or Financial Officer of the New York City to the effect that the financial statement is true.
9. A signed copy (in form 6506q-6) of certificate of compliance with non-discriminatory provisions of the Contract.
10. Attach a copy of valid workmen compensation insurance.
11. Valid asbestos insurance per occurrence.
12. General liability insurance when required.

C. Each payment request shall include a grand total for all work completed that billing period, the landfill waste manifests and a copy of waste transporter permit. The Department of Design and Construction will inspect the work performed, review the cost and approve or disapprove requests for payment.

D. EXPOSURE LOG: With this final payment, the asbestos abatement contractor shall submit a listing of the names and social security numbers of all employees actively engaged in the abatement work of this Contract. This list shall include a summary showing each part of the abatement work in which the employee was engaged and the dates thereof.

1.08 QUANTITY CALCULATIONS

In order to determine the square footage involved for the various pipe sizes of pipe insulation that might be encountered, the following table is to be used.

PIPE INSULATION SIZE O.D.	PIPE SIZE O.D.	SQUARE FOOTAGE PER LINEAR FOOT
2-1/2"	1/2"	0.65
2-3/4"	3/4"	0.72
3"	1"	0.79
3-1/4"	1-1/4"	0.85
3-1/2"	1-1/2"	0.92
4"	2"	1.05
4-1/2"	2-1/2"	1.18
5"	3"	1.31
6"	3-1/4"	1.57
7"	3-1/2"	1.83
8"	4"	2.09
9"	5"	2.36
10"	6"	2.62
12"	8"	3.14
14"	10"	3.67
16"	12"	4.19
18"	14"	4.71

1.09 METHOD OF PAYMENT

Payment shall be made in accordance with Items A through R below. Payment shall be calculated based on the actual quantity of the item performed by the asbestos abatement contractor, times the unit price specified below. Credits may apply to certain times, as specified below.

A. **REMOVAL, DISPOSAL AND REPLACEMENT OF ASBESTOS CONTAINING PIPE INSULATION:** Actual linear footage, multiplied by the square footage factor listed for the respective pipe size in Section 1.08, multiplied by the unit price in Section 1.04.

EXAMPLE: 100 lin.ft. of 1/2" pipe and 100 lin.ft. of 6" pipe, including elbows, tees. Flanges, etc.

100 X 0.65 = 65 sq.ft. 65 x unit price = Payment

100 X 2.62 = 262 sq.ft. 262 x unit price = Payment

B. **REMOVAL, DISPOSAL AND REPLACEMENT OF BOILER INSULATION:** (all types including Silicate Block and including the removal/replacement of metal jacketing) Payment shall be made at 1.5 times the unit price per square foot.

EXAMPLE: Item B. removal and replacement of 1000 S.F. of boiler insulation (incl. Silicate block)

1000 S.F. X (1.5) X the Unit Price = Payment

C. **REMOVAL, DISPOSAL AND REPLACEMENT OF TANK INSULATION:** (all types including removal/replacement of metal jacketing) Payment shall be made at 1.5 times the unit price per square foot.

D. **REMOVAL, DISPOSAL AND REPLACEMENT OF BOILER UPTAKE, & BREACHING INSULATION:** (all types including stiffening angles and wire lath) Payment shall be made at 2.0 times the unit price per square foot.

E. **REMOVAL, DISPOSAL AND REPLACEMENT OF DUCT INSULATION:** Payment shall be made at 1.0 times the unit price per square foot.

F. **REMOVAL, DISPOSAL AND REPLACEMENT OF SOFT ASBESTOS CONTAINING MATERIAL:** (Including sprayed-on fire proofing and sound proofing) Payment shall be made at 1.0 times the unit price per square foot of surface area. Area of irregular surfaces must be calculated and confirmed with DDC representative.

G. **ACOUSTIC PLASTER REPAIR AND/OR ENCAPSULATION:** Payment shall be made at 0.5 times the unit price per square foot.

H. **PATCHING OR REPAIR** of items listed in A through F will be paid at 0.33 times the unit price per square foot.

I. **REMOVAL, DISPOSAL AND REPLACEMENT OF WATERPROOFING ASBESTOS CONTAINING MATERIAL:** (including friable and non-friable waterproofing material from interior and exterior walls, floors, foundations, penetrations, louvers, vents and openings other than windows, doors and skylights) **Payment** shall be made at 0.5 times the unit price per square foot.

J. **REMOVAL, DISPOSAL AND REPLACEMENT OF ASBESTOS CONTAINING ELECTRICAL WIRING INSULATION:** (including friable and non-friable wiring insulation) Payment shall be made at 0.33 times the unit price per square foot.

K. **PAINTING:** Payment shall be made at 0.05 times the unit price per square foot.

L. **REMOVAL AND DISPOSAL OF ASBESTOS-CONTAINING PLASTER:** from ceilings and walls, including any wire lath and disposal as asbestos containing waste. Payment shall be made at 0.80 times the unit price per square foot.

M. **REMOVAL AND DISPOSAL OF ASBESTOS-CONTAINING FLOOR TILES, CEILING TILES, TRANSITE PANELS:** (including any adhesive, glue, mastic and/or underlayment) and disposal as asbestos containing waste. Payment shall be made at 0.40 times the unit price per square foot. If multiple

layers are discovered, each additional layer shall be paid at 0.20 times the unit price per square foot.

N. **ADDITIONAL CLEAN UP/HOUSEKEEPING OF WORK AREA:** (excluding pre-cleaning of work area required by regulations) HEPA vacuuming and wet cleaning of asbestos contaminated surface. Payment shall be made at 0.20 times the unit price per square foot. When GLOVE BAG is employed to remove ACM, cost of HEPA vacuuming and wet cleaning of floor area up to 3 feet on each side of glove-bag shall be included in unit price and no extra payment will be made.

O. **REMOVAL, DISPOSAL OF ASBESTOS-CONTAINING ROOFING MATERIAL:** including mastic, flashing and sealant compound and provide temporary asbestos-free roof covering consisting of one layer of rolled roofing paper sealed with asphaltic roofing compound. Payment shall be made at 0.8 times the unit price per square foot. Credit at a rate of 0.33 times the unit price will be taken for each square foot of temporary roof covering which the asbestos abatement contractor is directed not to install.

P. **PICK-UP AND DISPOSAL OF GROSS DEBRIS:** (excluding any waste generated from abatement under Item A-R) at a rate of $150 per cubic yard for asbestos contaminated waste and $75 per cubic yard for non-asbestos contaminated waste. This cost includes all labor and material cost associated with work.

Q. **REMOVAL OF ASBESTOS-CONTAINING BRICK, BLOCK, MORTAR, CEMENT OR CONCRETE:** along with all surfacing materials including wire lath and/or other supporting structures and disposal as ACM waste. Payment shall be made at a rate of $25.00 per cubic foot of material removed.

R. **REMOVAL AND DISPOSAL OF ASBESTOS CONTAINING WINDOW/DOOR CAULKING:** including friable and non-friable caulking, weather-stripping, glazing, sealants or other waterproofing materials applied to windows, doors, skylights, etc. Payment shall be made at the rate of $400.00 per opening regardless of size or configuration. This cost includes labor, consumable materials, set-up/breakdown, removal and disposal, as required.

Note 1: CREDIT: For items listed in A through F, a credit at a rate of 0.33 times the unit price, times the respective multiplier (for each item) will be taken for each square foot of insulation which the asbestos abatement contractor is not directed to reapply.

Note 2: MINIMUM PAYMENT: The minimum payment per call at any individual job sites or various job sites during the same day will be eight hundred dollars ($800.00).

Note 3: All payments shall be made as described in paragraph 1.09 herein.

Note 4: WORKING HIGHER THAN 12 FEET ABOVE FLOOR LEVEL OR WORK REQUIRING COMPLEX SCAFFOLDING OR CONSTRUCTION WORK

PLATFORMS: Provisions are made in this Contract to compensate the asbestos abatement contractor for work performed in locations that are difficult to access due to work at elevations that are significantly higher than the normal work level. The unit price for these items will be paid at 1.20 times the unit price described in Paragraphs 1.09, A through R for those portions of the work that are more than twelve (12) feet above the grade for that would be judged as the normal working level.

1.10 GUARANTEE

A. Work performed in compliance with each task shall be guaranteed for a period of one year from the date the completed work is accepted by the Department of Design and Construction.

B. The Commissioner of The Department of Design and Construction will notify the asbestos abatement contractor in writing regarding defects in work under the guarantee.

1.11 OCCUPANCY OF SITE NOT EXCLUSIVE

Attention is specifically drawn to the fact that contractors, performing the work of other Contracts, may be brought upon any of the work sites of this Contract. Therefore, the asbestos abatement contractor shall not have exclusive rights to any site of his work and shall fully cooperate and coordinate his work with the work of other contractors who may be brought upon any site of the work of this Contract. This paragraph applies to those areas outside the regulated Work Area as defined by Title 15, Chapter I of RCNY.

1.12 SUBMITTALS

A. Pre-Construction Submittals:

1. Attend a pre-construction meeting scheduled by the City of New York Department of Design and Construction. This meeting shall also be attended by a designated representative of the City of New York third party air monitoring firm, facility manager and the Construction Project Manager. At this meeting, the asbestos abatement contractor shall present three copies of the following items:
   a. asbestos abatement contractor's scope of work, work plan and schedule.
   b. Asbestos project notifications, approved variances and plans to Government Agencies.
   c. Copies of Permits, clearance and licenses if required.
   d. Schedules: the asbestos abatement contractor shall provide to the Construction Project Manager a copy of the following schedules for

approval. Once approved, schedules shall be maintained and updated as received. asbestos abatement contractor shall post a copy of all schedules at the site:

(1) A construction schedule stating critical dates of the project including, but not limited to, mobilization, Work Area preparation, demolition, gross removal, fine cleaning, encapsulation, inspections, clearance monitoring, and phase of refinishing and final inspections. The schedule shall be updated biweekly, at a minimum.

(2) A schedule of staffing stating number of workers per shift per activity, name and number of supervisor(s) per shift, shifts per day, and total days to be worked.

(3) Submit all changes in schedule or staffing to the Construction Project Manager prior to implementation.

e. Written description of emergency procedures to be followed in case of injury or fire. This section must include evacuation procedures, source of medical assistance (name and telephone number to nearest hospital) and procedures to be used for access by medical personnel (examples: first aid squad and physician). NOTE: Necessary Emergency Procedures Shall Take Priority Over All Other Requirements of These Specifications.

f. Safety Data Sheets (SDS) for encapsulants, sealants, firestopping foam, cleaners/disinfectants, spray adhesive and any and all potentially hazardous materials that may be employed on the project. No work involving the will be allowed to proceed until SDS are reviewed.

g. Worker Training and Medical Surveillance: The asbestos abatement contractor shall submit a list of the persons who will be employed by him /her to perform the removal work. Present evidence that workers have received proper training required by the regulations and the medical examinations required by OSHA 29 CFR 1926.1101.

h. Logs: Specimen copies of daily progress log, visitor's log, and disposal log.

(1) The asbestos abatement contractor shall provide a permanently bound log book of minimum 8-1/2" x 11" size at the entrance to the Worker and Waste Decontamination enclosure system as hereinafter specified. Log book shall

contain on title page the project name, name, address and phone number of the asbestos abatement contractor; name, address and phone number of asbestos abatement contractor and City's third-party air monitoring firm; emergency numbers including, but not limited to local Fire/Rescue Department. Log book shall contain a list of personnel approved for entry into the Work Area.

(2) All entries into the log shall be made in non-washable, permanent ink and such pen shall be strung to or otherwise attached to the log to prevent removal from the log-in area. Under no circumstances shall pencil entries be permitted. Any significant events occurring during the abatement project shall be entered the log. Upon completion of the job, the asbestos abatement contractor shall submit the logbook containing a day-to-day record of personnel log entries countersigned by the Construction Project Manager every day.

i. Worker's Acknowledgments: Submit statements signed by each employee that the employee has received training in the proper handling of ACM, understands the health implications and risks involved; and understands the use and limitations of the respiratory equipment to be used.

B. During Construction Submittals:

1. Security and safety logs showing names of person entering workspace, date and time of entry and exit, record of any accident, emergency evacuation, and any other safety and/or health incident.

2. Progress logs showing the number of workers, supervisors, hours of work and tasks completed shall be submitted daily to the Construction Project Manager.

3. Floor plans indicating asbestos abatement contractor's current work progress shall be submitted for review by the Construction Project Manager.

4. All asbestos abatement contractors' air monitoring and inspection results.

C. Project Closeout Submittals:

Upon completion of the project and as a condition of acceptance, the asbestos abatement contractor shall present two copies of the following items, bound and indexed:

1. Lien Waivers from asbestos abatement contractor, sub-asbestos abatement contractors and Suppliers,

2. Daily OSHA air monitoring results,

3. All Waste Manifests (Asbestos and Construction Debris), seals and disposal logs,

4. Field Sign-In/Sign-Out Logs for every shift,

5. Copies of all Building Department Forms and Permits,

6. A Letter of Compliance stating that all the work on this project was performed in accordance with the Specifications and all applicable Federal, State and Local regulations,

7. All Warranties as stated in the Specifications,

    a. Fully executed disposal certificates and transportation manifest.

8. Project Record: The asbestos abatement contractor shall maintain a project record for all small and large asbestos projects. During the project, the project record shall always be kept on site. Upon completion of the project, the project record shall be maintained by the building owner. The project record shall be submitted to DDC as part of the close out documents. The project record shall consist of:

    a. Copies of licenses of all asbestos abatement contractors involved in the project;

    b. Copies of NYCDEP and NYSDOL supervisor and handler certificates for all workers engaged in the project;

    c. Copies of all project notifications and reports filed with NYCDEP, NYSDOL and USEPA for the project, with any amendments or variances;

    d. Copies of all asbestos abatement permits, including associated approved plans and work place safety plan;

    e. A copy of the air sampling log and all air sampling results;

    f. A copy of the abatement asbestos abatement contractor's daily log book;

g. Copies of all asbestos waste manifests;

h. A copy of all Project Monitor's Reports (ACP-15).

i. A copy of each ATR-1 Form completed for the asbestos project (if required).

j. A copy of each Asbestos Project Conditional Closeout Report (ACP-20) if required.

k. A copy of the Asbestos Project Completion Form (ACP-21).

1.13 PROTECTION OF FURNITURE AND EQUIPMENT

Cover all furniture and equipment that cannot be removed from Work Areas. Movable furniture and equipment will be removed from Work Areas by the asbestos abatement contractor prior to start of work. At the conclusion of the work (after final air testing), the asbestos abatement contractor will remove all plastic covering on walls, floors, furniture, equipment and reinstall furniture and equipment. He shall remove and store all sheaths, curtains and drapes, and reinstall same following final clean up.

1.14 UTILITIES

A. General:

All temporary facilities shall be subject to the approval of the Commissioner. Prior to starting work at any site, locations and/or sketches (if required) of temporary facilities must be submitted to the Construction Project Manager for the required approval.

B. Water:

The Department of Design and Construction will furnish all water needed for construction, at no cost to the asbestos abatement contractor in buildings under their jurisdiction. However, it is the responsibility of the asbestos abatement contractor to ensure that hot water is provided for showering in the decontamination unit. The asbestos abatement contractor shall furnish, install and maintain any needed equipment to meet these requirements at his own expense.

C. Electricity:

The Department of Design and Construction will furnish all electricity needed for construction, at no cost to the asbestos abatement contractor in a building, under their jurisdiction. The asbestos abatement contractor is responsible for routing the electric power to the abatement Work Area.

All temporary lighting and temporary electrical service for Work Area shall be in weatherproof enclosures and be ground fault protected.

D. In leased spaces, arrangements for water supplies and electricity must be made with the landlord. However, all such arrangements must be made through and are subject to approval of the Department of Design and Construction. Utilities will be provided at no cost to the asbestos abatement contractor. However, it is the asbestos abatement contractor's (or the general contractor's) responsibility to furnish and install a suitable distribution system to the Work Area. This system will be provided at no cost to the City.

1.15 FEES

The asbestos abatement contractor shall be responsible for any and all fees or charges imposed by Local, State or Federal Law, Rule and Regulation applicable to the work specified herein, including fees or charges which may be imposed subsequent to the date of the Bid opening.

END OF SECTION

SECTION 03 30 00
Cast-In-Place Concrete

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The following documents apply to all required work for the Project: (1) the Contract Drawings, (2) the Specifications, (3) the General Conditions, (4) the Addendum, and (5) the Contract (City of New York Standard Construction Contract).

B. LEED / Environmentally Preferable Purchase (EPP) General Requirements:
   1. Refer to DDC General Conditions and the Addendum to the General Conditions
   2. LEED requirements apply to all Phase II work with the exception of the Existing Building scope. EPP requirements apply to the project's Existing Building scope only.

C. Refer to other Divisions of these Specifications to determine the type and extent of work therein affecting the work of this trade, whether or not such work is specifically mentioned in this Section.

1.2 SUMMARY

A. Except for that specifically excluded below, furnish and combine materials for all the work indicated on the Drawings or herein specified to be of plain or reinforced concrete, its installation with forms and reinforcement, its curing and finishing. Shop drawings, tools, ways, apparatus, and equipment necessary for concrete production, installation, and finish are included. The work under this Section includes but is not limited to the following:

   1. Footings, pile caps, and piers.
   2. Foundation walls.
   3. Slabs-on-grade.
   4. Slabs on metal deck.
   5. Furnishing and installing joint fillers, dams, and similar items required in conjunction with the concrete work.
   6. Installing items furnished by other trades and required to be built into the concrete work.
   7. Grouting column base plates.
   8. Furnishing and installing dowels for masonry walls.
   9. Installing embedded steel anchorages provided by others for the attachment of structural steel.
   10. Metal pan stair fill, housekeeping pads, and curbs for equipment.
   11. Dustproofing interior concrete slabs.
   12. All other items of concrete and related work shown on the Drawings, specified herein, or needed to make the work of this Section complete.

B. The following are excluded from the work specified in this Section:

1. Furnishing of certain metal inserts and other embedded items, installed under this Section, but supplied by other trades, including but not limited to stone masonry anchors.

2. Inserts and pipe sleeves for mechanical trades to be furnished and installed by mechanical contractors.

C. Specification Sections that directly relate to the work of this Section include, but are not limited to, the following:

1. Section 05 12 00 – Structural Steel.

2. Section 05 31 00 – Steel Decking

D. Notify all other trades responsible for installing inserts, sleeves, etc., when ready for such installation and for final checking immediately before concrete is placed. Cooperate with such trades to obtain proper installation. Leave openings in walls for pipe, ducts, etc., for mechanical and electrical work as shown on Drawings or required by layout of systems.

1.3 REFERENCED STANDARDS

A. Follow the guidelines contained in the latest editions of the following codes, specifications, and standards, including references contained in each document, except where more stringent requirements are shown or specified.

B. American Association of State Highway and Transportation Officials (AASHTO)

1. AASHTO T260 – Methods of Sampling and Testing for Total Chloride Ion in Concrete and Concrete Raw Materials.

C. American Concrete Institute (ACI)

1. ACI 211.1 – Recommended Practice for Selecting Proportions for Normal Weight Concrete.

2. ACI 214 – Recommendation for Evaluation of Compression Test Results of Field Concrete.

3. ACI 301 – Standard Specification for Structural Concrete.

4. ACI 304 – Recommended Practice for Measuring, Mixing and Placing Concrete.

5. ACI 305 – Recommended Practice for Hot Weather Concreting.

6. ACI 306 – Recommended Practice for Cold Weather Concreting.

7. ACI 306.1 – Standard Specification for Cold Weather Concreting

8. ACI 308 – Recommended Practice for Curing Concrete.

9. ACI 309 – Recommended Practice for Consolidation of Concrete.

10. ACI 311 – Recommended Practice for Concrete Inspection.

11. ACI 315 – Manual of Standard Practice for Detailing Reinforced Concrete Structures.

12. ACI 318 – Building Code Requirements for Reinforced Concrete.
13. ACI 347 – Guide to Formwork for Concrete.
14. ACI 613 – Recommended Practice for Selecting Proportions for Concrete.

D. ASTM International (ASTM)

1. ASTM C31 – Standard Practice for Making and Curing Concrete Test Specimens in the Field.
2. ASTM C33 – Standard Specification for Concrete Aggregates.
3. ASTM C39 – Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens.
4. ASTM C94 – Standard Specification for Ready-Mixed Concrete.
5. ASTM C143 – Standard Test Method for Slump of Hydraulic-Cement Concrete.
6. ASTM C150 – Standard Specification for Portland Cement.
7. ASTM C173 – Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method.
8. ASTM C192 – Standard Practice for Making and Curing Concrete Test Specimens in the Laboratory.
9. ASTM C231 – Standard Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method.
10. ASTM C260 – Standard Specification for Air-Entraining Admixtures for Concrete.
11. ASTM C309 – Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete.
12. ASTM C494 – Standard Specification for Chemical Admixtures of Concrete.
13. ASTM C595 – Standard Specification for Blended Hydraulic Cement.
14. ASTM E329 – Standard Specification for Agencies Engaged in Construction Inspection, Testing, or Special Inspection.

E. National Ready Mixed Concrete Association (NRMCA)

1. NRMCA Check List for Certification of Ready Mixed Concrete Production Facilities.

1.4 SUBMITTAL PROCEDURES

A. Refer to DDC General Conditions Section 01 33 00 "Submittal Procedures"

1.5 SUBMITTALS

A. General

1. All submissions shall be in accordance with the submission schedule, which shall be developed and agreed between the Commissioner and Contractor at the commencement of the Project.

2. Submittals shall be made in compliance with the DDC General Conditions

B. Submit the following action submittals for review and approval:

1. Concrete mix design for each type of concrete. The Contractor shall warrant by the submission of the design mixes that such mixes are totally representative of the concrete that he intends to supply to meet the requirements of the Contract Documents. Submit new design mixes for review and approval when any change in materials is required or needed. Include the following information for each concrete mix design:

   a. Method used to determine the proposed mix design (per ACI 301, Article 3.9).

   b. Compressive strength at seven and twenty-eight days: Submit strength test records, mix design materials, conditions, and proportions for concrete used for record of tests, standard deviation calculation, and determination of required average compressive strength.

   c. Gradation of fine and coarse aggregates: Testing data confirming proposed coarse aggregate meets ASTM C33 class designation. Include ASTM test results for aggregates subject to freeze-thaw environment.

   d. Proportions of all ingredients including all admixtures to be added either at the time of batching or at the job site.

   e. Water-to-cement ratio.

   f. Slump tested in accordance with ASTM C143.

   g. Air content of freshly mixed concrete by the pressure method, ASTM C231, or the volumetric method, ASTM C173.

   h. Unit weight of concrete ASTM C138.

   i. Mill test reports of fly ash chemical and physical analysis and certification of compliance with ASTM C618, Class C or F, if used.

   j. Manufacturer's Spec Data Sheets of each concrete admixture, including brand name, manufacturer, and dosage rate range.

   k. Mass-Concrete Submittals

      1) Mass-concrete provisions shall apply to all concrete that is equal to or greater than 3 ft in its least dimension.

      2) Thermal Control Plan: The Contractor shall submit to the Commissioner along with each mix design its proposed plan for complying with the specified temperature restrictions. The plan shall include:

         a) Complete descriptions of the concrete, curing blankets, integral cooling (if used), anticipated ambient conditions, methods for pre-cooling the concrete, and placement measures to be used.
         b) Heat of hydration analysis for the proposed concrete using adiabatic or semi-adiabatic heat signature (AHS) tests on 6 in. x 12 in. concrete cylinders or large (4 x 4 x 4 ft) heavily insulated blocks.

c) Simulation studies indicating the rate and extent of concrete temperature, maturity and strength developed under the anticipated weather conditions, mix design, placing procedures, placing temperature and curing methods to be used. A description of the software and hardware the Contractor proposes to use for the simulation studies shall be submitted for review by the Commissioner prior to submission of the thermal control plan.

3) Anticipated temperatures at the specified monitoring locations. Submit computations for the batch temperature, including the assumed temperature increase due to mixing, delivery, and placement, and the measured temperatures of the aggregate, water, cement, and pozzolans. The quantity of ice to be batched as mix water shall be listed.

4) Submit a report and plot the laboratory-measured initial and final set of the mass-concrete mix in accordance with ASTM C403.

5) Description and manufacturer product sheets for thermocouples and dataloggers proposed for use to monitor temperatures in the mass concrete placements.

6) Furnish continuous mass-concrete temperature records, including at least 72 hrs of data after the removal of thermal protection.

7) Submit a sketch of the proposed placement sequence, limits, and volumes.

2. Shop drawings for reinforcement detailing, fabricating, bending, and placing concrete reinforcement. Comply with ACI 315 – Manual of Standard Practice for Detailing Reinforced Concrete Structures showing bar schedules, stirrup spacing, bent bar diagrams, and arrangement of concrete reinforcement. Include special reinforcing required for openings through concrete structures.

3. Product Data for materials and items, including reinforcement and forming accessories, admixtures, patching compounds, curing compounds, and others if requested by the Commissioner.

4. Proposed methods for curing cast-in-place concrete

5. Submit hot and cold-water concrete mix procedure.

C. Submit the following informational submittals for record:

1. Health and Safety Data Sheets for each concrete admixture.

2. Proposed Schedule of Concrete Placement. Contractor shall keep a permanent log of the dates and times of concrete placement and where on the Project the concrete was cast. This log shall be made available to the Commissioner for inspection, upon request.

3. Qualifications of Concrete Foreman showing experience with this type of concrete installation.

4. Tickets for each batch of concrete delivered to the jobsite containing the following information:

a. The compressive strength of the concrete being delivered.

b. The volume of concrete in the delivery truck.

c. The time the concrete was batched (i.e., the time that water was discharged into the delivery truck to mix with the cement and aggregates).

d. List of admixtures.

e. Slump of concrete as placed.

f. Volume of water added to the delivery truck after initial batching.

g. Location where the concrete is being placed (i.e., foundation walls along grid Line A, between Grids 1 and 4).

D. Submit welding certificates for all welders.

E. Formwork Shop Drawings: Prepared by or under the supervision of a qualified professional engineer, detailing fabrication, assembly, and support of formwork.

1. Shoring and Reshoring: Indicate proposed schedule and sequence of stripping formwork, shoring removal, and reshoring installation and removal.

F. Material Certificates: For each of the following, signed by manufacturers:

1. Cementitious materials.
2. Admixtures.
3. Form materials and form-release agents.
4. Steel reinforcement and accessories.
5. Fiber reinforcement.
6. Waterstops.
7. Curing compounds.
8. Floor and slab treatments.
9. Bonding agents.
10. Adhesives.
11. Vapor retarders.
12. Semirigid joint filler.
13. Joint-filler strips.
14. Repair materials.

1.6 QUALITY ASSURANCE

A. Refer to DDC General Conditions Section 01 40 00 "Quality Requirements"

B. Foreman's Qualifications: Concrete work shall be done under the supervision of an experienced concrete foreman having foreman experience with "cast-in-place" concrete, similar to that used on this Project.

C. The Contractor shall perform all work in strict accordance with all applicable laws and regulations of the 2014 New York City Building Code. All such requirements shall take precedence over the requirements of the Specifications except in cases where the requirements of the Specifications are more exacting or stringent.

D. Testing of materials and inspections of installed work shall be completed throughout the duration of the Project, as directed by the Commissioner. Contractor shall provide free and safe access to material stockpiles and facilities for inspectors.

1. Retesting of rejected materials or reinspection of deficient work, shall be done at the Contractor's expense.

E. The Contractor is responsible for correction of concrete work that does not conform to the specified requirements, including strength, mix proportions, air void system, tolerances, and finishes. Correct deficient concrete as directed by the Commissioner.

F. All finishing crewmembers shall be ACI Certified Concrete Flatwork Technicians and Finishers. The supervisor shall be an ACI Certified Flatwork Technician and shall have input to the crew's placement and finishing procedures regarding the application of ACI Standards for quality flatwork. The ACI Standards that shall be observed are contained in the ACI – Concrete Craftsman Series.

G. The Commissioner will reject cast-in-place concrete that exhibits the following defects:

1. Bulging: Concrete surfaces that bulge due to insufficiently secured formwork, undersized ties, or flat bar clamps.

2. Wavy Concrete: Concrete surfaces that exhibit waves along plywood joints due to moisture migration into unsealed cuts of plywood sheets causing swellings.

3. Spalling: Concrete spalling due to shale, alkali reactivity, rusting steel too close to the surface, carbonation, improper removal of formwork, expansion of cast-in steel during the welding process, or other reasons.

4. Cracking and Crazing: Concrete cracking and crazing due to lack of control joints or high water-to-cement ratio above 0.50.

5. Air holes: Air holes resulting from improper vibration and excessive heights of individual layers of pours between vibration. Air holes due to spreading of concrete with vibrators rather than moving buckets or hoses.

6. Honeycombing: Concrete honeycombing including loss of fines from leaking formwork or other causes.

7. Discoloration: Concrete discoloration caused by any reason, including inconsistent concrete mix, different sources of cement and aggregates, temperature variation between individual pour and curing phases, improper and inconsistent use of vibrators, variation of time span of concrete in formwork, form oils, and migration of plasticizer into concrete from exposed sealant beads on formwork and around cast-in items such as electrical outlet boxes.

8. Visible Pour Joints: Visible pour joints in concrete resulting from leaking formwork due to lack of gaskets and insufficient overlap with old concrete preventing proper tightening of formwork. Placement of concrete layers in excessive heights and spreading concrete with vibrator.

9. Debris in Concrete: Concrete that includes debris, whether caused by insufficient cleaning of formwork or lack of cleanout and access doors at base of formwork.

H. The Contractor shall schedule a Concrete Preconstruction Meeting at least thirty days prior to placement of any concrete. Attendance at the meeting shall include the Ready Mix Supplier, Concrete Pumping Subcontractor, Field Testing Laboratory, and the Commissioner. The agenda of the meeting shall be prepared by the Contractor and shall include, but not be limited, to the following:

1. Review of concrete mix designs.

2. Field testing and quality control.

3. Concrete placing sequence and schedule.

4. Formwork, shoring, reshoring, and stripping.

5. Placing, jointing, and finishing procedures.

6. Curing and protection procedures.

I. Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant, obtain aggregate from one source, and obtain admixtures through one source from a single manufacturer.

J. Welding: Qualify procedures and personnel according to AWS D1.4 – Structural Welding Code – Reinforcing Steel.

K. ACI Publications: Comply with the following unless modified by requirements in the Contract Documents:

1. ACI 301 – Specification for Structural Concrete, Sections 1 through 5 and Section 7, "Lightweight Concrete."

2. ACI 117 – Specifications for Tolerances for Concrete Construction and Materials.

L. Concrete Testing Service: Engage a qualified independent testing agency to perform material evaluation tests and to design concrete mixtures.

M. Mockups: Cast concrete slab-on-grade panels to demonstrate typical joints, surface finish, texture, tolerances, and standard of workmanship.

1. Build panel approximately 200 sq ft for slab-on-grade in the location indicated or, if not indicated, as directed by Commissioner.

2. Approved panels may become part of the completed Work if undisturbed at time of Substantial Completion.

N. Conduct a pre-installation conference at Project site to comply with requirements in DDC General Conditions

1. Before submitting design mixtures, review concrete design mixture and examine procedures for ensuring quality of concrete materials. Require representatives of each entity directly concerned with cast-in-place concrete to attend, including the following:

a. Contractor's superintendent.

b. Independent testing agency responsible for concrete design mixtures.

c. Ready-mix concrete manufacturer.

d. Concrete subcontractor.

2. Review special inspection and testing and inspecting agency procedures for field quality control, concrete finishes and finishing, cold- and hot-weather concreting procedures, curing procedures, construction contraction and isolation joints, and joint-filler strips, semirigid joint fillers, vapor-retarder installation, anchor rod and anchorage device installation tolerances, steel reinforcement installation, floor and slab flatness and levelness measurement, and concrete protection.

O. Form TR3: Technical Report Concrete Design Mix: The contractor shall be responsible for, and bear all costs associated with the filing and securing of approvals, if any, for Form TR3: Technical Report Concrete Design Mix, including, but not limited to, engaging the services of a New York City licensed Concrete Testing Lab for the review and approval of concrete design mix, testing, signatures and professional seals, etc., compliant with NYC Department of Buildings requirements, for each concrete design mix.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Steel Reinforcement: Deliver, store, and handle steel reinforcement to prevent bending and damage. Avoid damaging coatings on steel reinforcement.

B. Waterstops: Store waterstops under cover to protect from moisture, sunlight, dirt, oil, and other contaminants.

PART 2 - PRODUCTS

2.1 FORM-FACING MATERIALS

A. Smooth-Formed Finished Concrete: Form-facing panels that will provide continuous, true, and smooth concrete surfaces. Furnish in largest practicable sizes to minimize number of joints.

1. Plywood, metal, or other approved panel materials.

2. Exterior-grade plywood panels, suitable for concrete forms, complying with DOC PS 1, and as follows:

a. B-B (Concrete Form), Class 1 or better; mill oiled and edge sealed.

B. Rough-Formed Finished Concrete: Plywood, lumber, metal, or another approved material. Provide lumber dressed on at least two edges and one side for tight fit.

C. Chamfer Strips: Wood, metal, PVC, or rubber strips, 3/4 by 3/4 in., minimum.

D. Rustication Strips: Wood, metal, PVC, or rubber strips, kerfed for ease of form removal.

E. Form-Release Agent: Commercially formulated form-release agent with a maximum of 350 g/L volatile organic compounds (VOC) that will not bond with, stain, or adversely affect concrete surfaces and will not impair subsequent treatments of concrete surfaces.

1. Formulate form-release agent with rust inhibitor for steel form-facing materials.

F. Form Ties: Factory-fabricated, removable or snap-off metal or glass-fiber-reinforced plastic form ties designed to resist lateral pressure of fresh concrete on forms and to prevent spalling of concrete on removal.

1. Furnish units that will leave no corrodible metal closer than 1 in. to the plane of exposed concrete surface.

2. Furnish ties that, when removed, will leave holes no larger than 1 in. in diameter in concrete surface.

3. Furnish ties with integral water-barrier plates to walls indicated to receive dampproofing or waterproofing.

2.2 STEEL REINFORCEMENT

A. Reinforcing Bars: ASTM A615/A615M, Grade 60, deformed.

B. Deformed-Steel Welded Wire Reinforcement: ASTM A497, flat sheet.

2.3 REINFORCEMENT ACCESSORIES

A. Joint Dowel Bars: ASTM A615/A615M, Grade 60, plain-steel bars, cut bars true to length with ends square and free of burrs.

B. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire reinforcement in place. Manufacture bar supports from steel wire, plastic, or precast concrete according to CRSI Manual of Standard Practice, of greater compressive strength than concrete and as follows:

1. For concrete surfaces exposed to view where legs of wire bar supports contact forms, use CRSI Class 1 plastic-protected steel wire or CRSI Class 2 stainless-steel bar supports.

2.4 CONCRETE MATERIALS

A. Cementitious Material: Use the following cementitious materials, of the same type, brand, and source, throughout Project:

1. Portland Cement: ASTM C150, Type II. Supplement with the following:

a. Fly Ash: ASTM C618, Class F.

b. Ground Granulated Blast-Furnace Slag: ASTM C989, Grade 100 or 120.

B. Normal-Weight Aggregates: ASTM C33, Class 1S coarse aggregate or better, graded. Provide aggregates from a single source with documented service record data of at least 10 yrs' satisfactory service in similar applications and service conditions using similar aggregates and cementitious materials.

1. Maximum Coarse-Aggregate Size: 3/4 in. nominal.

2. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.

C. Lightweight Aggregate: ASTM C330, 3/4-in. nominal maximum aggregate size.

D. Water: ASTM C94/C94M and potable.

2.5 ADMIXTURES

A. General Admixture Requirements

1. Concrete supplier and Contractor shall use manufacturer's product identified in this Section or submit alternate manufacturer product for approval by Commissioner.

2. All admixtures used in the concrete shall be produced by a single manufacturer.

3. Concrete supplier and Contractor shall certify compatibility of all ingredients in each mix design. Use admixtures in strict accordance with manufacturer's recommendations.

4. Concrete supplier and Contractor shall account for admixture volume in the concrete mix proportions in accordance with admixture manufacturer's recommendations.

5. Do not use calcium chloride or admixtures containing more than 0.1% chloride ions.

B. Air-Entraining Admixture: ASTM C260, certified by manufacturer to be compatible with other required admixtures.

1. Manufacturers: Subject to compliance with requirements, provide one of following:

a. Air-Mix or Perma-Air, Euclid Chemical Co.

b. Darex AEA or Daravair, W.R. Grace & Co.

c. MB-VR or Micro-Air, BASF Construction Chemicals.

d. Sika AER, Sika Corp.

e. Or approved equal

C. Water-Reducing Admixture: ASTM C494, Type A.

1. Manufacturers: Subject to compliance with requirements, provide one of following:

a. Eucon WR-75, Euclid Chemical Co.

b. WRDA, W.R. Grace & Co.

c. Pozzolith Normal or Polyheed, BASF Construction Chemicals

d. Plastocrete 161, Sika Corp.

e. Or approved equal

2.6 WATERSTOPS

A. Self-Expanding Rubber Strip Waterstops: Manufactured rectangular or trapezoidal strip, bentonite-free hydrophilic polymer modified chloroprene rubber, for adhesive bonding to concrete, 3/8 by 3/4 in.

1. Manufacturers: Subject to compliance with requirements, provide one of following:

a. Deneef Construction Chemicals; Swellseal

b. Greenstreak; Hydrotite

c. Sika Corp.

d. Or approved equal

2.7 CURING MATERIALS

A. Absorptive Cover: AASHTO M182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz per square yard when dry.

B. Moisture-Retaining Cover: ASTM C171, polyethylene film or white burlap-polyethylene sheet.

C. Water: Potable.

D. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C309, Type 1, Class B, dissipating.

1. Manufacturers: Subject to compliance with requirements, provide one of following:

a. Anti-Hydro International, Inc.; AH Curing Compound #2 DR WB.

b. Euclid Chemical Company (The); Kurez DR VOX.

c. W.R. Meadows

d. Or approved equal

2.8 CONCRETE MIXTURES, GENERAL

A. Prepare design mixtures for each type and strength of concrete, proportioned on the basis of laboratory trial mixture or field test data, or both, according to ACI 301.

1. Use a qualified independent testing agency for preparing and reporting proposed mixture designs based on laboratory trial mixtures.

B. Cementitious Materials: Limit percentage, by weight, of cementitious materials other than portland cement in concrete as follows:

1. Fly Ash: 25%.

2. Combined Fly Ash and Pozzolan: 25%.

3. Ground Granulated Blast-Furnace Slag: 50%.

4. Combined Fly Ash or Pozzolan and Ground Granulated Blast-Furnace Slag: 50% portland cement minimum, with fly ash or pozzolan not exceeding 25%.

C. Limit water-soluble, chloride-ion content in hardened concrete to 0.06% by weight of cement.

D. Admixtures: Use admixtures according to manufacturer's written instructions.

1. Use water-reducing high-range water-reducing or plasticizing admixture in concrete, as required, for placement and workability.

2. Use water-reducing and retarding admixture when required by high temperatures, low humidity, or other adverse placement conditions.

3. Use corrosion-inhibiting admixture in concrete mixtures where indicated.

2.9 CONCRETE MIXTURES FOR BUILDING ELEMENTS

A. Footings/Pile Caps/Grade Beams/Structural Slabs at Grade: Proportion normal-weight concrete mixture as follows:

1. Minimum Compressive Strength: 5,000 psi at twenty-eight days.

2. Maximum Water-Cementitious Materials Ratio: Less than 0.45.

3. Slump Limit: 8 in. for concrete with verified slump of 2 to 4 in. before adding high-range water-reducing admixture or plasticizing admixture, plus or minus 1 in.

4. Air Content: 6%, plus or minus 1.5% at point of delivery.

B. Foundation Walls: Proportion normal-weight concrete mixture as follows:

1. Minimum Compressive Strength: 5,000 psi at twenty-eight days.

2. Maximum Water-Cementitious Materials Ratio: Less than 0.45.

3. Slump Limit: 8 in. for concrete with verified slump of 2 to 4 in. before adding high-range water-reducing admixture or plasticizing admixture, plus or minus 1 in.

4. Air Content: 6%, plus or minus 1.5% at point of delivery.

C. Slabs-on-Grade: Proportion normal-weight concrete mixture as follows:

1. Minimum Compressive Strength: 4,000 psi at twenty-eight days.

2. Minimum Cementitious Materials Content: 470 lb per cubic yard.

3. Slump Limit: 5 in., plus or minus 1 in.

4. Air Content: 6%, plus or minus 1.5% at point of delivery for 3/4 in. nominal maximum aggregate size. Do not hard trowel air-entrained concrete. Use float finish only.

5. Air Content – Trowel Finish: Do not allow air content of troweled finished floors to exceed 3%.

D. Suspended Slabs: Proportion structural lightweight concrete mixture as follows:

1. Minimum Compressive Strength: 4,000 psi at twenty-eight days.

2. Calculated Equilibrium Unit Weight: 115 lb per cubic foot, plus or minus 3 lb per cubic foot as determined by ASTM C567.

3. Slump Limit: 5 in., plus or minus 1 in.

4. Air Content: 6%, plus or minus 1.5% at point of delivery for nominal maximum aggregate size greater than 3/8 in. Do not hard trowel air-entrained concrete. Use float finish only.

5. Air Content – Trowel Finish: Do not allow air content of troweled finished floors to exceed 3%.

2.10 FABRICATING REINFORCEMENT

A. Fabricate steel reinforcement according to CRSI Manual of Standard Practice.

2.11 CONCRETE MIXING

A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C 94/C 94M, and furnish batch ticket information.

1. When air temperature is between 85°F and 90°F, reduce mixing and delivery time from 90 min. to 75 min.; when air temperature is above 90°F, reduce mixing and delivery time to 60 min.

PART 3 - EXECUTION

3.1 EXECUTION REQUIREMENTS

A. Refer to DDC General Conditions for execution requirements.

3.2 GENERAL

A. Coordinate the installation of joint materials, floor drains, and other related materials with placement of forms and reinforcing steel.

B. Cast-in-Place Concrete Contractor shall coordinate with Structural Precast Concrete Fabricator's reviewed and approved shop drawings for placement of dowels connecting cast-in-place concrete elements to structural precast concrete elements. Contractor shall use templates, provided by Precast Fabricator, for placing dowels within specified tolerances.

3.3 FORMWORK

A. Design, erect, shore, brace, and maintain formwork, according to ACI 301, to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until structure can support such loads.

B. Construct formwork so concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits of ACI 117.

C. Limit concrete surface irregularities, designated by ACI 347R as abrupt or gradual, as follows:

1. Class A, 1/8 in. for smooth-formed finished surfaces.

2. Class B, 1/4 in. for rough-formed finished surfaces.

D. Construct forms tight enough to prevent loss of concrete mortar.

E. Fabricate forms for easy removal without hammering or prying against concrete surfaces. Provide crush or wrecking plates where stripping may damage cast concrete surfaces. Provide top forms for inclined surfaces steeper than 1.5 horizontal to 1 vertical.

1. Install keyways, reglets, recesses, and the like, for easy removal.

2. Do not use rust-stained steel form-facing material.

F. Set edge forms, bulkheads, and intermediate screed strips for slabs to achieve required elevations and slopes in finished concrete surfaces. Provide and secure units to support screed strips; use strike-off templates or compacting-type screeds.

G. Provide temporary openings for cleanouts and inspection ports where interior area of formwork is inaccessible. Close openings with panels tightly fitted to forms and securely braced to prevent loss of concrete mortar. Locate temporary openings in forms at inconspicuous locations.

H. Chamfer exterior corners and edges of permanently exposed concrete.

I. Form openings, chases, offsets, sinkages, keyways, reglets, blocking, screeds, and bulkheads required in the Work. Determine sizes and locations from trades providing such items.

J. Clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, and other debris just before placing concrete.

K. Retighten forms and bracing before placing concrete, as required, to prevent mortar leaks and maintain proper alignment.

L. Coat contact surfaces of forms with form-release agent, according to manufacturer's written instructions, before placing reinforcement.

3.4 EMBEDDED ITEMS

A. Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by cast-in-place concrete. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.

1. Install anchor rods, accurately located, to elevations required and complying with tolerances in Section 7.5 of AISC Code of Standard Practice for Steel Buildings and Bridges.

3.5 REMOVING AND REUSING FORMS

A. General: Formwork for sides of beams, walls, columns, and similar parts of the Work that does not support weight of concrete may be removed after cumulatively curing at not less than 50 F for 24 hrs after placing concrete, if concrete is hard enough to not be damaged by form-removal operations and curing and protection operations are maintained.

1. Leave formwork for beam soffits, joists, slabs, and other structural elements that supports weight of concrete in place until concrete has achieved at least 70% of its twenty-eight day design compressive strength.

2. Remove forms only if shores have been arranged to permit removal of forms without loosening or disturbing shores.

B. Clean and repair surfaces of forms to be reused in the Work. Split, frayed, delaminated, or otherwise damaged form-facing material will not be acceptable for exposed surfaces. Apply new form-release agent.

C. When forms are reused, clean surfaces, remove fins and laitance, and tighten to close joints. Align and secure joints to avoid offsets. Do not use patched forms for exposed concrete surfaces unless approved by Commissioner.

3.6 STEEL REINFORCEMENT

A. General: Comply with CRSI Manual of Standard Practice for placing reinforcement.

1. Do not cut or puncture vapor retarder. Repair damage and reseal vapor retarder before placing concrete.

B. Clean reinforcement of loose rust and mill scale, earth, ice, and other foreign materials that would reduce bond to concrete.

C. Accurately position, support, and secure reinforcement against displacement. Locate and support reinforcement with bar supports to maintain minimum concrete cover. Do not tack weld crossing reinforcing bars.

D. Set wire ties with ends directed into concrete, not toward exposed concrete surfaces.

E. Install welded wire reinforcement in longest practicable lengths on bar supports spaced to minimize sagging. Lap edges and ends of adjoining sheets at least one mesh spacing. Offset laps of adjoining sheet widths to prevent continuous laps in either direction. Lace overlaps with wire.

3.7 JOINTS

A. General: Construct joints true to line with faces perpendicular to surface plane of concrete.

B. Construction Joints: Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Commissioner.

1. Place joints perpendicular to main reinforcement. Continue reinforcement across construction joints, unless otherwise indicated. Do not continue reinforcement through sides of strip placements of floors and slabs.

2. Form keyed joints as indicated. Embed keys at least 1-1/2 inc. into concrete.

3. Locate joints for beams, slabs, joists, and girders in the middle third of spans. Offset joints in girders a minimum distance of twice the beam width from a beam-girder intersection.

4. Locate horizontal joints in walls and columns at underside of floors, slabs, beams, and girders and at the top of footings or floor slabs.

5. Space vertical joints in walls as indicated. Locate joints beside piers integral with walls, near corners, and in concealed locations where possible.

3.8 WATERSTOPS

A. Flexible Waterstops: Install in construction joints and at other joints indicated to form a continuous diaphragm. Install in longest lengths practicable. Support and protect exposed waterstops during progress of the Work. Field fabricate joints in waterstops according to manufacturer's written instructions.

3.9 CONCRETE PLACEMENT

A. Before placing concrete, verify that installation of formwork, reinforcement, and embedded items is complete and that required inspections have been performed.

B. Do not add water to concrete during delivery, at Project site, or during placement unless approved by Commissioner.

C. Before test sampling and placing concrete, water may be added at Project site, subject to limitations of ACI 301.

1. Do not add water to concrete after adding high-range water-reducing admixtures to mixture.

D. Deposit concrete continuously in one layer or in horizontal layers of such thickness that no new concrete will be placed on concrete that has hardened enough to cause seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as indicated. Deposit concrete to avoid segregation.

1. Deposit concrete in horizontal layers of depth to not exceed formwork design pressures and in a manner to avoid inclined construction joints.

2. Consolidate placed concrete with mechanical vibrating equipment according to ACI 301.

3. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations to rapidly penetrate placed layer and at least 6 in. into preceding layer. Do not insert vibrators into lower layers of concrete that have begun to lose plasticity. At each insertion, limit duration of vibration to time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing mixture constituents to segregate.

E. Deposit and consolidate concrete for floors and slabs in a continuous operation, within limits of construction joints, until placement of a panel or section is complete.

1. Consolidate concrete during placement operations so concrete is thoroughly worked around reinforcement and other embedded items and into corners.

2. Maintain reinforcement in position on chairs during concrete placement.

3. Screed slab surfaces with a straightedge and strike off to correct elevations.

4. Slope surfaces uniformly to drains where required.

5. Begin initial floating using bull floats or darbies to form a uniform and open-textured surface plane, before excess bleedwater appears on the surface. Do not further disturb slab surfaces before starting finishing operations.

F. Cold-Weather Placement: Comply with ACI 306.1 and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.

1. When average high and low temperature is expected to fall below 40°F for three successive days, maintain delivered concrete mixture temperature within the temperature range required by ACI 301.

2. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.

3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in mixture designs.

G. Hot-Weather Placement: Comply with ACI 301 and as follows:

1. Maintain concrete temperature below 90°F at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.

2. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade uniformly moist without standing water, soft spots, or dry areas.

3.10 FINISHING FORMED SURFACES

A. Rough-Formed Finish: As-cast concrete texture imparted by form-facing material with tie holes and defects repaired and patched. Remove fins and other projections that exceed specified limits on formed-surface irregularities.

1. Apply to concrete surfaces not exposed to public view.

B. Smooth-Formed Finish: As-cast concrete texture imparted by form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams. Repair and patch tie holes and defects. Remove fins and other projections that exceed specified limits on formed-surface irregularities.

1. Apply to concrete surfaces exposed to public view, to receive a rubbed finish, to be covered with a coating or covering material applied directly to concrete.

C. Rubbed Finish: Apply the following to smooth-formed finished as-cast concrete where indicated:

1. Smooth-Rubbed Finish: Not later than one day after form removal, moisten concrete surfaces and rub with carborundum brick or another abrasive until producing a uniform color and texture. Do not apply cement grout other than that created by the rubbing process.

D. Related Unformed Surfaces: At tops of walls, horizontal offsets, and similar unformed surfaces adjacent to formed surfaces, strike off smooth and finish with a texture matching adjacent formed surfaces. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces, unless otherwise indicated.

3.11 FINISHING FLOORS AND SLABS

A. General: Comply with ACI 302.1R recommendations for screeding, restraightening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.

B. Scratch Finish: While still plastic, texture concrete surface that has been screeded and bull-floated or darbied. Use stiff brushes, brooms, or rakes to produce a profile amplitude of 1/4 in. in one direction.

1. Apply scratch finish to surfaces indicated and to receive concrete floor toppings to receive mortar setting beds for bonded cementitious floor finishes.

C. Float Finish: Consolidate surface with power-driven floats or by hand floating if area is small or inaccessible to power driven floats. Restraighten, cut down high spots, and fill low spots. Repeat float passes and restraightening until surface is left with a uniform, smooth, granular texture.

1. Apply float finish to surfaces indicated to receive trowel finish and to be covered with fluid-applied or sheet waterproofing, built-up or membrane roofing, or sand-bed terrazzo.

D. Trowel Finish: After applying float finish, apply first troweling and consolidate concrete by hand or power-driven trowel. Continue troweling passes and restraighten until surface is free of trowel marks and uniform in texture and appearance. Grind smooth any surface defects that would telegraph through applied coatings or floor coverings.

1. Apply a trowel finish to surfaces indicated exposed to view or to be covered with resilient flooring, carpet, ceramic or quarry tile set over a cleavage membrane, paint, or another thin-film-finish coating system.

2. Finish surfaces to the following tolerances, according to ASTM E1155, for a randomly trafficked floor surface:

   a. Specified overall values of flatness, F(F) 25; and of levelness, F(L) 20; with minimum local values of flatness, F(F) 17; and of levelness, F(L) 15.

E. Trowel and Fine-Broom Finish: Apply a first trowel finish to surfaces indicated where ceramic or quarry tile is to be installed by either thickset or thin-set method. While concrete is still plastic, slightly scarify surface with a fine broom.

1. Comply with flatness and levelness tolerances for trowel finished floor surfaces.

F. Broom Finish: Apply a broom finish to exterior concrete platforms, steps, and ramps, and elsewhere as indicated.

1. Immediately after float finishing, slightly roughen trafficked surface by brooming with fiber-bristle broom perpendicular to main traffic route. Coordinate required final finish with Commissioner before application.

3.12 MISCELLANEOUS CONCRETE ITEMS

A. Filling In: Fill in holes and openings left in concrete structures, unless otherwise indicated, after work of other trades is in place. Mix, place, and cure concrete, as specified, to blend with in-place construction. Provide other miscellaneous concrete filling indicated or required to complete the Work.

B. Curbs: Provide monolithic finish to interior curbs by stripping forms while concrete is still green and by steel-troweling surfaces to a hard, dense finish with corners, intersections, and terminations slightly rounded.

C. Equipment Bases and Foundations: Provide machine and equipment bases and foundations as shown on Drawings. Set anchor bolts for machines and equipment at correct elevations, complying with diagrams or templates from manufacturer furnishing machines and equipment.

D. Steel Pan Stairs: Provide concrete fill for steel pan stair treads, landings, and associated items. Cast-in inserts and accessories as shown on Drawings. Screed, tamp, and trowel-finish concrete surfaces.

3.13 CONCRETE PROTECTING AND CURING

A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and ACI 301 for hot-weather protection during curing.

B. Formed Surfaces: Cure formed concrete surfaces, including underside of beams, supported slabs, and other similar surfaces. If forms remain during curing period, moist cure after loosening forms. If removing forms before end of curing period, continue curing for the remainder of the curing period.

C. Unformed Surfaces: Begin curing immediately after finishing concrete. Cure unformed surfaces, including floors and slabs, concrete floor toppings, and other surfaces.

D. Cure concrete according to ACI 308.1, by one or a combination of the following methods:

1. Moisture Curing: Keep surfaces continuously moist for not less than seven days with the following materials:

a. Water.

b. Continuous water-fog spray.

c. Absorptive cover, water saturated, and kept continuously wet. Cover concrete surfaces and edges with 12-in. lap over adjacent absorptive covers.

2. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period.

a. Do not use curing compound for concrete surfaces to receive floor coverings unless using a curing compound that the manufacturer certifies will not interfere with bonding of floor covering used on Project.

3.14 JOINT FILLING

A. Prepare, clean, and install joint filler according to manufacturer's written instructions.

1. Defer joint filling until concrete has aged at least one month. Do not fill joints until construction traffic has permanently ceased.

B. Remove dirt, debris, saw cuttings, curing compounds, and sealers from joints; leave contact faces of joint clean and dry.

C. Install semirigid joint filler full depth in saw-cut joints and at least 2 in. deep in formed joints. Overfill joint and trim joint filler flush with top of joint after hardening.

3.15 CONCRETE SURFACE REPAIRS

A. Defective Concrete: Repair and patch defective areas when approved by Commissioner. Remove and replace concrete that cannot be repaired and patched to Commissioner's approval.

B. Patching Mortar: Mix dry-pack patching mortar, consisting of one part portland cement to two-and-one-half parts fine aggregate passing a No. 16 sieve, using only enough water for handling and placing.

C. Repairing Formed Surfaces: Surface defects include color and texture irregularities, cracks, spalls, air bubbles, honeycombs, rock pockets, fins and other projections on the surface, and stains and other discolorations that cannot be removed by cleaning.

1. Immediately after form removal, cut out honeycombs, rock pockets, and voids more than 1/2 in. in any dimension in solid concrete, but not less than 1 in. in depth. Make edges of cuts perpendicular to concrete surface. Clean, dampen with water, and brush-coat holes and voids with bonding agent. Fill and compact with patching mortar before bonding agent has dried. Fill form-tie voids with patching mortar or cone plugs secured in place with bonding agent.

2. Repair defects on surfaces exposed to view by blending white portland cement and standard portland cement so that, when dry, patching mortar will match surrounding color. Patch a test area at inconspicuous locations to verify mixture and color match before proceeding with patching. Compact mortar in place and strike off slightly higher than surrounding surface.

3. Repair defects on concealed formed surfaces that affect concrete's durability and structural performance as determined by Commissioner.

D. Repairing Unformed Surfaces: Test unformed surfaces, such as floors and slabs, for finish and verify surface tolerances specified for each surface. Correct low and high areas. Test surfaces sloped to drain for trueness of slope and smoothness; use a sloped template.

1. Repair finished surfaces containing defects. Surface defects include spalls, popouts, honeycombs, rock pockets, crazing and cracks in excess of 0.01 in. wide or that penetrate to reinforcement or completely through unreinforced sections regardless of width, and other objectionable conditions.

2. After concrete has cured at least fourteen days, correct high areas by grinding.

3. Correct localized low areas during or immediately after completing surface finishing operations by cutting out low areas and replacing with patching mortar. Finish repaired areas to blend into adjacent concrete.

4. Correct other low areas scheduled to receive floor coverings with a repair underlayment. Prepare, mix, and apply repair underlayment and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface. Feather edges to match adjacent floor elevations.

5. Correct other low areas scheduled to remain exposed with a repair topping. Cut out low areas to ensure a minimum repair topping depth of 1/4 in. to match adjacent floor elevations. Prepare, mix, and apply repair topping and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface.

6. Repair defective areas, except random cracks and single holes 1 inch or less in diameter, by cutting out and replacing with fresh concrete. Remove defective areas with clean, square cuts and expose steel reinforcement with at least a 3/4-in. clearance all around. Dampen concrete surfaces in contact with patching concrete and apply bonding agent. Mix patching concrete of same materials and mixture as original concrete except without coarse aggregate. Place, compact, and finish to blend with adjacent finished concrete. Cure in same manner as adjacent concrete.

7. Repair random cracks and single holes 1 in. or less in diameter with patching mortar. Groove top of cracks and cut out holes to sound concrete and clean off dust, dirt, and loose particles. Dampen cleaned concrete surfaces and apply bonding agent. Place patching mortar before bonding agent has dried. Compact patching mortar and finish to match adjacent concrete. Keep patched area continuously moist for at least 72 hrs.

E. Perform structural repairs of concrete, subject to Commissioner's approval, using epoxy adhesive and patching mortar.

F. Repair materials and installation not specified above may be used, subject to Commissioner's approval.

3.16 QUALITY CONTROL

A. Refer to DDC General Conditions Section 01 40 00 "Quality Requirements".

B. Testing and Inspecting: The City of New York will engage a special inspector and qualified testing and inspecting agency to perform field tests and inspections per the New York City Building Code and prepare test reports.

C. Inspections: Special Inspector to comply with all requirements of the Concrete Cast-in-Place, Concrete Test Cylinders, and Concrete Mix Design Special Inspections per the New York City Building Code, including, but not limited to:

1. Steel reinforcement placement.
2. Verification of use of required design mixture.
3. Concrete placement, including conveying and depositing.
4. Curing procedures and maintenance of curing temperature.

D. Concrete Tests: Testing of composite samples of fresh concrete obtained according to ASTM C 172 shall be performed according to the following requirements:

1. Testing Frequency: Obtain at least one composite sample for each 100 cu yd or fraction thereof of each concrete mixture placed each day.
   a. When frequency of testing will provide fewer than five compressive-strength tests for each concrete mixture, testing shall be conducted from at least five randomly selected batches or from each batch if fewer than five are used.
2. Slump: ASTM C143/C143M; one test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mixture. Perform additional tests when concrete consistency appears to change.
3. Air Content: ASTM C231, pressure method, for normal-weight concrete; ASTM C173/C173M, volumetric method, for structural lightweight concrete; one test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
4. Concrete Temperature: ASTM C1064/C1064M; one test hourly when air temperature is 40°F and below and when 80°F and above, and one test for each composite sample.
5. Unit Weight: ASTM C567, fresh unit weight of structural lightweight concrete; one test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
6. Corrosion Inhibitor
   a. Test plastic concrete for presence of corrosion inhibitor using the Hach Nitrite Test by the Hach Co., Loveland, CO. Test each concrete sample used for concrete compression test cylinders at the rate of one test for each 50 cu yd, or fraction thereof, of each mix design placed in any one day.
   b. Core and test hardened concrete for corrosion inhibitor content at the rate of one core per 15,000 sq ft of slab. Testing of hardened concrete shall be performed following the procedures documented in State of North Carolina Test Procedure #C 20.0, "Determination of Calcium Nitrite in Concrete."
7. Compression Test Specimens: ASTM C31/C31M.
   a. Cast and laboratory cure two sets of two standard cylinder specimens for each composite sample.

b. Cast and field cure two sets of two standard cylinder specimens for each composite sample.

8. Compressive-Strength Tests: ASTM C39/C39M; test one set of two laboratory-cured specimens at seven days and one set of two specimens at twenty-eight days.

   a. Test one set of two field-cured specimens at seven days and one set of two specimens at twenty-eight days.

   b. A compressive-strength test shall be the average compressive strength from a set of two specimens obtained from same composite sample and tested at age indicated.

9. When strength of field-cured cylinders is less than 85% of companion laboratory-cured cylinders, Contractor shall evaluate operations and provide corrective procedures for protecting and curing in-place concrete.

10. Strength of each concrete mixture will be satisfactory if every average of any three consecutive compressive-strength tests equals or exceeds specified compressive strength and no compressive-strength test value falls below specified compressive strength by more than 500 psi.

11. Test results shall be reported in writing to Commissioner, concrete manufacturer, and Contractor within 48 hrs of testing. Reports of compressive-strength tests shall contain Project identification name and number, date of concrete placement, name of concrete testing and inspecting agency, location of concrete batch in Work, design compressive strength at twenty-eight days, concrete mixture proportions and materials, compressive breaking strength, and type of break for both seventh- and twenty-eight day tests.

12. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by Commissioner but will not be used as sole basis for approval or rejection of concrete.

13. Additional Tests: Testing and inspecting agency shall make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by Commissioner. Testing and inspecting agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42/C 42M or by other methods as directed by Commissioner.

14. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

15. Correct deficiencies in the Work that test reports and inspections indicate do not comply with the Contract Document

16. Measure floor and slab flatness and levelness according to ASTM E1155 within 24 hours of finishing.

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SECTION 03 45 00
Architectural Pre-Cast Concrete

PART I - GENERAL

1.1 RELATED DOCUMENTS

A. The following documents apply to all required work for the Project: (1) the Contract Drawings, (2) the Specifications, (3) the General Conditions, (4) the Addendum and (5) the Contract (City of New York Standard Construction Contract).

B. LEED General Requirements

1. Refer to DDC General Conditions

a. Section 01 33 00 "Submittal Procedures"
b. Section 01 74 19 "Construction Waste Management and Disposal"
c. Section 01 81 13.04 "Sustainable Design Requirements for LEED v4 Buildings"

1.2 SUMMARY

A. Section includes:

1. Pre-cast concrete panels with exposed architectural concrete finishes,

2. Provide anchorages, reinforcing bars, welded wire steel fabric, ties, supports and anchorages required for reinforcement of pre-cast concrete units.

3. Provide all structural steel inserts, lifting hooks, anchor units, plates, dowels, etc., cast in to precast concrete members required for handling and for the connections of pre-cast members, and all loose structural steel anchor units, angles, plates, etc., required to connect pre-cast units to the structural framework of the building.

4. Provide all structural steel anchor units, HSS outriggers, angles, plates, bearing pads, shims, bolting, welding, grouting, dry packing and all other materials and accessories necessary for the setting, connection and accurate placement of the pre-cast concrete units to structures. These shall include all components detailed in structural drawings beyond the primary beam or columns to ensure compatability of panel with supports. Furnish complete layout details for the installation of the above.

5. Cast in to the pre-cast units all inserts, anchors, blocking, sleeves, and housing for the attachment of electrical and plumbing equipment and other façade components and assemblies to the pre-cast concrete as indicated in architectural drawings.

6. Provide thermal break material at all gravity and bearing connections. Coordinate position of thermal breaks with architectural thermal envelope as indicated in architectural drawings.

7. Check all lines, levels, planes and pitches required for accurate placement of work of this Section.

8. Protect, repair, patch and clean all pre-cast concrete work of this Section, as required.

9. Provide full time supervision of the erection and installation of pre-cast concrete work.

10. Furnish all mock-up work, samples, design mixes and laboratory tests required in connection with work under this Section.

11. Prepare the engineering design calculations for all architectural pre-cast concrete members and connections, and prepare required shop, erection and setting drawings and details for work under this Section. Structural steel support components indicated in structural drawings beyond the structural beams and columns shall be incorporated into the precast engineering design calculations and adjusted as necessary for final assembly.

12. Waterproof additive at panels that are at or extend below grade.

B. Related Sections

1. Cast-in-Place Concrete - Section 03 30 00.

2. Structural Steel Framing - Section 05 12 00.

3. Cold Formed Metal Framing - Section 05 40 00.

4. Rainscreen System - Section 07 00 01.

5. Thermal Insulation - Section 07 21 00.

6. Exterior Joint Sealants - Section 07 92 01.

7. Signage - Section 10 14 00, for custom graphic relief formwork.

1.3 QUALITY ASSURANCE

A. Refer to DDC General Conditions Section 01 40 00 "Quality Requirements".

B. Installer Qualifications:

1. The contractor or subcontractor performing the work of this section must, within the last five (5) consecutive years, have successfully completed in a timely fashion at least three (3) projects similar in size and type to the required work. In addition, the contractor or subcontractor must be licensed or approved by the manufacturer.

2. Manufacturer Qualifications: The manufacturer providing the material or equipment specified in this section must, for the past five (5) years, have been regularly engaged in the manufacture of material or equipment similar in type to that required for this Project. Such similar material or equipment provided by the manufacturer must have been in satisfactory service for not less than five (5) years.

C. Testing of Joints: Joints should be tested for water penetration during construction: water is injected behind the outer seal at a rate of no more than 1 or 2 litres per minute while visually confirming both drainage from associated weep hole and the lack of penetration into the building.

1.4 SUBMITTALS

A. Refer to DDC General Conditions Section 01 33 00 "Submittal Procedures".

B. Shop Drawings: Prepare shop drawings, details and schedules as required to fully illustrate details of work and to meet job conditions. Provide separate shop drawings for mock-up work. The shop drawings shall include, but are not limited to, the following:

1. Location of each identified pre-cast concrete unit in the completed structure. Show all openings and all dimensions. Show relationship to structural framing members. Show concrete types, strengths and finishes.

2. Show reinforcing details, including grade, type and size of reinforcing bars, welded wire fabric.

3. Details of Connections: Show joints, bearings, connection devices, length and types of welds, all related embedded items and grouting and dry packing.

4. Show jointing clearances and clearances between the units.

5. Show full size typical details of joints between units, showing methods of sealant installation, coordinated with sealant contractor.

6. Provide shop drawings for all sealant conditions.

7. Prepare shop drawings in accordance with "Manual of Standard Practice for Detailing Reinforced Concrete Structures" (ACI-315), except where in conflict with local building regulations. Scale of details shall be adequate to fully and clearly illustrate work.

8. Submit complete design calculations for all pre-cast members and connections. Indicate all design loads, including live loads, wind loads, seismic loads, and dead loads and including all stresses during shipment and erection and due to loads from construction procedures. Design calculations shall be done by Pre-Cast Concrete Contractor's Professional Engineer, licensed to practice in the State of New York. Calculations shall be submitted a minimum of four (4) weeks prior to scheduled start of fabrication. Design calculations shall be based on the design requirements specified herein.

   a. Panels and connections shall be designed for their gravity loads.
   b. Panels and connections shall be designed for lateral wind load pressures as follows:
      1). Typical Panels: As per New York City Building Code.
   c. Connections of panels to structural supporting members shall be made so as to not induce eccentric or torsional forces in the supporting members.

C. Samples: Submit the following samples:

1. Cement and aggregates for architectural pre-cast concrete.

2. Submit two (2) 24" square by 1-1/2" thick samples of each type of surface required (formed or unformed) showing finishes proposed for all exposed pre-cast concrete work, using the proposed concrete mix and cast against the same form material to be actually used in the construction, finished as specified. Resubmit samples until satisfactory to the Commissioner. Small size samples must be accepted by the Commissioner prior to making of full size sample or starting fabrication.

3. Prior to production fabrication of pre-cast concrete units, provide a full size sample of each shape and type of the required pre-cast concrete units at manufacturer's plant for the Commissioner's review. Notify the Commissioner when full size sample is ready for inspection. Do not start production fabrication of pre-cast concrete units until the full size sample has received the Commissioner's written

acceptance. Form materials are subject to rejection if forms used do not provide finish specified. Accepted full size sample shall be set up for display at the pre-cast plant, be adequately protected from damage, and shall serve as the standard of acceptance for similar pre-cast concrete units installed in the work, which shall be equal to and correspond in all respects to the approved full size sample. Approved full size sample may be incorporated in the work, provided it is still in acceptable condition.

4. Commissioner's approval of small size and full size pre-cast concrete samples will be for color, texture, appearance and general condition only. Compliance with all other requirements of the Contract Documents is the exclusive responsibility of the Contractor.

5. Sample of patching methods and instructions / description of procedure.

D. Mock-Up: Prior to the approval for fabrication of any pre-cast work, but after the approval of the full size samples, including 2 corner conditions, display a mock-up of the panel at the fabricator's plant. Provide precast panel and all wall components as indicated on the architectural drawings for incorporation into the exterior visual mockup.

1. See drawing set for scope and extents of aesthetic mockup requirements.

E. Submit Name of Manufacturer and/or Supplier for the following:

1. Cements, each type.
2. Aggregate, each type.
3. Reinforcing bars and pre-stressing tendons.
4. Welded steel wire fabric.
5. Concrete.
6. Welding electrodes.
7. Studs.
8. Inserts and anchors.
9. Non-shrink grout.
10. Neoprene pads.
11. Form release agent.

F. Certificates: Submit the following:

1. Mill certificates for all cement, identifying by lot material, of each grind and shipment.
2. Mill certificates for all reinforcing bars and welded steel wire fabric.
3. Mill certificates of all structural steel plates, shapes and members.

4. Notarized certificates of compliance of anchors, bolts, shear studs, welding electrodes, concrete inserts, neoprene pads, shop paint, field paint and non-shrink grout.

5. Certification of welders for welding reinforcement, shop and field connections.

6. Certification that pre-cast concrete panels, required to have fire resistive rating where so indicated on drawings, are equivalent to UL listed fire rated pre-cast concrete panels.

G. The pre-cast concrete manufacturing plant and manufacturer shall be certified by the Pre-Cast/Prestressed Concrete Institute Plant Certification Program, Certification shall be for Group A, Architectural Products.

1. Fabricator shall comply with PCI recommended methods for patching.

H. The pre-cast units will not spall or show evidence of visible warping, cracking or staining resulting from materials or workmanship by this trade for a period of one (1) year effective (insert date of substantial completion). Units showing such defects will be replaced and made good together with any work of other trades damaged during removal of defective precast units, at no expense to the City of New York.

1.5 REGULATIONS AND REFERENCE STANDARDS

A. All work shall be done according to the following codes and reference standards unless specifically shown or specified otherwise in Contract Documents:

1. 2014 New York City Building Code.

2. ACI 318: "Building Code Requirements for Reinforced Concrete."

3. ACI 315: "Manual of Standard Practice for Detailed Reinforced Concrete Structures."

4. ACI 306: "Cold Weather Concreting."

5. ACI 305: "Hot Weather Concreting."

6. ACI 211.1: "Recommended Practice for Selecting Proportions for Normal and Heavyweight Concrete."

7. ACI 304-73: Recommended Practice for Measuring, Mixing, Transporting and Placing Concrete."

8. ACI 347: "Recommended Practice for Concrete Formwork."

9. PCI MNL-117: "Manual for Quality Control for Plants and Production of Architectural Pre-Cast Concrete Products."

10. PCI Design Handbook, Pre-Cast and Pre-Stressed Concrete.

11. AISC Manual of Steel Construction, Latest Edition.

12. AWS D1.1 - Rev. 2: "Structural Welding Code."

13. AWS D12.1: "Reinforcing Steel Welding Code."

14. Applicable ASTM Specification.

15. Industrial Fasteners Institute, Handbook for Fastener Standards.

B. The Contractor shall have available at all times for reference the above regulations, standards, etc., editions noted (or the latest edition, if edition is not noted).

C. Where reference is made to Specifications of American Society for Testing Materials (ASTM) or other specific standards, furnish material and/or work in strict accordance with referenced standard, subject to any qualifications herein.

D. In the event of discrepancies between various regulations and standards referred to above, most stringent requirements govern.

1.6 TESTS AND INSPECTIONS

A. Plant and Field Tests and Inspection (by Contractor's Independent Testing Laboratory)

1. Testing Laboratory: Plant and field tests and inspection will be conducted by Contractor's Independent Testing Laboratory and/or field inspector engaged and paid by the Contractor.

2. Plant Tests and Inspections by Contractor's Independent Testing Laboratory shall be in accordance with PCI, MNL-117, Sections 2.1.1 and 2.1.3.

3. Field Tests and Inspection by Contractor's Independent Testing Laboratory shall include, but not be limited to:

   a. Erection methods.
   b. Connections in accordance with approved shop drawings.
   c. Welding of connections.
   d. Compliance with erection tolerances.
   e. Compliance of all members with sizes, types and finishes.
   f. Checking leveling and grouting.
   g. Inspection of bearing pads.
   h. Field tests for concrete strength, if required.
   i. Checking and cleaning of joint edges prior to erection of units and width of joints between erected units.

1.7 REJECTIONS

A. Defective Work

1. Precast concrete units which do not conform to the specified requirements, including dimensional tolerances, strength, and finishes, shall be replaced with pre-cast concrete units that meet the requirements of this Section. The Contractor shall also be responsible for the cost of corrections to any other work affected by or resulting from corrections to the pre-cast concrete work.

2. Defective pre-cast concrete units and materials may be rejected at any time, whether in place or not. Promptly remove and replace rejected pre-cast concrete units and materials at no additional cost to the City of New York.

B. Dimensional Tolerances: Units having any dimension smaller or greater than required, and outside the specified tolerance limits, will be considered deficient and shall be rejected if the appearance or function of

the unit is adversely affected, or if the larger dimensions interfere with other construction. Repair, or remove and replace, rejected units as required to meet the construction conditions.

C. Strength Deficiencies

1. When there is evidence that the strength of a pre-cast concrete unit does not meet specification requirements, the Testing Laboratory, upon direction from the Commissioner, and with the City of New York's written approval, shall take cores drilled from hardened concrete or perform non-destructive strength tests to determine compressive strength.

2. Determination of compressive strength by drilled cores shall comply with ASTM C 42 and as follows:

   a. Take at least three (3) representative cores from pre-cast units of suspect strength, from locations directed by the Commissioner.
   b. Test cores in a saturated surface dry condition per ACI 318 if the concrete will be wet during the use of the completed structure.
   c. Test cores in an air dry condition per ACI 318 if the concrete will be dry at all times during use of the completed structure.
   d. Strength of concrete for each series of cores will be considered satisfactory if their average compressive strength is at least eighty-five (85) percent of the twenty-eight (28) day design compressive strength.
   e. Test results will be made in writing on the same day that tests are made, with copies to the Commissioner. Include in test reports the project identification name and number, date, name of pre-cast concrete manufacturer, name of concrete testing service, identification letter, number, and type of member or members represented by core tests, nominal maximum size aggregate, design compressive strength, compression breaking strength and type of break (corrected for length diameter ratio), direction of applied load to core with respect to horizontal plane of concrete as placed, and moistened condition of core at time of testing.

3. Patching: Where core test results are satisfactory and pre-cast units are acceptable for use in the work, fill core holes solid with patching mortar, and finish to match adjacent concrete surfaces.

D. Finishes: Architectural pre-cast concrete units whose finish has any of the following defects will be rejected. Repair the following finish defects if permitted by the Commissioner, or remove and replace rejected units as required to meet the requirements of this Section.

1. Does not match previously approved samples as to uniformity of color or texture.

2. Has chipped, ragged, irregular or broken corners or edges.

3. Joints, false joints, drips or notches are not properly located or aligned.

4. Has damaged surfaces, notches or other surface defects.

5. Excessive air pits and voids evident on the exposed surfaces.

6. Adjacent flat and return surfaces with more than a slight difference in exposure.

7. Casting lines evident from different placements.

8. Visible form joints or irregular surfaces.

9. Rust staining on panel surfaces.
10. Blotching or acid stains evident on panel surfaces.
11. Foreign material embedded in the facing mix.
12. Cracks visible after wetting.
13. Visible repairs.
14. Reinforcement shadow lines.

1.8 ENGINEERING CRITERIA

A. The Contractor shall be responsible for providing design calculations for all architectural pre-cast concrete work, including connections, reinforcement and installation of the architectural pre-cast concrete units. All information to be submitted for review and approval by the Commissioner. The Contractor shall also be responsible for the locating and placing of all items required for connections to all other work.

B. Engineering design of pre-cast members and connections to superstructure shall be done by a Professional Engineer, licensed in the State of New York, with experience in pre-cast concrete design.

1. Structural Criteria: Design architectural pre-cast concrete units to:

   a. Panels and connections shall be designed for their gravity loads with bearing locations to be located as indicated in architectural elevation support diagrams.
   b. Panels and connections shall be designed for lateral wind load pressures as follows:
      1). Typical Panels: 30 pounds per square foot pressure or suction per New York City Building Code Simplified Design Procedure II components and cladding pressures.
   c. Structural beams and columns have been designed for maximum 13" eccentricity of the precast façade panel gravity loads, based on the centerline of a 7" wide panel to centerline of structural beam or column width. Design and reinforcing of panels and connections of panels to structural supporting members shall be made so as to not induce additional eccentric or torsional forces in the supporting members.
   d. Panel and support design shall include redundancy in lateral tie anchorages to compensate for incomplete bearing or failure of a single gravity bearing location within each panel so as to avoid panel collapse. Inelastic behavior of lateral ties and the remaining gravity bearing and the redudancy need not be considered a serviceability limit state.
   e. Allow for expansion and/or contraction, without harmful affect to the units, connections, joint seals, or adjoining construction due to a temperature range of 0 degrees F to 120 degrees referenced to 70 degrees F.

2. Connections: Design all connections for the effect of shrinkage forces, temperature changes, and deflection of the supporting or adjacent structures. Connections shown on the Contract Drawings do not relieve the manufacturer of the responsibility for the design and performance of connections.

3. Reinforcing: Conform to requirements of ACI 318-11 and New York City Building Code. Reinforce all bearing areas against diagonal tension, splitting, rupture and flexure. Place extra ties, stirrups and reinforcing bars at support points. Allow no bearing pressure in edges of unreinforced section.

4. Corners: Exterior corners of pre-cast panels shall return at the corner of each unit as indicated on the drawings. No mitered joints at exterior corner shall be allowed.

5. Lifting Devices: All inserts to be used for lifting or handling shall be on non-exposed surfaces.

PART II - PRODUCTS

2.1 MANUFACTURERS

A. Basis of Design: Subject to compliance with requirements, provide High Concrete Group LLC; Architectural precast concrete or comparable by one of the following:
1. BPDL
2. Universal Concrete
3. Or approved equal

2.2 FORMWORK

A. Provide forms that are non-reactive with concrete and will produce the required finish surfaces.

B. Accurately construct forms mortar-tight and of sufficient strength to withstand all pressures due to concrete placing operations, temperature changes, and when prestressed, pretensioning and detensioning operations. Maintain formwork to provide complete pre-cast concrete units of shapes, lines, and dimensions indicated, within the specified fabrication tolerances.

C. Unless forms for plant manufactured prestressed concrete units are stripped prior to detensioning, design forms so that stresses are not included in pre-cast units due to deformation of concrete under pre-stress or to movement during detensioning.

D. Refer to section 2.7 herein for further information.

2.3 REINFORCEMENT STEEL AND ACCESSORIES

A. Reinforcing Bars: ASTM A615, Grade 60.

B. Welded Wire Steel Fabric: ASTM A185, cold drawn wire. Supply in flattened sheets or mats. Tie wires for pre-cast work: #16 monel metal.

C. Steel Wire: ASTM A82, plain, cold drawn, steel.

D. Reinforcing Bar Accessories: Type to suit the condition; non-corrosive.

E. For concrete surfaces exposed to view, where legs of supports are in contact with forms, provide supports with legs that are plastic protected (CRSI, Class 1) or stainless steel protected (CRSI, Class 2).

2.4 CONCRETE MATERIALS

A. Portland Cement: ASTM C 150, Type I or Type III.

1. Charcoal precast mix for exterior façade:

a. Base Mix: Match with available local raw materials PCI Plate 548

b. Water Cement Ratio: 0.42 Max
c. Entrained Air: 5.0% + or - 1.5%
d. Required Compressive Strength: 5,000 psi
e. Concrete Finish: Acid Etch - Life
f. Aesthetic Note: Select concrete aggregates to provide moderate light refraction effect when exposed by means of concrete surface finishing process.

2. Interior backup wall is standard concrete grey.

3. Use only one brand and type of cement throughout the project, consistent in color / finish unless otherwise acceptable to the Commissioner.

4. Use white Portland cement for facing concrete mix to match Commissioner's control sample.

5. Standard "gray" Portland cement may be used for non-exposed backup concrete.

B. Coarse Aggregate for Facing Mixes: ASTM C 33; stone aggregate that is hard, durable, carefully selected and graded; free of material causing staining or reacting with cement.

1. Use aggregate from same source as those used in Commissioner's control sample.

C. Fine Aggregate for Facing Mixes: ASTM C 33.

D. Water: Drinkable, free from foreign materials in amounts harmful to concrete and embedded steel.

E. Air-Entraining Admixture: ASTM C 260.

F. Waterproof Additive:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Krystol
b. Xypex
c. Aquafin
d. Or approved equal

G. Non-Metallic, Shrinkage-Resistant Grout: Pre-mixed, non-metallic, non-corrosive, non-staining product containing selected silica sands, Portland cement, shrinkage compensating agents, plasticizing and water reducing agents, complying with CRD-C62.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Euco N.S.; Euclid Chemical Co.
b. Masterflow 713; Master Builders
c. Five Star Grout; U.S. Grout Corp.
d. Or approved equal.

2.5 MISCELLANEOUS MATERIALS

A. Steel Hardware Units

1. Steel Plates: Structural quality, hot rolled carbon steel complying with ASTM A 36, or ASTM A 283, Grade C.

2. Structural Size Steel Shapes: ASTM A 36 except HSS

3. Bar Size Steel Shapes, Steel Bar Flats, and Steel Bar Rounds: ASTM A 36 or ASTM A 306, Grade 65.

4. HSS: ASTM A 500, Grade B.

5. Threaded Rods: Shall be coil rods made of high tensile grade steel. The rated ultimate capacity for 3/4" rods to be thirty-six thousand (36,000) lbs., for 1" rods seventy-five thousand (75,000) lbs. Dayton Sure-Grip and Shore Co., or equal.

6. Anchor Bolts: ASTM A 307, low carbon steel bolts, regular hexagon nuts and carbon steel washers.

7. Finish of Steel Hardware Units and Fasteners: Hot dip galvanized steel complying with ASTM A 123 or A 153 as applicable.

B. Weldments: To conform with the requirements of the AISC "Specification for the Design, Fabrication and Erection of Structural Steel for Building."

C. Shear Connectors:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Nelson Stud Welding
b. KSM Products
c. JVI Inc.
d. Or approved equal

D. Plastic Shims: 80,000 psi

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Korolath
b. Vers-a-Shim
c. Paragon Products
d. Or approved equal

E. Flashing Reglet: Twenty-eight (28) gauge (0.014") stainless steel, Type 302/304; type profile and conditions as shown on drawings.

F. Touch-Up Galvanizing Compound:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. ZRC Chemical Co.; ZRC Cold Galvanizing Compound
b. Brite Products; Brite Zinc
c. Duncan Galvanizing Corp.; ZiRP
d. Or approved equal.

2.6 QUALITY AND PROPORTIONING (MIX DESIGN)

A. Concrete Compressive Strength: Five thousand (5,000) psi minimum, at twenty-eight (28) days.

B. Concrete Weight: All pre-cast concrete shall be normal weight concrete having an air-dry weight of one hundred fifty (150) lbs. maximum per cubic feet of concrete.

C. Concrete Slumps: The Contractor must be capable of producing concrete of satisfactory quality and strength, that will produce the specified finishes, free of voids, honeycombing, or excessive air bubbles. Execution of this contract signifies that the Contractor accepts full responsibility for the production of concrete of satisfactory quality, strength and finishes.

D. Air-Entrained Concrete: All architectural pre-cast concrete shall be air entrained, using the specified air-entraining admixture as per manufacturer's written instructions, to provide entrained air, by volume, in the cured concrete of between three (3) percent and six (6) percent.

E. Proportioning and Tests for Proportioning

1. Responsibility: The Contractor shall be responsible for making and paying for all concrete design mixes and tests to determine the suitability of ingredients and the proportion of specified ingredients for the concrete type and strength, of the specified air entrainment, that will be fully workable for all placing conditions and that will produce finishes acceptable to the Commissioner.

2. Ingredients Tests: Prior to making design mixes, the Contractor's Testing Laboratory shall conduct the following tests in accordance with the procedures referred to in the Reference Standards to assure conformance with the Project Specifications.

   a. Cement: Specific gravity of cement.
   b. Aggregates: Sieve analysis, specific gravity, soundness, percentage of voids, absorption, and moisture content of fine and coarse aggregate. Dry rodded weight of coarse aggregate. Fineness modulus of fine aggregate.

3. Concrete Design Mixes

   a. Design Mixes: The Contractor's Independent Testing Laboratory shall recommend the design mixes to be used for the project for the type and strength of concrete that will produce concrete of specified strengths and finishes. Design mixes shall indicate water-cement ratio, water content, admixture content, cement content, aggregate content, aggregate gradations, slump, air content and strength. Design mixes and related tests shall be in accordance with the procedures referred to in the Reference Standards.
   b. Trial Mixes: For the type and strength of normal weight concrete, made four (4) trial mixes, using varying water-cement ratios.
   c. Strength of Trial Mixes: Per ACI Standards.

4. Additional Tests: Contractor, at no expense to the City of New York, shall have the Contractor's Testing Laboratory conduct additional tests on concrete ingredients and make new design mixes whenever the character or source of ingredients is changed or if the placed concrete fails to meet specified strengths.

2.7 FABRICATION

A. Reference Standards: Fabricate pre-cast concrete units so as to comply with the manufacturing and testing procedures and quality control recommendations of Pre-Cast Concrete Institute's MNL-116 and MNL-117 "Manuals for Quality Control for Production of Pre-Cast Pre-Stressed Concrete Products and of Architectural Pre-Cast Products," except as modified herein.

B. Concrete: Store, measure, mix and deliver concrete in accordance with PCI MNL-117, ASTM C 94, and as herein specified.

C. Formwork

1. Reference Standards: Formwork shall conform to ACI 347-68 "Recommended Practice for Concrete Formwork," and to requirements specified herein.

2. Molds: Cast pre-cast concrete units in one-piece seamless rigid molds for exposed faces, except where two-piece molds are permitted. Molds shall be made of smooth fiberglass, or other suitable material acceptable to the Commissioner, conforming to shape, profile, lines and dimensions indicated, so as to obtain a smooth finish matching Commissioner's samples and approved pre-cast concrete unit full size samples. Prevent deformation of molds and maintain surfaces of molds free of irregularities, dents, sags, or damage of any kind. The forms or molds must be designed to withstand vibration and lateral forces, and must be accurate in details, with sharp corners and arrises so as to assure finished units satisfactory to the Commissioner and matching approved samples. There shall be no visible joints or seam lines in the molds or in the finished concrete surface, unless joint or lines are required by Commissioner's drawings.

3. Holes and Embedded Items: Contractor shall provide all holes and openings (both cast-in and drilled) required for his work and for work of other trades. All holes and openings shall be cast in. Contractor shall furnish and install all embedded items required for work of other trades furnished by other subcontractors. Accurately locate and position embedded items and secure to formwork. See drawings, including drawings of other subcontractors, for extent and location of holes, openings, drips and embedded items. Show all holes, openings, drips and embedded items on shop drawings. Coordinate with other subcontractors.

4. Built-In Anchorages: Accurately position built-in anchorage devices and secure to formwork. Locate anchorages where they do not affect the position of main reinforcement or the placing of concrete.

5. Form Release Coating: Before each casting, coat surfaces of thoroughly cleaned forms with a bond breaking compound before reinforcement is placed. Provide commercial formulation form coating compounds that will not bond with, stain, or adversely affect concrete surfaces, and will not impair subsequent treatments or sealing (with sealant) of concrete surfaces requiring bond or adhesion. Apply in compliance with manufacturer's instructions.

   a. Where sealant bond is affected by form release coating, coating must be thoroughly removed by abrading surface (i.e. grinding, sandblasting, etc.) to ensure no loss of adhesion of sealant.

D. Exposed Unformed Surfaces: All panels exposed to exterior on two (2) sides shall be floated and/or troweled on the unformed surface in a manner which will enable finishing to match the formed surface. Floating and/or troweling shall be consistently performed on all unformed surfaces. All unformed surfaces shall be oriented as indicated on the drawings.

E. Reinforcement

1. Reference Standards: Reinforcement shall conform to ACI 318 "Building Code Requirements for Reinforced Concrete" and to ACI 315 "Manual of Standard Practice for Detailing Reinforced Concrete Structures" and to requirements specified below.

2. Clean reinforcement of loose rust and mill scale, earth and other materials which reduce or destroy bond with concrete.

3. Reinforcement Cover: Place reinforcement to obtain the minimum coverage for concrete protection, which shall be 1-1/2" from face exposed to weather and one (1) inch from face not exposed to weather unless otherwise indicated on drawings.

4. Positioning and Securing Reinforcement: Accurately position support and secure reinforcement against displacement by formwork, construction, or concrete placement operations.

5. Welding: Perform all welding in accordance with AWS D1.1 - Rev. 2 and AWS D12.1. All welders shall be properly certified by AWS. Care shall be exercised during welding to minimize effect of welding heat. Welds shall be designed to prevent a tearing at end of weld which could cause a progressive failure. Detailed welding procedure covering all specified welds on erection and shop drawings may be requested for review and comment by the Commissioner.

F. Place concrete in a continuous operation to prevent the formation of seams or planes of weakness in pre-cast units, complying with requirements of ACI 304. Thoroughly consolidate placed concrete in each pre-cast unit by internal and external vibration without dislocation or damage to reinforcement and built in items. Internal vibration, if necessary, shall not touch reinforcement.

G. Identification: Provide permanent markings in pre-cast units to identify pick-up points and orientation in the structure, complying with the markings indicated on the final shop drawings. Imprint the date of casting on each pre-cast unit where it will not show in the finished structure.

H. Curing: Cure in accordance with applicable reference standards.

I. Fabricate precast architectural concrete units straight and true to size and shape with exposed edges and corners precise and true so each finished panel complies with PCI MNL 117 product tolerances as well as position tolerances for cast-in items.

J. Fabricate units straight, smooth, and true to size and shape, with exposed edges and corners precise and square unless otherwise indicated.

1. Pre-cast units that are warped, cracked, broken, spalled, stained, or otherwise defective will not be acceptable.

K. Finish of Formed Surfaces

1. For Architectural Pre-Cast Concrete Units: All exposed formed surfaces and exposed troweled surfaces of architectural pre-cast concrete units shall have smooth "as-cast" finish. Where exposed aggregate finish is noted, conform to:

a. Light acid etched finish, producing a "matte" surface to match approved samples.

b. It is the intent of these specifications that no patching of architectural pre-cast concrete will be required. In the event remedial action is required, it shall consist of patching with approved patching mortar and then texturing. No patching shall be done without the Commissioner's written approval.

L. Finish of Unformed Unexposed Surfaces: All unformed surfaces of pre-cast concrete shall be consolidated, brought to a proper level with a straight edge, floated and then given the following finish:

1. Uniform Float Finish: Typically for all surfaces not exposed to view.

M. Quality Control: Pre-cast unit manufacturer shall institute quality control procedures for the manufacture, inspection and testing of pre-cast units in compliance with recommendations of PCI MNL-117. Furnish the Commissioner with copies of test reports and/or certifications for materials and quality control testing of pre-cast units.

PART III - EXECUTION

3.1 EXECUTION REQUIREMENTS

A. Refer to DDC General Conditions for execution requirements.

3.2 INSTALLATION

A. Deliver anchorage items which are to be embedded in other construction before start of such work. Provide setting diagrams, templates, instructions and directions as required for installation.

B. Do not install pre-cast units until concrete has attained its design strength.

C. In handling and lifting, use only lifting inserts provided.

D. Place no pre-cast concrete units or material in the work that is damaged.

E. Install pre-cast concrete units plumb, level, square and true, without exceeding the recommended erection and location tolerances of PCI, MNL-117, unless more stringent requirements are specified herein. Provide temporary supports and bracing as required to maintain position, stability and alignment as members are being permanently connected.

F. Anchor units in final position by bolting, welding, grouting, or as otherwise shown on drawings. Remove temporary shims, wedges, and spacers as soon as possible after anchoring is completed. Make adjustments as required to maintain accurate face joint dimensions.

1. At bolted connections use lock washer, "Slotlok" system welding or other approved means to prevent loosening of nuts.

2. At welded connections apply galvanizing touch-up compound specified herein.

G. Welding: Perform all welding in compliance with AWS D1.0 and D12.1, including qualifications of welders.

H. Protect units from damage by field welding or cutting operations during erection and provide non-combustible shields as required.

3.3 ERECTION TOLERANCES

A. Install precast architectural concrete units level, plumb, square, true, and in alignment without exceeding the noncumulative erection tolerances of PCI MNL 117, Appendix I.

3.4 TESTING

A. Joints should be tested for water penetration during construction: water is injected behind the outer seal at a rate of no more than 1 or 2 litres per minute while visually confirming both drainage from associated weep hole and the lack of penetration into the building.

END OF SECTION 03 45 00

SECTION 04 20 00
Unit Masonry

PART I - GENERAL

1.1 RELATED DOCUMENTS

A. The following documents apply to all required work for the Project: (1) the Contract Drawings, (2) the Specifications, (3) the General Conditions, (4) the Addendum and (5) the Contract (City of New York Standard Construction Contract).

B. LEED / Environmentally Preferable Purchase (EPP) General Requirements:

1. Refer to DDC General Conditions and the Addendum to the General Conditions

2. LEED requirements apply to all Phase II work with the exception of the Existing Building scope. EPP requirements apply to the project's Existing Building scope only.

1.2 SUMMARY

A. Section includes:

1. Concrete block interior partitions.

2. Glazed thin brick at interior.

3. Glazed brick at exterior.

4. Ground face concrete masonry units.

5. Metal joint reinforcing, anchors, ties, weeps, closures and related accessories for masonry.

6. Control and expansion joints in masonry, filled with joint fillers.

7. Thru-wall flashing.

8. Mortar net.

9. Chases, recesses, pockets and openings in masonry as required for installation of work.

10. Building in of items \ into masonry, including access doors, door frames, anchors, sleeves and inserts, and other similar items to be embedded in masonry.

11. Grouting in of metal items built into masonry work.

12. Protection, pointing and cleaning of masonry.

B. Related Sections

1. Firestops and Smokeseals - Section 07 84 13.

2. Interior Joint Sealants - Section 07 92 00.

3. Exterior Joint Sealants - Section 07 92 01.

1.3 SUBMITTAL PROCEDURES

A. Refer to DDC General Conditions Section 01 33 00 "Submittal Procedures".

1.4 SUBMITTALS

A. Shop Drawings: Submit for:

1. Anchoring details.
2. Control and expansion joint locations and details.
3. Special brick shapes, including large scale shop drawings showing configuration and dimensions.
4. Flashing at typical lintels indicating relationship of flashing to lintel hangers.

B. Samples (Submit the following):

1. Each type of face brick in sufficient number and color (not less than 5) to show full range of color, texture and shade. Submit certification that brick meets ASTM standards specified herein.
    a. Submit samples of all special shapes required showing color and finish range and sizes.
2. Joint reinforcing, each type, width and proposed location (labeled).
3. Anchors, each type, width and proposed location (labeled).
4. Joint filler, each type.
5. Flashing, including splice sample, 12" long.
6. Mortar color, 12" long cured sample.

C. Manufacturer's Literature: Submit technical and installation information for:

1. Mortar materials, each material and mortar type.
2. Certification of mortar mix.
3. Concrete block, joint reinforcing, anchors, ties and joint filler; submit manufacturer's technical and descriptive literature.
4. Block manufacturer shall submit certifications of compliance with ASTM C 90, C 331 and UL 618 prior to any job site delivery. Field sample of concrete block may be tested by an Independent Testing Laboratory according to the requirements of ASTM C 140.

D. Construction Procedures: Submit proposed procedures and materials for cleaning masonry work; including certification that cleaner will not adversely affect gaskets, sealants, etc.

1.5 QUALITY ASSURANCE

A. Refer to DDC General Conditions Section 01 40 00 "Quality Requirements".

B. Work of this Section shall conform to the requirements of the following:

1. 2011 "Building Code Requirements for Masonry Structures," (TMS 402-11/ACI 530-11/ASCE 5-11).
2. 2011 "Specification for Masonry Structures," (TMS 602-11/ACI 530.1-11/ASCE 6-11).
3. New York City Building Code.

1.6 DELIVERY, STORAGE AND HANDLING

A. Store masonry units and mortar materials on raised platforms and under ventilated and waterproof cover.

B. Masonry Units: Pack, deliver and store to prevent breakage, cracking, chipping, spalling or other damage. Store, protect and ventilate units at project site.

C. Aggregate: Store with provisions for good drainage.

D. Reinforcement and Anchors: Store and protect so that when placed, joint reinforcement and anchors will be free of soil, dirt, ice, loose rust, scale, or other coatings which would destroy or reduce bond with mortar and will not be disfigured or bent out of shape.

PART II - PRODUCTS

2.1 MATERIALS

A. Standard Concrete Block

1. Portland cement, ASTM C 150, Type 1, low alkali (less than 0.6%), single source for entire project.
2. Aggregates, ASTM C 331, lightweight expanded shale, clay or slate aggregates, manufactured by the rotary kiln process.
    a. Subject to compliance with requirements, products that may be incorporated into the Work include the following:
        1). Northeast Solite Corporation; Solite
        2). Norlite LLC; Norlite
        3). Buildex Incorporated; Haydite
        4). Or approved equal.
3. Concrete Masonry Units: Load bearing lightweight aggregate concrete masonry units conforming to the requirements of ASTM C 90, Type 1.
    a. Block behind face brick and for fire-rated walls shall be 75% solid units.
    b. All other block may be hollow units.
4. The producer of the concrete masonry units shall furnish certification from an independent testing laboratory confirming that all 8" or larger masonry units meet all of the UL 618 requirements for two (2)

hours or better (as required), referencing full scale fire test reports (ASTM E 119). All 4" and 6" units shall conform to "National Bureau of Standards" and "National Research Council" full scale fire tests.

5. Sizes and Shapes: Nominal face size 8" x 16" by thickness as indicated on drawings, with stretcher units, jamb units, header units, square corner units (at ends and corners of exposed or painted work), sash units (at control joints within masonry wall), lintel units and other special shapes and sizes required to complete the work.

6. Finish: For exposed block surfaces, in addition to ASTM requirements, block shall have uniformly dense, flat, fine grain texture, with no cracks, chips, spalls, or other defects which would impair appearance. For concealed CMU, surfaces shall be free from deleterious materials that would stain plaster or corrode metal.

7. Curing: All concrete block shall be steam cured, and air dried for not less than thirty (30) days before delivery.

8. Density of concrete block shall not exceed one hundred and five (105) lbs. per cubic foot.

9. Shrinkage: Shrinkage of concrete blocks shall not exceed 0.065% when tested in accordance with ASTM C 426-99.

10. Water Content

    a. At the time of delivery to the job site, concrete masonry units shall have a value, in weight of contained water, of not more than thirty (30) percent of the fully saturated content for the unit tested.
    b. Ship all units from the factory, and store at the job site, with all necessary protection to prevent increase of water content from rain and other sources.

B. Ground Face Concrete Masonry Unit

1. Provide concrete masonry units (CMU) manufactured with 100% recyclable postconsumer glass supplementary cementitious material (SCM). Units shall meet or exceed ASTM C 90, ASTM C 129 and ASTM C 1634.

    a. Exterior: See Finish Schedule.
    b. Interior: See Finish Schedule. Thin faced ACMU, attached with Tab System on back-up CMU.

2. Basis of Design: Subject to compliance with requirements, provide Kingston Block & Masonry Supply; Pozzotive CMU or comparable product by one of the following:

    a. Westbrook Concrete
    b. Echelon Masonry
    c. Or approved equal

3. Comply with requirements above except block shall be normal weight with density no greater than 125 pcf.

C. Brick

1. Glazed Thin Brick (Interior): See Finish Schedule; attached with Tab System on back-up CMU.

a. Thin Veneer Brick: ASTM C 1088, Grade SW, Type FBX

2. Glazed Brick (Exterior): See Finish Schedule.

a. Body: ASTM C 216, Grade SW, Type FBX.
b. Glazing: ASTM C 126
c. Size: 3-5/8" x 2-1/4" x 7-58" unless otherwise noted.
d. Provide all special molded shapes as indicated on the drawings.
e. For sills, caps and similar applications resulting in exposure of brick surfaces which otherwise would be concealed from view, provide uncored units with all exposed surfaces finished.

3. Basis of Design: Subject to compliance with requirements, provide Belden; products as indicated on Finish Schedule or comparable product by one of the following:
a. Elgin Butler
b. Glen-Gery
c. Or approved equal

D. Tab System: Provide heavy duty metal masonry support panel for interior mechanical support of thin veneer on CMU or metal frame construction; steel with G90 galvanized coating.

1. Product: Subject to compliance with requirements, provide one of the following:

a. Tabs Wall Systems LLC; Tabs II Thin Brick Wall System Panel
b. Glen-Gery; Thin Tech
c. Brick It; Designer Metal Grid System
d. Or approved equal.

E. Joint Reinforcing for Masonry Walls

1. Non-Seismic Construction: For anchoring face brick to CMU back-up, provide welded "ladder" design, of 3/16" dia. gauge steel rods with adjustable 3/16" wire rectangular pintle anchors fastened to reinforcement 16" o.c. Provide special formed prefabricated pieces at corners and intersections of walls or partitions. Anchors to extend at least 2" into face of brick. Show anchor locations on approved shop drawings.

a. Reinforcing assembly shall have hot dip galvanized steel finish conforming to ASTM A 153 with zinc coating of 1.5 oz. of zinc per sq. ft. after fabrication.
b. Basis of Design: Subject to compliance with requirements, provide Hohmann & Barnard; Ladder Type 270 with Lox All Adjustable Anchor or comparable product by one of the following:
1). Heckmann Building Products
2). Wire-Bond
3). Or approved equal

2. For block walls forming part of exterior wall construction, provide super heavy duty reinforcing fabricated of 3/16" dia. side and cross rods, truss or ladder design, ties, spaced every block course. Provide prefabricated pieces at corners and intersections of walls or partitions.

a. Reinforcing assembly shall be hot dip galvanized steel finish conforming to ASTM A 153 with zinc coating of 1.5 oz. of zinc per sq. ft., after fabrication.

3. For interior block walls and partitions, provide standard reinforcing fabricated of 9 ga. side and cross rods, truss or ladder design, no ties, spaced every other block course. Provide prefabricated pieces at corners and intersections of walls or partitions. Reinforcing shall be mill galvanized conforming to ASTM A 641, Class B-1, applied after fabrication.

4. Wire used in assemblies noted above shall be cold drawn steel wire conforming to ASTM A 82.

F. Anchors and Ties

1. For anchoring brick to cold formed metal framing, provide hot dip galvanized anchors. Ensure brick tie length matches or exceeds exterior insulation depth so that insulation does not need to be cut out at pintle locations.

   a. Product: Subject to compliance with requirements, provide one of the following:Heckmann Building Products;
      1). Heckmann Building Products; Wing-Nut Pos-I-Tie with self-drilling screw for steel studs zinc barrel and thermal wing-nut, and Seismic Wire Pintle Tie hot-dip galvanized steel.
      2). Hohman & Barnard; X-Seal Veneer Anchor hot-dip galvanized steel anchors with X-Seal Tape and Model 187 Seismiclip with 9 ga. wire.
      3). Wire-Bond
      4). Or approved equal

2. Wire Mesh: Galvanized sixteen (16) gauge steel wire, 1/4" square mesh, width 1/2" less than wall thickness, by length to suit condition.

3. For anchoring masonry to structural steel, provide hot-dip galvanized steel anchors. Galvanizing shall conform to ASTM A 153, with zinc coating of 1.5 oz. of zinc per sq. ft.

   a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      1). Hohmann & Barnard
      2). Heckmann Building Products
      3). Wire-Bond
      4). Or approved equal

4. For anchoring CMU interior partitions to underside of steel beams, provide hot dip galvanized steel partition top anchors.

   a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      1). Heckmann Building Products; No. 419 and No. 421
      2). Hohmann & Barnard; No. PTA 420
      3). Wire-Bond; PTA #4301
      4). Or approved equal

5. For anchoring CMU interior partitions to underside of structural deck, see structural drawings.

G. Reinforcing Bars and Rods: ASTM A 615, Grade 60. See Drawings for size.

H. Control and Expansion Joint Fillers

1. Vertical Installation Within Concrete Masonry Wall: Extruded high grade neoprene rubber, cross shape, for use with concrete masonry sash units, which shall provide a force fit in the grooves of the sash block and shall have 1/2" diameter tubular ends (compressed 25% when installed in 3/8" wide joint).

   a. Provide the following sizes:
      1). 2-5/8" wide control joint fillers for 4" block walls.
      2). 4-5/8" wide for 6" block walls.
      3). 6-5/8" wide for 8" block walls.
   b. Provide backer rod and sealant joint over joint filler as per drawings and Section 07 92 00, Interior Joint Sealants and Section 07 92 01 Exterior Joint Sealants.

2. Isolation Joint Filler at Abutting Construction and at Intersecting CMU Walls: Compressible and resilient closed cell neoprene gasket with pressure sensitive adhesive backing, thickness 30% greater than thickness of joint. Recess joint filler and install backer rod and sealant as per drawings and Section 07 92 00, Interior Joint Sealants.

3. Within Face Brick: Provide filler rod and sealant installed by Section 07 92 01 Exterior Joint Sealants. Filler depth shall be 2 times joint width.

   a. Compressible filler between top of brick and bottom of shelf angle or steel lintel shall be "Soft Joint Sealant" made by Polytite, or equal by BASF Construction Chemicals - Building Systems, Construction Foam Products, a division of Nomaco, Inc. or approved equal.

4. Within Expansion Joint at Face Brick: Manufacturer's standard preformed, pre-compressed, open-cell polyurethane foam sealant impregnated with a water based, non-drying polymer modified acrylic water repellent. Provide "Seismic Colorseal" installed to twenty-five 25 percent compression, as manufactured by Emseal or equal by Schul International Co., Inc., Watson Bowman Acme Corp. or approved equal.

   a. Properties: Permanently elastic, mildew resistant, non-migratory, non-staining, and compatible with joint substrates and other joint sealants. Density: 8.4 to 9.1 lb./cu. ft..

I. Neoprene Joint Filler: Provide closed cell neoprene, Type NN-1, conforming to ASTM D 1056, Grade 1, high performance, as manufactured by Williams Products Inc., or equal made by D. S. Brown, Norton, or approved equal.

2.2 MORTAR MATERIALS

A. Portland Cement: ASTM C 150, Type 1, standard color, one source.

B. Hydrated Lime: ASTM C 207, Type S.

C. Aggregate for Mortar: Clean, washed, buff colored sand, graded per ASTM C 144.

D. Aggregate for Grout: ASTM C 404.

E. Water: Clean, fresh and suitable for drinking.

2.3 MORTAR MIX

A. Exterior Face Brick Construction: Mortar mixes shall meet ASTM C 270, Type N, cement/lime mortar. Colors of mortars shall use coloring agent made by Davis Colors, Lehigh Cement or approved equal. Color of mortar to meet with Commissioner's approval. The Contractor may use pre-packaged colored mortar equal to "Color Mortar Blend" by Glen-Gery or equal by Davis Colors, Lehigh Cement or approved equal.

1. Mortar Color(s): See Finish Schedule.

2. Color of mortar must meet with Commissioner's approved sample and mock-up panel.

B. Interior Masonry Construction: Provide Portland cement/lime mortar conforming to ASTM C 270, Type N; for load bearing conditions, mortar shall conform to ASTM C 270, Type M.

C. Reinforced Concrete Block: Provide Portland cement/lime mortar conforming to ASTM C 270, Type S.

D. Grout for Unit Masonry: Comply with ASTM C 476 for grout for use in construction of unit masonry. Use grout of consistency (fine or coarse) at time of placement which will completely fill all spaces intended to receive grout. Grout shall have a minimum compressive strength of 3000 psi when tested in accordance with ASTM C 1019.

E. Mixing

1. General: Add cement just before mixing and mix dry. Use sufficient amount of water as necessary to produce workable mix. Mix in small batches to make plastic mass.

2. Mixing: Machine mix all mortars in approved type mixer with device to accurately and uniformly control water. Add hydrated lime dry. Mix dry materials not less than two (2) minutes. Add water, then mix not less than three (3) minutes, not to exceed five (5) minutes. Mix only amount of mortar that can be used before initial set. Do not use mortar which has reached its initial set or two (2) hours after initial mixing, whichever comes earlier. Mortar may not be re-tempered. Clean mixer for each batch, whenever mortar type is changed, and at end of each day's work.

3. Acceleration or other admixtures not permitted.

4. Mortar shall have a flow after suction of not less than seventy-five (75) percent of that immediately after mixing as determined by ASTM C 91.

F. Admixtures

1. No air-entraining admixtures or cementitious materials containing air-entraining admixtures shall be used in the mortar.

2. No antifreeze compounds or other substances shall be used in the mortar to lower the freezing point.

3. Calcium chloride or admixtures containing calcium chloride shall not be used in mortar.

2.4 WEEP HOLES

A. Provide clear plastic weep holes 3/8" wide and 1-1/2" high by four (4) inches long.

1. Basis of Design: Subject to compliance with requirements, provide Hohmann & Barnard; No. 342 or comparable product by one of the following:

    a. Advanced Building Products
    b. Heckmann Building Products
    c. Wire-Bond
    d. Or approved equal.

2.5 THRU-WALL FLASHING

A. Provide sheet membrane flashing as part of exterior wall membrane system. Provide sealants and tapes as recommended by the manufacturer. Provide preformed corner sections "end dams" with system when flashing is discontinuous.

1. Provide flashing for surface adhered applications at sheathed areas with 26 ga. stainless steel termination bar.

2. Wall flashing shall have 26 ga. stainless steel drip edge adhered to edge of flashing, drip edge shall be set in sealant as specified in Section 07 92 01 Exterior Joint Sealants.

2.6 MORTAR NET

A. Provide 10" high HDPE open mesh mortar net of width to fit masonry cavity shown on drawings.

1. Basis of Design: Subject to compliance with requirements, provide Hohmann & Barnard or comparable by one of the following:

    a. Advanced Building Products
    b. Heckmann Building Products
    c. Or approved equal

PART III - EXECUTION

3.1 EXECUTION REQUIREMENTS

A. Refer to DDC General Conditions for execution requirements.

3.2 INSTALLATION

A. General

1. Do not wet concrete block units.

2. Build single wythe walls to the actual thickness of the masonry units, using units of nominal thickness shown.

3. Build chases and recesses as shown or required for the work of other trades.

4. Leave openings for equipment to be installed before completion of masonry work. After installation of equipment, complete masonry work to match work immediately adjacent to the opening.

5. Lay out walls in advance for accurate spacing of surface bond patterns with uniform joint widths and to properly locate openings, movement type joints, returns and off-sets. Avoid the use of less than half size units at corners, jambs and wherever possible.

6. Lay up walls plumb and true with courses level, accurately spaced and coordinated with other work.

7. Pattern Bond: Lay exposed masonry patterns as noted on drawings. If not shown, provide running bond. Lay concealed concrete block with all units in a wythe bonded by lapping not less than two (2) inches. Bond and interlock each course of each wythe at corners. Do not use units of less than four (4) inches horizontal face dimensions at corners or jambs.

8. Where possible, masonry walls and partitions shall be built after all overhead ducts, pipes and conduits are in place and tested. Masonry shall be neatly built around the items above. Walls and partitions shall be plumb, true to line and free from defects such as open cells, voids, dry joints and other similar defects. In rooms and spaces scheduled to have concrete block finish, all such surfaces, including upper wall surfaces up to termination of structural ceiling in spaces without suspended ceilings, shall be made suitable for paint application. Cutting of openings in walls and partitions in place shall be done only with the approval of the Commissioner.

B. Mortar Bedding and Jointing

1. All joints between bricks shall be completely filled with mortar. Bed joints shall be beveled per BMI recommendations, with the brick then shoved in place. At cavity wall construction, care shall be taken that no excess mortar goes into masonry cavity. Head joints shall be completely filled with mortar and shall be formed by applying a full coat of mortar to the entire end or the entire side, as the case requires, and then shoving the mortar covered end and/or side of the brick tightly against the bricks previously laid; the practice of "slushing" by throwing mortar into the head joints will not be permitted. All brick shall be laid without disturbing the brick previously laid. Brick shall be laid within a minute or so after the mortar is placed. Dry or butt joints will not be permitted. Grouting shall be done only as necessary. Do not slush head joints.

2. After brick placement, mortar squeezed out of bed joints shall be cut off before tooling.

3. Lay concrete masonry units with full mortar coverage on horizontal and vertical face shells. Bed webs in mortar in starting course on exterior walls and in all courses of piers, columns and pilasters, where solid CMU is used and where adjacent to cells or cavities to be reinforced or filled with concrete or grout.

    a. To ensure alignment of brick and block coursing, adjust block back-up by cutting block to ensure alignment of coursing or use adjustable anchorage.

4. Lay masonry walls with 3/8" joints unless otherwise shown on drawings.

5. Tool exposed joints slightly concave. Concealed joints shall be struck flush.

6. Remove masonry units disturbed after laying; clean and reset in fresh mortar. Do not pound corners at jambs to fit stretcher units which have been set in position. If adjustments are required, remove units, clean off mortar and reset in fresh mortar.

C. Stopping and Resuming Work: Rake back 1/2 brick length in each course; do not tool. Clean exposed surfaces of set masonry, wet units lightly (if required) and remove loose masonry units and mortar prior to laying fresh masonry.

D. Built-In Work

1. As the work progresses, build in items located within masonry construction. Fill in solidly with masonry around built-in items.

2. Mortar in door frames, access doors, louvers and other metal items embedded or built into masonry work solidly with mortar as the masonry units are laid up.

3. Grout under lintels, bearing plates, and steel bearing on masonry with solid bed grout.

4. Sleeves, pipes, ducts and all other items which pass through masonry walls shall be caulked with interior grade sealant meeting requirements of Section 07 92 00 Interior Joint Sealants, so as to be air tight and prevent air leakage. Refer to Section 07 84 13 Firestops and Smokeseals for packing of voids in rated masonry walls.

5. Fill vertical cells of masonry units solid with grout which have anchoring, reinforcing rods, supporting or hanging devices embedded in the cell, including stone anchors and window or curtain wall anchors.

6. Fill vertical cells of masonry units solid with mortar on each side of door frames to sixteen (16) inches beyond.

7. Unless otherwise noted, fill vertical cells of masonry units solid with grout which are below steel bearing plates, steel beams, and ends of lintels, to eight (8) inches beyond bearing and from floor to bearing.

8. Place wire mesh in horizontal joint below masonry unit cells to be filled with mortar, to prevent mortar from dropping into unfilled cells below.

9. Masonry indicated as being reinforced shall have all voids filled solid with grout. Grout shall be consolidated in place by vibration or other methods which ensure complete filling of cells. When the least clear dimension of the grouted cell is less than two (2) inches, the maximum height of grout pour shall not exceed twelve (12) inches. When the least clear dimension is two (2) inches or more, maximum height of grout pour shall not exceed forty-eight (48) inches. When grouting is stopped for one (1) hour or longer, the grout pour shall be stopped 1-1/2" below the top of a masonry unit. Vertical bar reinforcing shall be accurately placed and held in position while being grouted and shall be in place before grouting starts. All such reinforcing shall have a minimum clear cover of 5/8". Lap all bars a minimum of forty (40) bar diameters and provide steel spacer ties (not to exceed 192 bar diameter) to secure and position all vertical steel and prevent displacement during grouting. Provide continuous horizontal reinforcement embedded in mortar joints every second course.

E. Cutting and Patching

1. All exposed masonry which requires cutting or fitting shall be cut accurately to size with motorized carborundum or diamond saw, producing cut edges.

2. Do not saw cut any masonry openings in face brick construction without Commissioner's approval and after a procedure has been reviewed and approved.

3. Holes made in exposed masonry units for attachment of handrail brackets and similar items shall be neatly drilled to proper size.

4. All masonry which requires patching in exposed work, if approved by the Commissioner, shall be patched neatly with mortar to match appearance of masonry as closely as possible and to the Commissioner's satisfaction. Rake back joints and use pointing mortar to match as required.

F. Solid Wall Construction

1. Fill the vertical longitudinal joint between wythes solidly with mortar by parging the in-place wythe and shoving units into the parging.

2. Tie wythes with continuous horizontal reinforcement embedded in mortar joints sixteen (16) inches o.c. vertically.

G. Cavity Walls

1. All exterior masonry walls, unless otherwise indicated, shall be cavity walls of thickness indicated.

2. Two wythes of masonry cavity walls shall be securely tied together by horizontal joint reinforcement and ties anchored to reinforcement, as herein specified, spaced every other block course.

   a. Where cavity back-up is concrete use ties specified herein spaced sixteen (16) inches o.c. both directions.

3. Cavity between facing and backing wythe shall be kept clean and clear of all mortar droppings, and no mortar ledges shall project into the cavity. Temporary wood strips, cut to width of cavity and fitted with lift-up wires, shall be laid on the joint reinforcement and carefully lifted out before placement of the next layer of reinforcement. Any projecting mortar shall be spread over the back of the outer wythe immediately following the setting of the masonry unit.

   a. Mortar net shall be installed at the bottom of each cavity over the flashing to protect weep holes.

4. At cavity and solid walls adjacent to window openings fill block solid with mortar where window anchors are to be located.

5. Concrete block back-up at cavity wall construction shall be anchored to slab at top with dovetail anchors spaced sixteen (16) inches o.c.

6. Anchor CMU back-up with anchors as specified herein.

7. Refer to Section 07 21 00, "Thermal Insulation," for material and installation of cavity wall insulation.

H. Interior Block Partitions

1. Build to full height unless otherwise shown on drawings. At non-rated partitions, fill void between CMU and structural deck with continuous neoprene filler conforming to the requirements of Article 2.1 herein. At fire rated partitions, fill void with fire stop material meeting the requirements of Section 07 84 13, Firestops and Smokeseals. Fasten to structure at top of partition using steel angles as specified herein.

2. Provide continuous horizontal joint reinforcing every other block course, except as otherwise noted. Fully embed longitudinal side rods in mortar for their entire length with a minimum cover of 5/8". Lap reinforcement a minimum of six (6) inches at ends of units.

3. Provide continuity at corners and wall intersections by use of prefabricated "L" and "T" sections. Cut and bend units as directed by manufacturer for continuity at returns, offsets, column fireproofing, pipe enclosures and other special conditions.

4. Corners

   a. Provide interlocking masonry unit bond in each course at corners.
   b. Provide continuity at corners with prefabricated "L" reinforcement units, in addition to masonry bonding.

5. Intersecting and Abutting Walls

   a. Unless vertical control joints are shown as part of structural frame, provide interlocking masonry bond. Provide starters and special shapes as shown on the drawings to bond these walls.
   b. In addition to masonry bonding, provide horizontal reinforcement using prefabricated "T" units at interior partitions.

I. Ties and Anchors for Masonry Construction

1. Provide ties and anchors as shown or specified, but not less than one metal tie, spaced not to exceed sixteen (16) inches o.c. horizontally and/or vertically. Provide additional ties within 1'-0" of all openings and adjacent to expansion joints and spaced not more than 16" apart around perimeter of openings.

2. Anchoring Masonry to Structure: Provide an open space not less than 1/2" in width between masonry and structural member, unless otherwise shown. Keep open space free of mortar or other rigid materials.

3. Attach brick veneer to cold formed metal framing by anchoring brick to studs using specified anchors penetrating through sheathing and through flange of stud. Prior to application of anchors cover sheathing and vapor barrier with tape specified herein. Space anchors 8" o.c. at each stud; provide stainless steel screw anchors for attaching anchor to studs.

J. Control and Expansion Joints: Provide expansion, control and isolation joints in masonry as shown. Build in related items as the masonry work progresses.

1. CMU Control Joint Spacing: If location of control joints is not shown, place vertical joints spaced not to exceed 20'-0" o.c. In addition, locate joints at points of natural weakness in the masonry work, including the following:

   a. At structural column or joint between bay.
   b. Above control joints in the supporting structure.
   c. Above major openings at end of lintels upward and below at ends of sills downward. Place at one side of jamb for openings not less than 7'-0" wide and at both sides for openings over 6'-0" wide.
   d. At reduction of wall thickness.

e. Where masonry abuts supporting structure.
f. If additional joints are required, indicate them on approved shop drawings.

2. Brick Veneer Expansion Joint Spacing: Vertical expansion joints in brick veneer construction shall be located maximum 20'-0" o.c. unless otherwise noted in addition to expansion joints located within 2'-0" of each corner of the building.

K. Lintels: For concrete block walls, use specially formed U-shaped concrete block lintel units with reinforcing bars in accordance with the following table, filled with grout.

Number and Size of Reinforcing Bars Required at Concrete Block Lintels		
Maximum Clearance Span	Wall Width	Rebar No. - Size
2'-0" to 6'-0" 6'-0" to 8'-0"	6"	2 - #3 2 - #4
2'-0" to 6'-0" 6'-0" to 8'-0"	8"	2 - #3 2 - #4
2'-0" to 6'-0" 6'-0" to 8'-0"	12"	3 - #3 3- #4

3.3 FLASHING/WEEP HOLES

A. General: Install embedded flashing and weep holes in masonry at relieving angles, shelf angles, lintels, ledges, other obstructions to the downward flow of water in the wall, and where indicated. Space weeps 16" o.c. unless otherwise shown on drawings. Weeps shall occur immediately above the flashing.

B. Prepare masonry surfaces so that they are smooth and free from projections that could puncture flashing.

C. Flashing shall be placed, generally, at bottoms of cavity wall construction, over all wall openings, window jambs, at sills of window, and in other locations where indicated on the drawings. Flashing shall overlap a minimum of 6". At bottoms of cavity walls, the flashing shall be built extending from the exterior face of the brick, up and into the mortar joint 2" at the inner wythe of the CMU back-up; at sheathed areas attached with pressure bar. At concrete spandrel beams and columns the flashing shall be installed with a termination bar. Extreme care shall be exercised in placing the masonry materials not to damage the flashing. Flashing damaged during the masonry erection shall be repaired or replaced by the Contractor at no additional cost to the City of New York. Discontinuous flashing shall terminate with an end dam in a head joint, rising at least 1".

D. When spanning an air space, flashing shall be supported with a mortar wash, insulation or treated wood blocking.

E. Where flashing is penetrated by anchors, patch flashings at penetration using adhesive and mastic recommended by the manufacturer to ensure watertight seal.

F. Install flashing in accordance with manufacturer's instructions, using adhesive, primer, thinner, cleaner and mastic as recommended by flashing manufacturer.

1. Flashing shall overlap adjacent piece of flashing a minimum of 6".

G. Provide drip edge when flashing extends beyond face of brick.

3.4 CLEANING, PROTECTION, ADJUSTMENT

A. Protection: The Contractor shall take adequate precautions for the protection of all surfaces against mortar spatter and shall immediately remove any such spatter should it inadvertently occur, leaving no stain or discoloration.

1. Excess mortar shall be wiped off the masonry surfaces as the work progresses.

2. Wood coverings shall be placed over all such masonry surfaces as are likely to be damaged during the progress of the entire project.

3. Protective measures shall be performed in a manner satisfactory to the Commissioner.

4. Damaged masonry units shall be replaced to satisfaction of the Commissioner.

B. Cleaning of Masonry: Upon completion, all exposed masonry shall be thoroughly cleaned following recommendations of the BIA Technical Note No. 20. Before applying any cleaning agent to the entire wall, it shall be applied to a sample wall area of approximately 4' x 4' in a location approved by the Commissioner. No further cleaning work may proceed until the sample area has been approved by the Commissioner, after which time the same cleaning materials and method shall be used on the remaining wall area. If stiff brushes and water do not suffice, the surface shall be thoroughly saturated with clear water and then scrubbed with a solution of an approved detergent masonry cleaner, equal to "Vana Trol" made by ProSoCo Inc. or equal made by Diedrich, EaCo Chem, Inc. or approved equal, mixed as per manufacturer's directions, followed immediately by a thorough rinsing with clear water. All lintels and other corrodible parts shall be thoroughly protected during cleaning.

1. Unless otherwise required by cleaning agent manufacturer use only low pressure device (30 to 50 psi) for application of cleaning agent and water rinsing.

C. Pointing: Point any defective joint with mortar identical with that specified for that joint.

END OF SECTION 04 20 00

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SECTION 04 90 00
Masonry Restoration and Cleaning

PART I - GENERAL

1.1 RELATED DOCUMENTS

A. The following documents apply to all required work for the Project: (1) the Contract Drawings, (2) the Specifications, (3) the General Conditions, (4) the Addendum and (5) the Contract (City of New York Standard Construction Contract).

B. Environmentally Preferable Purchase (EPP) General Requirements:

1. Refer to the Addendum to the General Conditions

1.2 SUMMARY

A. Section includes:

1. Cleaning down existing face brick walls.
2. Repointing existing face brick walls.
3. Replacing existing damaged face brick.

B. Related Sections

1. Unit Masonry - Section 04 20 00.
2. Interior Joint Sealants - Section 07 92 00.

1.3 QUALITY ASSURANCE

A. Refer to DDC General Conditions Section 01 40 00 "Quality Requirements".

B. Field-Constructed Mock-Ups: Prior to start of general masonry and stone restoration, prepare the following sample panels on the building where directed by Commissioner. Obtain Commissioner's acceptance of visual qualities before proceeding with the work. Retain acceptable panels in undisturbed condition, suitably marked, during construction as a standard for judging completed work.

1. Cleaning: Demonstrate materials and methods to be used for cleaning each type of masonry surface and condition on sample panels of approximately 25 sq. ft. in area.

   a. Test adjacent non-masonry materials for possible reaction with cleaning materials.
   b. Allow waiting period not less than seven (7) calendar days, after completion of sample cleaning to permit study of sample panels for negative reactions.

2. Repointing: Prepare two (2) separate sample areas of approximately 3' high by 6' wide for each type of repointing required, one for demonstrating methods and quality of workmanship expected in removal of mortar from joints and the other for demonstrating quality of materials and workmanship expected in pointing mortar joints.

1.4 SUBMITTALS

A. Refer to DDC General Conditions Section 01 33 00 "Submittal Procedures".

B. Product Data: Submit manufacturers' technical data for each product indicated including recommendations for their application and use. Include test reports and certifications substantiating that products comply with requirements.

C. Restoration Program: Submit written program for each phase of restoration process including protection of surrounding materials on building and site during operations. Describe in detail materials, methods and equipment to be used for each phase of restoration work.

1.5 DELIVERY, STORAGE AND HANDLING

A. Carefully pack, handle, and ship masonry units and accessories strapped together in suitable packs or pallets or in heavy cartons. Unload and handle to prevent chipping and breakage.

B. Protect masonry restoration materials during storage and construction from wetting by rain, snow or ground water, and from staining or intermixture with earth or other types of materials.

C. Protect grout, mortar and other materials from deterioration by moisture and temperature. Store in a dry location or in waterproof containers. Keep containers tightly closed and away from open flames. Protect liquid components from freezing. Comply with manufacturer's recommendations for minimum and maximum temperature requirements for storage.

1.6 PROJECT CONDITIONS

A. Clean masonry surfaces only when air temperatures are 40 deg. F. and above and will remain so until masonry has dried out, but for not less than seven (7) days after completion of cleaning.

B. Do not repoint mortar joints or repair masonry unless air temperatures are between 40 deg. F. and 80 deg. F. and will remain so for at least forty-eight (48) hours after completion of work.

C. Prevent grout or mortar used in repointing and repair work from staining face of surrounding masonry and other surfaces. Immediately remove grout and mortar in contact with exposed masonry and other surfaces.

D. Protect sills, ledges and projections from mortar droppings.

1.7 SEQUENCING/SCHEDULING

A. Perform masonry restoration work in the following sequence:

1. Repair existing masonry including replacing existing masonry with new masonry materials.
2. Rake-out existing mortar from joints indicated to be repointed.
3. Repoint existing mortar joints of masonry indicated to be restored.
4. Clean existing masonry surfaces.

PART II - PRODUCTS

2.1 MASONRY MATERIALS

A. Provide face brick conforming to the requirements of Section 04 20 00, Unit Masonry.

B. For mortar materials, conform to the requirements of Section 04 20 00, Unit Masonry.

2.2 CLEANING MATERIALS AND EQUIPMENT

A. Water for Cleaning: Clean, potable, free of oils, acids, alkalis, salts, and organic matter.

B. Alkaline Prewash Cleaner: Manufacturer's standard alkaline cleaner for prewash applications only which are followed by acidic cleaner of type indicated for afterwash.

1. Manufacturers: Subject to compliance with requirements, provide:

a. ProSoCo, Inc.; Sure Klean 766 Prewash
b. Diedrich Chemicals
c. Cathedral Stone Products
d. Or approved equal

C. Acidic Cleaner: Manufacturer's standard strength acidic masonry restoration cleaner composed of hydrofluoric acid blended with other acids including trace of phosphoric acid and combined with special wetting systems and inhibitors.

1. Basis of Design Product: Subject to compliance with requirements, provide Diedrich Chemicals; Diedrich 101 Masonry Restorer or comparable product by one of the following:
   a. ProSoCo, Inc.
   b. Cathedral Stone Products.
   c. Or approved equal

D. Liquid Strippable Masking Agent: Manufacturer's standard liquid, film forming, strippable masking material for protecting glass, metal and polished stone surfaces from damaging effect of acidic and alkaline masonry cleaners.

1. Basis of Design Product: Subject to compliance with requirements, provide Diedrich Chemicals; Diedrich Acid Guard or comparable product by one of the following:
   a. ProSoCo, Inc.
   b. Cathedral Stone Products.
   c. Or approved equal

E. Spray Equipment: Provide equipment for controlled spray application of water and chemical cleaners, at rates required by the manufacturer, measured at spray tip, and for volume.

1. For spray application of chemical cleaners provide low-pressure tank or chemical pump suitable for chemical cleaner indicated, equipped with cone-shaped spray-tip.

2. For spray application of water provide fan-shaped spray-tip which disperses water at angle of not less than 15 degrees.

2.3 MORTAR MIXES

A. Measuring and Mixing: Measure cementitious and aggregate material in a dry condition by volume or equivalent weight. Do not measure by shovel, use known measure. Mix materials in a clean mechanical batch mixer.

1. Mixing Pointing Mortar: Thoroughly mix cementitious and aggregate materials together before adding any water. Then mix again adding only enough water to produce a damp, unworkable mix which will retain its form when pressed into a ball. Maintain mortar in this dampened condition for 1-to-2 hours. Add remaining water in small portions until mortar of desired consistency is reached. Use mortar within thirty (30) minutes of final mixing; do not retemper or use partially hardened material.

B. Colored Mortar: Produce mortar of color required by use of selected coloring agent.

C. Do not use admixtures of any kind in mortar, other than colorant.

D. Mortar Proportions

1. Pointing Mortar for Brick: One part white Portland cement, 2 parts lime and 6 parts colored mortar aggregate. Add colored mortar pigment to product mortar colors required to match.

2. Rebuilding Mortar: Comply with ASTM C 270, Proportion Specification, Type N, with cementitious material content limited to Portland cement-lime and coloring agent.

PART III - EXECUTION

3.1 EXECUTION REQUIREMENTS

A. Refer to DDC General Conditions for execution requirements.

3.2 PROTECTION

A. General: Comply with recommendations of manufacturers of chemical cleaners for protecting building surfaces against damage from exposure to their products.

B. Protect persons, motor vehicles, surrounding surfaces of building whose masonry surfaces are being restored, building site, and surrounding buildings from injury resulting from masonry restoration work.

1. Prevent chemical cleaning solutions from coming into contact with pedestrians, motor vehicles, landscaping, buildings and other surfaces which could be injured by such contact.

2. Do not clean masonry during winds of sufficient force to spread cleaning solutions to unprotected surfaces.

3. Dispose of run-off from cleaning operations by legal means and in manner which prevents soil erosion, undermining of paving and foundations, damage to landscaping, and water penetration into building interiors.

4. Erect temporary protection covers over pedestrian walkways and at points of entrance and exit for persons and vehicles which must remain in operation during course of masonry restoration work.

C. Protect glass, unpainted metal trim and polished stone from contact with acidic chemical cleaners by covering them with liquid strippable masking agent or polyethylene film and waterproof masking tape. Apply masking agent to comply with manufacturer's recommendations. Do not apply liquid masking agent to painted or porous surfaces.

3.3 CLEANING EXISTING MASONRY, GENERAL

A. Proceed with cleaning in an orderly manner; work from top to bottom of each scaffold width and from one end of each elevation to the other.

B. Use only those cleaning methods indicated for each masonry material and location.

C. Perform each cleaning method indicated in a manner which results in uniform coverage of all surfaces, including corners, moldings, interstices and which produces an even effect without streaking or damage to masonry surfaces.

D. Rinse off chemical residue and soil by working upwards from bottom to top of each treated area at each stage or scaffold setting.

E. Water Application Methods: Prior to chemical cleaning, apply water application to mock-ups by spray at various pressures to determine if masonry surfaces can be cleaned adequately and to the Commissioner's satisfaction in this manner. If water applications prove ineffective, proceed with chemical cleaners.

F. Chemical Cleaner Application Methods: Apply chemical cleaners to masonry surfaces to comply with chemical manufacturer's recommendations. Do not allow chemicals to remain on surface for periods longer than that indicated or recommended by manufacturer.

1. For hard to remove dirt or grime, apply pre-wash cleaner prior to application of chemical cleaner; follow manufacturer's instructions.

3.4 BRICK REMOVAL AND REBUILDING

A. Brick Removal

1. Carefully remove by hand any brick which are damaged, spalled or deteriorated. Cut out full units from joint to joint and in manner to permit replacement with full size units.

2. Support and protect masonry indicated to remain which surrounds removal area.

3. Salvage as many whole, undamaged bricks as possible.

4. Remove mortar, loose particles and soil from salvaged brick by cleaning with brushes and water. Store brick for reuse.

5. Clean remaining brick at edges of removal areas by removing mortar, dust, and loose debris in preparation for rebuilding.

B. Brick Rebuilding

1. Install new or salvaged brick to replace removed brick. Fit replacement units into bonding and coursing pattern of existing brick. If cutting is required use motor driven saw designed to cut masonry with clean, sharp unchipped edges.

2. Lay replacement brick with completely filled bed, head and collar joints. Butter ends with sufficient mortar to fill head joints and shove into place. Wet clay brick which have ASTM C 67 initial rates of absorption (suction) of more than 30 grams per 30 sq. in. per minute. Use wetting methods which ensure that units are nearly saturated but surface dry when laid. Maintain joint width for replacement units to match existing.

3. Tool exposed mortar joints in repaired areas to match joints of surrounding existing brickwork.

3.5 REPOINTING EXISTING MASONRY

A. Joint Raking

1. Rake out mortar from joints to depths equal to 2-1/2 times their widths but not less than 1/2" nor less than that required to expose sound, unweathered mortar.

2. Remove mortar from masonry surfaces within raked-out joints to provide reveals with square backs and to expose masonry for contact with pointing mortar. Brush, vacuum or flush joints to remove dirt and loose debris.

3. Do not spall edges of masonry units or widen joints. Replace any masonry units which become damaged.

   a. Cut out old mortar by hand with chisel and mallet.
   b. Power operated rotary hand saws and grinders will be permitted but only on specific written approval of Commissioner based on submission by Contractor of a satisfactory quality control program and demonstrated ability of operators to use tools without damage to masonry. Quality control program shall include provisions for supervising performance and preventing damage due to worker fatigue.

B. Joint Pointing

1. Rinse masonry joint surfaces with water to remove any dust and mortar particles. Time application of rinsing so that, at time of pointing, excess water has evaporated or run off, and joint surfaces are damp but free of standing water.

2. Apply first layer of pointing mortar to areas where existing mortar was removed to depths greater than surrounding areas. Apply in layers not greater than 3/8" until a uniform depth is formed. Compact each layer thoroughly and allow to become thumbprint-hard before applying next layer.

3. After joints have been filled to a uniform depth, place remaining pointing mortar in three (3) layers with each of first and second layers filling approximately 2/5 of joint depth and third layer the remaining 1/5. Fully compact each layer and allow to become thumbprint hard before applying next layer. Where existing bricks have rounded edges recess final layer slightly from face. Take care not to spread mortar over edges onto exposed masonry surfaces, or to featheredge mortar.

4. When mortar is thumbprint hard, tool joints to match original appearance of joints, unless otherwise indicated. Remove excess mortar from edge of joint by brushing.

5. Cure mortar by maintaining in a damp condition for not less than seventy-two (72) hours.

6. Where repointing work precedes cleaning of existing masonry allow mortar to harden not less than thirty (30) days before beginning cleaning work.

END OF SECTION 04 90 00

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SECTION 05 12 00
Structural Steel

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The following documents apply to all required work for the Project: (1) the Contract Drawings, (2) the Specifications, (3) the General Conditions, (4) the Addendum, and (5) the Contract (City of New York Standard Construction Contract).

B. LEED General Requirements:

1. Refer to DDC General Conditions

   a. Section 01 33 00 "Submittal Procedures"

   b. Section 01 74 19 "Construction Waste Management and Disposal"

   c. Section 01 81 13.04 "Sustainable Design Requirements for LEED v4 Buildings"

C. Refer to other Divisions of these specifications to determine the type and extent of work therein affecting the work of this trade, whether or not such work is specifically mentioned in this Section.

1.2 SUMMARY

A. The Work includes labor, materials, equipment, and services required for completion of Work under this Section as shown on Drawings and as specified here.

B. This Section includes the following:

1. Structural steel.
2. Steel deck support angles.
3. Column base plate leveling nuts and/or shim packs.
4. Field Installed headed shear studs.
5. Grout.
6. Hot-dip galvanizing of steel material.
7. Shop priming and or painting of steel material.

C. Related Sections include the following:

1. DDC General Conditions for independent testing agency procedures and administrative requirements.
2. DDC General Conditions for general submittal procedures.
3. Division 5 Section "Steel Decking" for field installation of shear connectors.

4. Division 5 Section "Miscellaneous Metals" for steel lintels or shelf angles not attached to structural-steel frame, miscellaneous steel fabrications, and other metal items not defined as structural steel.

5. Division 9 "Painting and Finishing" and Division 7 Section "Intumescent Fireproofing" for surface preparation and priming requirements.

D. Work furnished under this Section and installed under other Sections:

1. Division 3 Section "Cast-in-Place Concrete" and "Architectural Cast-in-Place Concrete": Installation of structural shapes, bolts, angles, plates, and inserts embedded in new concrete.

1.3 DEFINITIONS

A. Structural Steel: Elements of structural-steel frame, as classified by AISC Code of Standard Practice for Steel Buildings and Bridges, that support design loads.

B. Special Inspector: Personnel performing testing and inspection as specified and as required by the 2014 New York City Building Code.

C. Contractor's Engineer: Professional Structural Engineer licensed in the State of New York, responsible for the structural design of connections.

1.4 PERFORMANCE REQUIREMENTS

A. Detailing: Detail structural members, connections, accessories, and temporary components required for transportation and erection.

1. Refer to Architectural details for miscellaneous items, tolerances, and provisions to be made for the attachment of other materials.

2. Where indicated as requiring coordination, refer to approved mechanical shop drawings for exact location and dimensions of supports for mechanical equipment and penetrations.

B. Connections: Detail all connections to withstand loads indicated and comply with concepts, prescriptions, and restrictions indicated.

1. Where appropriate, select and complete connections using schematic details indicated and AISC Manual of Steel Construction, Load and Resistance Factor Design.

2. Engineering Responsibility: Fabricator's responsibilities include using a Professional Engineer Licensed in the State of New York to prepare structural analysis data for structural-steel connections.

C. Construction: Type 2, simple framing

1.5 SUBMITTAL PROCEDURES

Refer to DDC General Conditions Section 01 33 00 – Submittal Procedures.

1.6 SUBMITTALS

A. International Code Council Evaluation Service Reports. For each type of product indicated where product other than that specified in Construction Documents is proposed for use. Use shall be subject to Commissioner's approval.

1. Expansion anchors.

2. Adhesive anchors.

B. Product Data: For each type of product indicated including but not limited to the following:

1. Expansion anchors.

2. Adhesive anchors.

3. Welding filler metals and fluxes.

4. Galvanizing repair paint.

C. Shop Drawings: Show fabrication of structural-steel components.

1. Before submitting Shop Drawings to the Commissioner, precheck the shop drawings for conformity of details to the Contract Documents and as coordinated with other work. Include signature of Contractor's representative indicating that the drawings have been prechecked. The Contractor is wholly responsible for the conformity of dimensions and details of the shop drawings with the Contract Documents.

2. Submit Job Standard Connection details and calculations before detail drawings. Submit connection information in tabular form with:

a. Weld sizes.

b. Sizes and material of connecting elements.

c. Number, size, and type of bolt.

d. Material; minimum thickness of supporting member part.

e. Material and minimum thickness of supported member part.

3. Submit erection plans before or with detail drawings.

4. Resubmitted Drawings

a. Clearly and individually identify changes in resubmitted shop drawings whether the change results from a review comment or not.

b. Date and identify each shop drawing issue.

c. Identify each shop drawing by the same drawing number throughout the duration of the Project.

5. Include on detail drawings:

   a. Details and dimensions of all pieces.

   b. Steel material designation.

   c. Surface preparation and finish.

   d. Details of cuts, connections, splices, camber, holes, welds, bolts and other pertinent data.

   e. Identification marks cross-referenced to erection plans.

6. Include embedment drawings.

7. Prepare details avoiding interference of steel connections, gussets, and bracing elements with architectural details, shaft openings, and wall openings.

8. Indicate welds by standard AWS symbols, distinguishing between shop and field welds, and show size, length, and type of each weld.

9. Indicate type, size, and length of bolts, distinguishing between shop and field bolts. Identify pretensioned and slip-critical high-strength bolted connections.

10. For structural-steel connections indicated to comply with design loads, include structural analysis data signed and sealed by the Fabricator's Engineer responsible for their preparation. The Fabricator's Engineer designing connections shall be a Professional Engineer licensed in the State of New York.

11. Approval of the Shop Drawings is for size and arrangement of principal and auxiliary members and conformance of connections. Approval does not relieve the Contractor's responsibility for dimensions, fabrications, and correct fitting of structural members.

D. Connection Design

1. Immediately upon submission of Job Standard Connection details and/or erection drawings, submit an affidavit from the Fabricator's Engineer, whose registration number shall appear on the affidavit, stating the following: "All connections and details required to resist the loads and reactions shown on the Contract Drawings and as specified, excepting those completely designed and detailed on the Contract Documents will be designed by me personally or by qualified personnel under my direct supervision."

2. At the completion of the work, the same Fabricator's Engineer shall submit an affidavit stating: "All connections and details required to resist the loads and reactions shown on the Contract Drawings and as specified, excepting those completely designed and detailed on the Contract Documents have been designed by me personally or by qualified personnel under my direct supervision."

E. Forces imposed on base building structure by temporary attachments for bracing of cranes, hoists, or any other equipment imposing loads on the structure during construction. Provide drawings and calculations of temporary bracing stamped and signed by a Professional Engineer licensed in the State of New York.

F. Welding Procedure Specifications including Qualification Test Reports for welds qualified by test, for each class of weld to be incorporated in the work

G. Welding certificates.

H. Qualification Data: For Installer, Fabricator, Fabricator's Engineer, Fabricator's quality control agency if separate from fabricator.

I. Mill Test Reports: Signed by manufacturers certifying that the following products comply with requirements:

1. Structural steel including chemical and physical properties.
2. Bolts, nuts, and washers including mechanical properties and chemical analysis.
3. Tension-control, high-strength bolt-nut-washer assemblies.
4. Shear stud connectors.
5. Shop primers.
6. Nonshrink grout.

J. Source quality-control test reports.

K. Galvanizing: Submit an original and two copies of the coating applicator's notarized Certificate of Compliance that the hot-dip galvanized coating meets or exceeds the specified requirements of ASTM A123 or ASTM A153 as applicable.

L. Fabrication and Erection Errors: Notify Commissioner of fabrication or erection errors requiring field work. Before performing corrective work, submit for review and approval description of field work.

1.7 QUALITY ASSURANCE

A. Refer to DDC General Conditions Section 01 40 00 – Quality Requirements.

B. Installer Qualifications: A qualified installer who participates in the AISC Quality Certification Program and is designated an AISC-Certified Erector, Category CSE.

C. Fabricator Qualifications: A qualified fabricator who participates in the AISC Quality Certification Program and is designated an AISC-Certified Plant, Category BU.

D. Shop-Painting Applicators: Qualified according to AISC's Sophisticated Paint Endorsement SPE or SSPC-QP 3 – Standard Procedure for Evaluating Qualifications of Shop Painting Applicators.

E. Galvanizing Applicators: Company specializing in hot-dip galvanizing after fabrications and following the procedures of the Quality Assurance Manual of the American Galvanizers Association.

F. Welding: Qualify procedures and personnel according to AWS D1.1 – Structural Welding Code – Steel.

G. Comply with applicable provisions of the following specifications and documents as amended herein:

1. AISC Code of Standard Practice for Steel Buildings and Bridges, 2016 Edition.
2. AISC Seismic Provisions for Structural Steel Buildings and Supplement No. 2.

3. AISC Load and Resistance Factor Design Specification for Structural Steel Buildings.

4. AISC Specification for the Design of Steel Hollow Structural Sections.

5. AISC Specification for Load and Resistance Factor Design of Single-Angle Members.

6. RCSC Specification for Structural Joints Using ASTM A325 or A490 Bolts, 2000 Edition.

7. AWS Structural Welding Code – Steel.

8. SSPC Society for Protective Coatings: Steel Structures Painting Manual, Vol. 2.

9. GA Inspection of Products Hot-Dip Galvanized After Fabrication.

H. Mockups: Build mockups of architecturally exposed structural steel to set quality standards for fabrication and installation.

1. Coordinate finish painting requirements with Division 9 painting Sections.

2. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

I. The City of New York shall employ a Special Inspector to oversee and administer, and an independent Testing Agency(s) to perform, a Program of Structural Tests and Inspections for compliance with Chapter 17 of the 2014 New York City Building Code.

1. The Special Inspector will organize and direct the test and inspection program. All inspection and test reports shall be submitted to the Contractor and the Commissioner. The Contractor shall be responsible for understanding the test and inspection program and notifying the Testing Agency and the Special Inspector when work is ready for tests and/or inspections. The Contractor will provide access to the Testing Agency and Special Inspector. Inspections and tests of the Program of Structural Tests and Inspections will not relieve the Contractor of responsibility for supervision, testing, and inspection for quality control of the work.

2. Provide testing and inspection reports to the New York City Department of Buildings when requested by the New York City Department of Buildings. Upon completion of the construction, the Special Inspector will make a final report on the satisfactory completion of the Program for Structural Tests and Inspection to the New York City Department of Buildings and to the Commissioner.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Store materials to permit easy access for inspection and identification. Keep steel members off ground and spaced by using pallets, dunnage, or other supports and spacers. Protect steel members and packaged materials from corrosion and deterioration.

1. Store fasteners in a protected place. Clean and relubricate bolts and nuts that become dry or rusty before use.

2. Do not store materials on structure in a manner that might cause distortion, damage, or overload to members or supporting structures. Repair or replace damaged materials or structures as directed.

3. Load and store galvanized articles in accordance with accepted industry standards.

1.9 COORDINATION

A. Furnish anchorage items to be embedded in or attached to other construction without delaying the Work. Provide setting diagrams, sheet metal templates, instructions, and directions for installation.

1.10 PREINSTALLATION CONFERENCES

A. Hold one conference at least thirty (30) days before the start of Shop Drawings and one at least thirty (30) days before start of erection.

B. Pre Shop Drawing Conference

1. Agenda to cover but not be limited to the following:

   a. Connection calculations.

   b. Procedures for review of submissions.

   c. Detailing procedures and preferences.

   d. Connection details.

   e. Welding procedures.

   f. Submission procedures.

   g. Requests for information (RFI) procedures.

   h. Fabrication procedures and preferences.

   i. Specification and design drawing requirements.

2. Pre shop drawing conference attendees include but are not limited to:

   a. Contractor.

   b. Contractor's Superintendent.

   c. Contractor's Assistant Superintendent or equivalent responsible for the structural steel.

   d. Fabricator's representative.

   e. Professional Engineer licensed in the State of New York performing connection calculations.

   f. Commissioner.

C. Pre-erection Conference: Conduct conference at Project site to comply with requirements in DDC General Conditions.

1. Agenda to cover but not be limited to the following:

a. Anchor bolt conditions.

b. Welding procedures and welder qualifications.

c. Bolting procedures.

d. Methods, equipment, and sequencing of erection.

e. Inspection.

f. Metal deck and stud installation.

g. Corrective measures in field.

2. Pre-erection conference attendees include but are not limited to:

a. Contractor.

b. Contractor's Superintendent.

c. Contractors steel assistant superintendent or equivalent.

d. Fabricator's representative.

e. Metal deck erectors representative (if different from steel erector).

f. Commissioner.

g. Inspection and Testing Agency

D. Contractor to record, type, and distribute minutes of meeting to all attendees.

E. Notify attendees at least ten (10) days before the scheduled date of the conference.

PART 2 - PRODUCTS

2.1 MATERIALS

A. W-Shapes: ASTM A992/A992M.

B. Rolled Sections in ASTM A 6 Groups 3, 4, and 5: Supply with Charpy V-notch testing in accordance with ASTM A6 Supplementary Requirement S5. Conduct impact tests in accordance with ASTM A673 Frequency (P) Piece Testing. Meet minimum average impact value of 20 ft-lbs. Absorbed energy at +70°F.

C. Channels and Angles: ASTM A36/A36M.

D. Plate and Bar: ASTM A36/A36M.

E. Cold-Formed Hollow Structural Sections: ASTM A 500, Grade B or C, structural tubing.

F. Welding Electrodes for All Complete Joint Penetration Welds: Shall be rated as providing minimum Charpy V-Notch toughness of 20 ft-lbs at 0°F.

G. Other Welding Electrodes: Comply with AWS requirements.

2.2 BOLTS, CONNECTORS, AND ANCHORS

A. High-Strength Bolts, Nuts, and Washers: ASTM A325, Type 1, heavy hex steel structural bolts; ASTM A563 heavy hex carbon-steel nuts; and ASTM F36 hardened carbon-steel washers; all with plain finish.

B. High-Strength Bolts, Nuts, and Washers: ASTM A490, Type 1, heavy hex steel structural bolts; ASTM A563 heavy hex carbon-steel nuts; and ASTM F436 hardened carbon-steel washers; all with plain finish.

C. Zinc-Coated High-Strength Bolts, Nuts, and Washers: ASTM A 325, Type 1, heavy-hex steel structural bolts; ASTM A563, Grade DH heavy-hex carbon-steel nuts; and ASTM F 436, Type 1, hardened carbon-steel washers.

1. Finish: Hot-dip zinc coating.

D. Tension-Control, High-Strength Bolt-Nut-Washer Assemblies: ASTM F1852, Type 1, heavy hex, round head steel structural bolts with splined ends; ASTM A563 heavy hex carbon-steel nuts; and ASTM F436 hardened carbon-steel washers.

1. Finish: Plain.

E. Shop Installed Shear Connectors: ASTM A108, Grades 1015 through 1020, headed-stud type, cold-finished carbon steel; AWS D1.1, Type B.

F. Unheaded Anchor Rods: ASTM F1554, Grade 55, weldable.

1. Configuration: Straight.

2. Nuts: ASTM A563 heavy hex carbon steel.

3. Plate Washers: ASTM A36/A36M carbon steel.

4. Washers: ASTM F436 hardened carbon steel.

5. Finish: Plain.

G. Threaded Rods: A 572/A 572M, Grade 50.

1. Nuts: ASTM A 563 heavy hex carbon steel.

2. Washers: ASTM F 436 hardened, carbon steel.

3. Finish: Plain.

2.3 EXPANSION ANCHORS

A. Products: Subject to compliance with requirements, provide one of the following:

1. Hilti Kwik Bolt TZ.

2. Kelken Construction Systems
3. Allfastners
4. Or approved equal

2.4 ADHESIVE ANCHORS

A. Products: Subject to compliance with requirements, provide one of the following:

1. Hilti HY RE 500 System.
2. Kelken Construction Systems
3. Allfastners
4. Or approved equal

B. Rods: ASTM A36 or ASTM A307 Carbon Steel.

C. Nuts and Washers: Match rod material.

2.5 PRIMER

A. Primer: SSPC-Paint 25 BCS, Type II, zinc oxide, raw linseed oil, and alkyd.

B. Galvanizing Repair Paint: SSPC-Paint 20.

1. ZRC Cold Galvanizing Compound.
2. Brite Zinc by Brite Products.
3. Duncan Glavanizing Corp.
4. Or approved equal

2.6 GROUT

A. Nonmetallic, Shrinkage-Resistant Grout: ASTM C1107, factory-packaged, nonmetallic aggregate grout, noncorrosive, non-staining, mixed with water to consistency suitable for application and a 30-min. working time.

2.7 FABRICATION

A. Structural Steel: Fabricate and assemble in shop to greatest extent possible. Fabricate according to AISC Code of Standard Practice for Steel Buildings and Bridges and AISC Load and Resistance Factor Design Specification for Structural Steel Buildings.

1. Camber structural-steel members where indicated.
2. Identify high-strength structural steel according to ASTM A6/A6M and maintain markings until structural steel has been erected.

3. Mark and match-mark materials for field assembly.

4. Complete structural-steel assemblies, including welding of units, before starting shop-priming operations.

B. Thermal Cutting: Perform thermal cutting by machine to greatest extent possible.

1. Plane thermally cut edges to be welded to comply with requirements in AWS D1.1.

C. Bolt Holes: Cut, drill, or punch standard bolt holes perpendicular to metal surfaces.

D. Finishing: Accurately finish ends of columns and other members transmitting bearing loads.

E. Cleaning: Clean and prepare steel surfaces that are to remain unpainted according to SSPC-SP 3 – Power Tool Cleaning.

F. Shear Connectors: Prepare steel surfaces as recommended by manufacturer of shear connectors. Use automatic end welding of headed-stud shear connectors according to AWS D1.1 and manufacturer's written instructions.

G. Holes: Provide holes required for securing other work to structural steel and for passage of other work through steel framing members.

1. Cut, drill, or punch holes perpendicular to steel surfaces. Do not thermally cut bolt holes or enlarge holes by burning.

2. Base-Plate Holes: Cut, drill, mechanically thermal cut, or punch holes perpendicular to steel surfaces.

3. Weld threaded nuts to framing and other specialty items indicated to receive other work.

2.8 SHOP CONNECTIONS

A. High-Strength Bolts: Shop install high-strength bolts according to RCSC Specification for Structural Joints Using ASTM A325 or A490 Bolts for type of bolt and type of joint specified.

1. Joint Type: Simple Framing: Snug tightened.

2. Joint Type: Moment Connection, Braced Frame: Slip Critical.

3. Do not reuse high-strength bolts.

B. Weld Connections: Comply with AWS D1.1 for welding procedure specifications, tolerances, appearance, and quality of welds and for methods used in correcting welding work.

1. Where backing or runoff tabs are removed, back gouge, and grind steel smooth, and reweld as required to establish specified profile.

2. Assemble and weld built-up sections by methods that will maintain true alignment of axes without exceeding tolerances of AISC Code of Standard Practice for Steel Buildings and Bridges for mill material.

2.9 SHOP PRIMING

A. Shop prime steel surfaces except the following:

1. Surfaces embedded in concrete or mortar. Extend priming of partially embedded members to a depth of 2 in.
2. Surfaces to be field welded.
3. Surfaces to be high-strength bolted with slip-critical connections.
4. Surfaces to receive sprayed fire-resistive materials.
5. Galvanized surfaces.

B. Surface Preparation: Clean surfaces to be painted. Remove loose rust and mill scale and spatter, slag, or flux deposits. Prepare surfaces according to the following specifications and standards:

1. SSPC-SP 6/NACE No. 3 – Commercial Blast Cleaning.

C. Priming: Immediately after surface preparation, apply primer according to manufacturer's written instructions and at rate recommended by SSPC to provide a dry film thickness of not less than 1.5 mils. Use priming methods that result in full coverage of joints, corners, edges, and exposed surfaces.

1. Stripe paint corners, crevices, bolts, welds, and sharp edges.
2. Apply two coats of shop paint to inaccessible surfaces after assembly or erection. Change color of second coat to distinguish it from first.

D. Painting: Apply a 1-coat, non-asphaltic primer complying with SSPC-PS Guide 7.00 – Painting System Guide 7.00: Guide for Selecting One-Coat Shop Painting Systems, to provide a dry film thickness of not less than 1.5 mils.

2.10 GALVANIZING

A. Hot-Dip Galvanized Finish: Apply zinc coating by the hot-dip process to structural steel according to ASTM A123/A123M.

1. Fabricate structural steel in accordance with Class 1 guidelines as described in AGA Recommended Details for Galvanized Structures.
2. Fill all vent holes and grind smooth after fabricating.
3. Fabricate in accordance with the applicable portions of ASTM A143, ASTM A384, and ASTM A385. Avoid fabrication techniques that could cause distortion and embrittlement of the steel.
4. The Fabricator shall consult with the Commissioner and hot-dip galvanizer regarding potential problems or potential handling problems during the galvanizing process that may require modification of design before fabrication begins.
5. Coordination between Fabricator and Galvanizer:

a. Review approved Shop Drawings.

b. Location of holes and lifting lugs for galvanizing.

c. Avoiding using unsuitable marking paints, grease, oil paint, and other deleterious material.

d. Removal of welding slag, splatter, anti-splatter compounds and burrs prior to delivery for galvanizing.

e. Removal of surface contaminants and coating that would not be removable by the normal chemical cleaning process in the galvanizing operation.

6. Galvanize lintels and shelf angles attached to structural-steel frame and located in exterior walls.

2.11 SOURCE QUALITY CONTROL

A. Engage an independent testing and inspecting agency to perform shop tests and inspections and prepare test reports.

1. Provide testing agency with access to places where structural-steel work is being fabricated or produced to perform tests and inspections.

B. Correct deficiencies in Work that test reports and inspections indicate does not comply with the Contract Documents.

C. Bolted Connections: Shop-bolted connections will be tested and inspected according to RCSC's Specification for Structural Joints Using ASTM A325 or A490 Bolts.

D. Welded Connections: In addition to visual inspection, shop-welded connections will be tested and inspected according to AWS D1.1 and the following inspection procedures, at testing agency's option and as indicated on Drawings:

1. Liquid Penetrant Inspection: ASTM E165.

2. Magnetic Particle Inspection: ASTM E709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration will not be accepted.

3. Ultrasonic Inspection: ASTM E164.

4. Radiographic Inspection: ASTM E94.

E. In addition to visual inspection, shop-welded shear connectors will be tested and inspected according to requirements in AWS D1.1 for stud welding and as follows:

1. Bend tests will be performed if visual inspections reveal either a less-than- continuous 360° flash or welding repairs to any shear connector.

2. Tests will be conducted on additional shear connectors if weld fracture occurs on shear connectors already tested, according to requirements in AWS D1.1.

PART 3 - EXECUTION

3.1 EXECUTION REQUIREMENTS

A. Refer to DDC General Conditions for execution requirements.

3.2 EXAMINATION

A. Verify elevations of concrete- and masonry-bearing surfaces and locations of anchor rods, bearing plates, and other embedments, with steel erector present, for compliance with requirements.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.3 PREPARATION

A. Provide temporary shores, guys, braces, and other supports during erection to keep structural steel secure, plumb, and in alignment against temporary construction loads and loads equal in intensity to design loads. Remove temporary supports when permanent structural steel, connections, and bracing are in place, unless otherwise indicated.

1. Do not remove temporary shoring supporting composite deck construction until cast-in-place concrete has attained its design compressive strength.

3.4 ERECTION

A. Set structural steel accurately in locations and to elevations indicated and according to AISC Code of Standard Practice for Steel Buildings and Bridges and Load and Resistance Factor Design Specification for Structural Steel Buildings.

B. Base and Bearing Plates: Coordinate this portion of the Work with the grouting work specified under Section 03 30 00 – Cast-in-Place Concrete. Clean concrete- and masonry-bearing surfaces of bond-reducing materials, and roughen surfaces prior to setting base and bearing plates. Clean bottom surface of base and bearing plates.

1. Set base and bearing plates for structural members on wedges, shims, or setting nuts as required.

2. Weld plate washers to top of base plate.

3. Snug-tighten anchor rods after supported members have been positioned and plumbed. Do not remove wedges or shims but, if protruding, cut off flush with edge of base or bearing plate before packing with grout.

4. Promptly pack grout solidly between bearing surfaces and base or bearing plates so no voids remain. Neatly finish exposed surfaces; protect grout and allow to cure. Comply with manufacturer's written installation instructions for shrinkage-resistant grouts.]

C. Maintain erection tolerances of structural steel within AISC Code of Standard Practice for Steel Buildings and Bridges.

D. Align and adjust various members forming part of complete frame or structure before permanently fastening. Before assembly, clean bearing surfaces and other surfaces that will be in permanent contact with members. Perform necessary adjustments to compensate for discrepancies in elevations and alignment.

1. Level and plumb individual members of structure.

2. Make allowances for difference between temperature at time of erection and mean temperature when structure is completed and in service.

E. Splice members only where indicated.

F. Remove erection bolts on welded, architecturally exposed structural steel; fill holes with plug welds; and grind smooth at exposed surfaces.

G. Do not use thermal cutting during erection unless approved by Commissioner. Finish thermally cut sections within smoothness limits in AWS D1.1.

H. Do not enlarge unfair holes in members by burning or using drift pins. Ream holes that must be enlarged to admit bolts.

I. Shear Connectors: Prepare steel surfaces as recommended by manufacturer of shear connectors. Use automatic end welding of headed-stud shear connectors according to AWS D1.1/D1.1M and manufacturer's written instructions.

3.5 FIELD CONNECTIONS

A. High-Strength Bolts: Install high-strength bolts according to RCSC Specification for Structural Joints Using ASTM A325 or A490 Bolts for type of bolt and type of joint specified.

1. Joint Type: Simple Framing: Snug tightened.

2. Joint Type: Moment Connection, Braced Frame: Slip Critical.

3. Do not reuse high strength bolts.

B. Weld Connections: Comply with AWS D1.1 for welding procedure specifications, tolerances, appearance, and quality of welds and for methods used in correcting welding work.

1. Comply with AISC Code of Standard Practice for Steel Buildings and Bridge and Specification for Structural Steel Buildings – Allowable Stress Design and Plastic Design, Load and Resistance Factor Design Specification for Structural Steel Buildings for bearing, adequacy of temporary connections, alignment, and removal of paint on surfaces adjacent to field welds.

2. Where backing or runoff tabs are removed, gouge, and grind steel smooth, and reweld as necessary to meet specified profile.

3. Assemble and weld built-up sections by methods that will maintain true alignment of axes without exceeding tolerances of AISC Code of Standard Practice for Steel Buildings and Bridges for mill material.

3.6 FIELD QUALITY CONTROL

A. Special Inspection and Testing Agency: engage a qualified independent testing and inspecting agency to inspect field welds and high-strength bolted connections.

B. Bolted Connections: Shop-bolted connections will be tested and inspected according to RCSC Specification for Structural Joints Using ASTM A325 or A490 Bolts.

C. Welded Connections: Field welds will be visually inspected according to AWS D1.1.

1. In addition to visual inspection, field welds will be tested according to AWS D1.1 and the following inspection procedures, at testing agency's option and as specified on Drawings:

   a. Liquid Penetrant Inspection: ASTM E165.

   b. Magnetic Particle Inspection: ASTM E709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration will not be accepted.

   c. Ultrasonic Inspection: ASTM E164.

   d. Radiographic Inspection: ASTM E94.

D. Correct deficiencies in Work that test reports and inspections indicate does not comply with the Contract Documents.

3.7 REPAIRS AND PROTECTION

A. Repair damaged galvanized coatings on galvanized items with galvanized repair paint according to ASTM A780 and manufacturer's written instructions.

B. Touchup Painting: After installation, promptly clean, prepare, and prime or reprime field connections, rust spots, and abraded surfaces of prime-painted joists and accessories, bearing plates, and abutting structural steel.

1. Clean and prepare surfaces by SSPC-SP 2 hand-tool cleaning or SSPC-SP 3 power-tool cleaning.

2. Apply a compatible primer of same type as shop primer used on adjacent surfaces.

C. Touchup Painting: Cleaning and touchup painting are specified in Division 9 Painting Sections.

3.8 CLEANING

A. Remove and dispose of away from the site: Erection bolts, erection attachments, temporary lifting lugs, safety barrier supports, and any other auxiliary or temporary steel components that interfere with other work.

END OF SECTION 05 12 00

SECTION 05 21 00
Steel Joist Framing

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The following documents apply to all required work for the Project: (1) the Contract Drawings, (2) the Specifications, (3) the General Conditions, (4) the Addendum, and (5) the Contract (City of New York Standard Construction Contract).

B. LEED General Requirements:
   1. Refer to DDC General Conditions
      a. Section 01 33 00 "Submittal Procedures"
      b. Section 01 74 19 "Construction Waste Management and Disposal"
      c. Section 01 81 13.04 "Sustainable Design Requirements for LEED v4 Buildings"

1.2 SUMMARY

A. Section Includes:

1. K-series steel joists.
2. KCS-type K-series steel joists.
3. K-series steel joist substitutes.
4. LH- and DLH-series long-span steel joists.
5. CJ-series composite steel joists.
6. Joist girders.
7. Joist accessories.

B. Related Requirements

1. Section 03 30 00 – Cast-in-Place Concrete for installing bearing plates in concrete.
2. Section 04 20 00 – Unit Masonry for installing bearing plates in unit masonry.
3. Section 05 12 00 – Structural Steel for field-welded shear connectors.

1.3 DEFINITIONS

A. SJI's "Specifications": Steel Joist Institute Standard Specifications, Load Tables and Weight Tables for Steel Joists and Joist Girders.

B. Special Joists: Steel joists or joist girders requiring modification by manufacturer to support nonuniform, unequal, or special loading conditions that invalidate load tables in SJI's "Specifications."

1.4 SUBMITTAL PROCEDURES

A. Refer to DDC General Conditions Section 01 33 00 – Submittal Procedures.

1.5 SUBMITTALS

A. Product Data: For each type of joist, accessory, and product.

B. Shop Drawings

1. Include layout, designation, number, type, location, and spacing of joists.
2. Include joining and anchorage details; bracing, bridging, and joist accessories; splice and connection locations and details; and attachments to other construction.
3. Indicate locations and details of bearing plates to be embedded in other construction.

C. Qualification Data: For manufacturer and Professional Engineer Licensed in the State of New York.

D. Welding certificates.

E. Manufacturer certificates.

F. Mill Certificates: For each type of bolt.

G. Comprehensive engineering analysis of special joists signed and sealed by the qualified Professional Engineer licensed in the State of New York responsible for its preparation.

H. Field quality-control reports.

1.6 QUALITY ASSURANCE

A. Refer to DDC General Conditions Section 01 40 00 – Quality Requirements.

B. Manufacturer Qualifications: A manufacturer certified by SJI to manufacture joists complying with applicable standard specifications and load tables in SJI's "Specifications."

1. Manufacturer's responsibilities include providing professional engineering services for designing special joists to comply with performance requirements.

C. Welding Qualifications: Qualify field-welding procedures and personnel according to AWS D1.1/D1.1M – Structural Welding Code – Steel.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, and handle joists as recommended in SJI's "Specifications".

B. Protect joists from corrosion, deformation, and other damage during delivery, storage, and handling.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Structural Performance: Provide special joists and connections capable of withstanding design loads indicated.

1. Use ASD; data are given at service-load level

2. Design special joists to withstand design loads with live-load deflections no greater than the following:

a. Roof Joists: Vertical deflection of 1/360 of the span.

2.2 LONG-SPAN STEEL JOISTS

A. Manufacture steel joists according to Standard Specification for Longspan Steel Joists, LH-Series and Deep Longspan Steel Joists, DLH-Series in SJI's "Specifications," with steel-angle top- and bottom-chord members; of joist type and end and top-chord arrangements as indicated.

B. Provide holes in chord members for connecting and securing other construction to joists.

C. Camber long-span steel joists according to SJI's "Specifications." or as indicated.

D. Equip bearing ends of joists with manufacturer's standard beveled ends or sloped shoes if joist slope exceeds 1/4 in. per 12 in.

2.3 PRIMERS

A. Primer: SSPC-Paint 15, or manufacturer's standard shop primer complying with performance requirements in SSPC-Paint 15.

B. Primer: Provide shop primer that complies with Section 09 90 00 "Painting and Finishing".

2.4 JOIST ACCESSORIES

A. Bridging: Provide bridging anchors and number of rows of horizontal or diagonal bridging of material, size, and type required by SJI's "Specifications" for type of joist, chord size, spacing, and span. Furnish additional erection bridging if required for stability.

B. Fabricate steel bearing plates from ASTM A36/A36M steel with integral anchorages of sizes and thicknesses indicated.

C. Steel bearing plates with integral anchorages are specified in Section 05 50 00 – Metal Fabrications.

D. Furnish ceiling extensions, either extended bottom-chord elements or a separate extension unit of enough strength to support ceiling construction. Extend ends to within 1/2 in. of finished wall surface unless otherwise indicated.

1. Finish: Plain, uncoated.

E. High-Strength Bolts, Nuts, and Washers: ASTM A325, Type 1, heavy hex steel structural bolts; ASTM A563 heavy hex carbon-steel nuts; and ASTM F436 hardened carbon-steel washers.

1. Finish: Plain.

F. Welding Electrodes: Comply with AWS standards.

G. Furnish miscellaneous accessories including splice plates and bolts required by joist manufacturer to complete joist assembly.

2.5 CLEANING AND SHOP PAINTING

A. Clean and remove loose scale, heavy rust, and other foreign materials from fabricated joists and accessories by power-tool cleaning, SSPC-SP 3.

B. Do not prime paint joists and accessories to receive sprayed fire-resistive materials.

C. Apply one coat of shop primer to joists and joist accessories to be primed to provide a continuous, dry paint film not less than 1 mil thick.

D. Shop priming of joists and joist accessories is specified in Section 09 90 00 "Painting and Finishing".

PART 3 - EXECUTION

3.1 EXECUTION REQUIREMENTS

A. Refer to DDC General Conditions for execution requirements.

3.2 EXAMINATION

A. Examine supporting substrates, embedded bearing plates, and abutting structural framing for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.3 INSTALLATION

A. Do not install joists until supporting construction is in place and secured.

B. Install joists and accessories plumb, square, and true to line; securely fasten to supporting construction according to SJI's "Specifications," joist manufacturer's written instructions, and requirements in this Section.

1. Before installation, splice joists delivered to Project site in more than one piece.

2. Space, adjust, and align joists accurately in location before permanently fastening.

3. Install temporary bracing and erection bridging, connections, and anchors to ensure that joists are stabilized during construction.

4. Delay rigidly connecting bottom-chord extensions to columns or supports until dead loads are applied.

C. Field weld joists to supporting steel bearing plates and framework. Coordinate welding sequence and procedure with placement of joists. Comply with AWS requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.

D. Bolt joists to supporting steel framework using high-strength structural bolts. Comply with RCSC Specification for Structural Joints Using ASTM A325 or ASTM A490 Bolts for high-strength structural bolt installation and tightening requirements.

E. Install and connect bridging concurrently with joist erection, before construction loads are applied. Anchor ends of bridging lines at top and bottom chords if terminating at walls or beams.

3.4 FIELD QUALITY CONTROL

A. Testing Agency: engage a qualified testing agency to perform tests and inspections.

B. Visually inspect field welds according to AWS D1.1/D1.1M.

1. In addition to visual inspection, test field welds according to AWS D1.1/D1.1M and the following procedures, at testing agency's option:

   a. Liquid Penetrant Inspection: ASTM E165/E165M.

   b. Magnetic Particle Inspection: ASTM E709.

   c. Ultrasonic Testing: ASTM E164.

   d. Radiographic Testing: ASTM E94.

C. Visually inspect bolted connections.

D. Prepare test and inspection reports.

3.5 PROTECTION

A. Repair damaged galvanized coatings on galvanized items with galvanized repair paint according to ASTM A780/A780M and manufacturer's written instructions.

B. Touchup Painting: After installation, promptly clean, prepare, and prime or reprime field connections, rust spots, and abraded surfaces of prime-painted joists, bearing plates, abutting structural steel, and accessories. Refer to Section 09 90 00 "Painting and Finishing".

1. Clean and prepare surfaces by power-tool cleaning according to SSPC-SP 3.

2. Apply a compatible primer of same type as primer used on adjacent surfaces.

END OF SECTION 05 21 00

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SECTION 05 31 00
Steel Decking

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The following documents apply to all required work for the Project: (1) the Contract Drawings, (2) the Specifications, (3) the General Conditions, (4) the Addendum, and (5) the Contract (City of New York Standard Construction Contract).

B. LEED / Environmentally Preferable Purchase (EPP) General Requirements:
   1. Refer to DDC General Conditions and the Addendum to the General Conditions
   2. LEED requirements apply to all Phase II work with the exception of the Existing Building scope. EPP requirements apply to the project's Existing Building scope only.

1.2 SUMMARY

A. Section Includes:

   1. Roof deck.

   2. Composite floor deck.

B. Related Requirements

   1. Section 03 30 00 – Cast-in-Place Concrete for normal-weight and lightweight structural concrete fill over steel deck.

   2. Section 05 12 00 – "Structural Steel" for shop- and field-welded shear connectors.

   3. Section 05 50 00 – "Miscellaneous Metals" for framing deck openings with miscellaneous steel shapes.

   4. Section 09 90 00 – "Painting and Finishing" for repair painting of primed deck and finish painting of deck.

1.3 SUBMITTAL PROCEDURES

A. Refer to DDC General Conditions Section 01 33 00 – Submittal Procedures.

1.4 SUBMITTALS

A. Product Data: For each type of deck, accessory, and product indicated.

B. Shop Drawings

   1. Include layout and types of deck panels, anchorage details, reinforcing channels, pans, cut deck openings, special jointing, accessories, and attachments to other construction.

C. Welding certificates.

D. Product Certificates: or each type of steel deck.

E. Product Test Reports: For tests performed by a qualified testing agency, indicating that each of the following complies with requirements:

1. Power-actuated mechanical fasteners.

2. Acoustical roof deck.

F. Evaluation Reports: For steel deck, from ICC-ES.

G. Field quality-control reports.

1.5 QUALITY ASSURANCE

A. Refer to DDC General Conditions Section 01 40 00 – Quality Requirements.

B. Testing Agency Qualifications: Qualified according to ASTM E329 for testing indicated.

C. Welding Qualifications: Qualify procedures and personnel according to AWS D1.3/D1.3M – Structural Welding Code - Sheet Steel.

D. FM Global Listing: Provide steel roof deck evaluated by FM Global and listed in its "Approval Guide, Building Materials" for Class 1 fire rating and Class 1-90 windstorm ratings.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Protect steel deck from corrosion, deformation, and other damage during delivery, storage, and handling.

B. Stack steel deck on platforms or pallets and slope to provide drainage. Protect with a waterproof covering and ventilate to avoid condensation.

1. Protect and ventilate acoustical cellular roof deck with factory-installed insulation to maintain insulation free of moisture.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. AISI Specifications: Comply with calculated structural characteristics of steel deck according to AISI North American Specification for the Design of Cold-Formed Steel Structural Members.

B. Fire-Resistance Ratings: Comply with ASTM E119; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Indicate design designations from UL Fire Resistance Directory or from the listings of another qualified testing agency.

2.2 ROOF DECK

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Steel Deck

a. Canam Steel Corp.

b. Epic Metals Corporation

c. Nucor Corp: Vulcraft Division

d. Or approved equal

B. Roof Deck: Fabricate panels, without top-flange stiffening grooves, to comply with SDI Specifications and Commentary for Steel Roof Deck, in SDI Publication No. 31, and with the following:

1. Aluminum-Zinc-Alloy-Coated Steel Sheet: ASTM A792/A792M, Structural Steel (SS), Grade 50 (230) minimum, AZ50 (AZ150) aluminum-zinc-alloy coating.

2. Deck Profile: As indicated on the contract drawings.

3. Profile Depth: As indicated on the contract drawings.

4. Design Uncoated-Steel Thickness: As indicated on the contract drawings.

5. Span Condition: Double span.

6. Side Laps: Interlocking seam.

2.3 COMPOSITE FLOOR DECK

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Steel Deck

a. Canam Steel Corp.

b. Epic Metals Corporation.

c. Nucor Corp: Vulcraft Division.

d. Or approved equal

B. Composite Floor Deck: Fabricate panels, with integrally embossed or raised pattern ribs and interlocking side laps, to comply with"SDI Specifications and Commentary for Composite Steel Floor Deck, in SDI Publication No. 31, with the minimum section properties indicated, and with the following:

1. Profile Depth: As indicated on the contract drawings.

2. Design Uncoated-Steel Thickness: As indicated on the contract drawings.

3. Span Condition: Double span.

2.4 ACCESSORIES

A. General: Provide manufacturer's standard accessory materials for deck that comply with requirements indicated.

B. Mechanical Fasteners: Corrosion-resistant, low-velocity, power-actuated or pneumatically driven carbon-steel fasteners; or self-drilling, self-threading screws.

C. Side-Lap Fasteners: Corrosion-resistant, hexagonal washer head; self-drilling, carbon-steel screws, No. 10 minimum diameter.

D. Flexible Closure Strips: Vulcanized, closed-cell, synthetic rubber.

E. Miscellaneous Sheet Metal Deck Accessories: Steel sheet, minimum yield strength of 40,000 psi, not less than 0.0359-in. design uncoated thickness, of same material and finish as deck; of profile indicated or required for application.

F. Pour Stops and Girder Fillers: Steel sheet, minimum yield strength of 40,000 psi, of same material and finish as deck, and of thickness and profile recommended by SDI Publication No. 31 for overhang and slab depth.

G. Column Closures, End Closures, Z-Closures, and Cover Plates: Steel sheet, of same material, finish, and thickness as deck unless otherwise indicated.

H. Galvanizing Repair Paint: ASTM A780/A780M.

I. Repair Paint: Manufacturer's standard rust-inhibitive primer of same color as primer.

PART 3 - EXECUTION

3.1 EXECUTION REQUIREMENTS

A. Refer to DDC General Conditions for execution requirements.

3.2 EXAMINATION

A. Examine supporting frame and field conditions for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.3 INSTALLATION, GENERAL

A. Install deck panels and accessories according to applicable specifications and commentary in SDI Publication No. 31, manufacturer's written instructions, and requirements in this Section.

B. Install temporary shoring before placing deck panels if required to meet deflection limitations.

C. Locate deck bundles to prevent overloading of supporting members.

D. Place deck panels on supporting frame and adjust to final position with ends accurately aligned and bearing on supporting frame before being permanently fastened. Do not stretch or contract side-lap interlocks.

1. Align cellular deck panels over full length of cell runs and align cells at ends of abutting panels.

E. Place deck panels flat and square and fasten to supporting frame without warp or deflection.

F. Cut and neatly fit deck panels and accessories around openings and other work projecting through or adjacent to deck.

G. Provide additional reinforcement and closure pieces at openings as required for strength, continuity of deck, and support of scheduled Work and final conditions.

H. Comply with AWS requirements and procedures for manual shielded metal arc welding, appearance and quality of welds, and methods used for correcting welding work.

3.4 ROOF-DECK INSTALLATION

A. Fasten roof-deck panels to steel supporting members by arc spot (puddle) welds of the surface diameter indicated or arc seam welds with an equal perimeter that is not less than 1-1/2 in. long, and as follows:

1. Weld Diameter: As indicated on the contract drawings.

2. Weld Spacing: Weld edge and interior ribs of deck units with a minimum of two welds per deck unit at each support. Space welds as indicated on the contract drawings.

3. Weld Washers: Install weld washers at each weld location.

B. Side-Lap and Perimeter Edge Fastening: Fasten side laps and perimeter edges of panels between supports, at intervals not exceeding the lesser of one-half of the span or 18 in., and as follows:

1. Mechanically fasten with self-drilling, No. 10 diameter or larger, carbon-steel screws.

C. End Bearing: Install deck ends over supporting frame with a minimum end bearing of 1-1/2 in., with end joints as follows:

1. End Joints: Lapped 2 in.

D. Miscellaneous Roof-Deck Accessories: Install ridge and valley plates, finish strips, end closures, and reinforcing channels according to deck manufacturer's written instructions. Weld to substrate to provide a complete deck installation.

1. Weld cover plates at changes in direction of roof-deck panels unless otherwise indicated.

E. Flexible Closure Strips: Install flexible closure strips over partitions, walls, and where indicated. Install with adhesive according to manufacturer's written instructions to ensure complete closure.

3.5 FLOOR-DECK INSTALLATION

A. Fasten floor-deck panels to steel supporting members by arc spot (puddle) welds of the surface diameter indicated and as follows:

1. Weld Diameter: 5/8 in., nominal.

2. Weld Spacing: Weld edge ribs of panels at each support. Space additional welds an average of 12 in. apart, but not more than 18 in. apart.

3. Weld Spacing: Space and locate welds as indicated on the contract drawings.

4. Weld Washers: Install weld washers at each weld location.

B. Side-Lap and Perimeter Edge Fastening: Fasten side laps and perimeter edges of panels between supports, at intervals not exceeding the lesser of one-half of the span or 36 in., and as follows:

1. Mechanically fasten with self-drilling, No. 10 diameter or larger, carbon-steel screws.

C. End Bearing: Install deck ends over supporting frame with a minimum end bearing of 1-1/2 in. with end joints as follows:

1. End Joints: Butted.

D. Pour Stops and Girder Fillers: Weld steel sheet pour stops and girder fillers to supporting structure according to SDI recommendations unless otherwise indicated.

E. Floor-Deck Closures: Weld steel sheet column closures, cell closures, and Z-closures to deck, according to SDI recommendations, to provide tight-fitting closures at open ends of ribs and sides of deck.

3.6 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

B. Field welds will be subject to inspection.

C. Prepare test and inspection reports.

D. Remove and replace work that does not comply with specified requirements.

E. Additional inspecting, at Contractor's expense, will be performed to determine compliance of corrected work with specified requirements.

3.7 PROTECTION

A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on both surfaces of deck with galvanized repair paint according to ASTM A780/A780M and manufacturer's written instructions.

B. Repair Painting: Wire brush and clean rust spots, welds, and abraded areas on both surfaces of prime-painted deck immediately after installation, and apply repair paint. Refer to Section 09 90 00 – "Painting and Finishing".

1. Apply repair paint, of same color as adjacent shop-primed deck, to bottom surfaces of deck exposed to view.

   Wire brushing, cleaning, and repair painting of bottom deck surfaces are included in Section 09 90 00 – "Painting and Finishing".

END OF SECTION 05 31 00

SECTION 05 40 00
Cold Formed Metal Framing

PART I - GENERAL

1.1 RELATED DOCUMENTS

A. The following documents apply to all required work for the Project: (1) the Contract Drawings, (2) the Specifications, (3) the General Conditions, (4) the Addendum and (5) the Contract (City of New York Standard Construction Contract).

B. LEED / Environmentally Preferable Purchase (EPP) General Requirements:

1. Refer to DDC General Conditions and the Addendum to the General Conditions

2. LEED requirements apply to all Phase II work with the exception of the Existing Building scope. EPP requirements apply to the project's Existing Building scope only.

1.2 SUMMARY

A. Section includes:

1. "C" shaped steel studs for exterior non-load bearing wall frame construction.

2. "C" shaped steel joists.

3. Anchors and accessories.

4. Gypsum sheathing.

5. Field inspection.

B. Related Sections

1. Unit Masonry - Section 04 20 00.

2. Structural Steel - Section 05 12 00.

3. Thermal Insulation - Section 07 21 00.

4. Weather Resistive Barriers - Section 07 27 01.

5. Gypsum Drywall - Section 09 29 00.

1.3 QUALITY ASSURANCE

A. Refer to DDC General Conditions Section 01 40 00 "Quality Requirements".

B. Component Engineering: Compute structural properties of studs in accordance with AISI "North American Specification for the Design of Cold Formed Steel Structural Members."

C. Fire-Rated Assemblies: Where framing units are indicated to be components of fire-resistance rated assemblies, provide cold-formed metal framing identical to that of assemblies tested for fire resistance per ASTM E 119. Products used in the assembly shall carry a classification label from an approved testing and inspection agency.

D. Qualifications

1. Manufacturer's Qualifications: Minimum three years' experience in producing products of the type specified.

2. Installer's Qualifications: Minimum three years' experience in installation of the type of product specified.

3. Welding: Qualify procedures and personnel according to AWS D1.1/D1.1M "Structural Welding Code - Steel" and AWS DL3 "Structural Welding Code – Sheet Steel."

E. Pre-Installation Meeting

1. Convene meeting at project site within one week of scheduled start of installation with representatives of the following in attendance: City of New York, Commissioner, Contractor and installer.

2. Review substrate conditions, requirements of related work, installation instructions, storage and handling procedures, and protection measures.

3. Keep minutes of meeting, including responsibilities of various parties and deviations from specifications and installation instructions. Distribute minutes to attendees within 72 hours.

F. Comply with the following standards:

1. American Iron and Steel Institute (AISI):

a. "North American Specification for the Design of Cold-Formed Steel Structural Members," latest edition.
b. "Standard for Cold-Formed Steel Framing General Provisions."

2. American Welding Society (AWS):

a. Structural Welding Code (D1.1).
b. Specifications for Welding Sheet Steel in Structures (E1.3).

3. ASTM:

a. ASTM A 653 - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coted (Galvannealed) by the Hot-Dip Process.
b. ASTM A 780 - Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings.
c. ASTM A 924 - Standard Requirements for Sheet Steel, Metallic-Coated by the Hot-Dipped Process.

d. ASTM C 955 - Standard Specification for Load-Bearing (Transverse and Axial) Steel Studs, Runners (Tracks), and Bracing or Bridging for Screw Application of Gypsum Panel Products and Metal Plaster Bases.
e. ASTM A 1003 - Standard Specification for Steel Sheet, Carbon, Metallic- and Non-Metallic-Coated for Cold-Formed Framing Members.
f. ASTM C 1007 - Standard Specification for Installation of Load Bearing (Transverse and Axial) Steel Studs and Related Accessories.
g. ASTM C 1513 - Standard Specification for Steel Tapping Screws for Cold-Formed Steel Framing Connections.

G. Vertical and Lateral Fire Propagation Test Characteristics: The exterior wall assembly is required to comply with NFPA 285 "Standard Method of Test for the Evaluation of Flammability Characteristics of Exterior Nonload-bearing Wall Assemblies Containing Combustible Components." The base wall, stud cavity insulation, wall sheathing, air barrier, continuous wall rigid insulation and exterior cladding are components that are required to be to be evaluated as part of this specific assembly test.

H. The Contractor will provide signed and sealed fully engineered shop drawings for the enclosure systems in their entirety for confirmation of compliance with the performance and aesthetic criteria.

1.4 SUBMITTALS

A. Refer to DDC General Conditions Section 01 33 00 "Submittal Procedures".

B. Product Data: For information only, submit manufacturer's product information and installation instructions for each item of cold-formed framing and accessories.

C. Shop Drawings

1. Submit shop drawings for components and installations not fully dimensioned or detailed in manufacturer's product data. Include placing drawings for framing members showing size and gauge designations, number, type, location and spacing. Indicate supplemental bracing, splices, window and door headers accessories and details as may be required for proper installation.

2. If the Contractor elects to prefabricate framing members into panels for erection, he shall submit shop drawings of such panels at suitable scale showing all dimensions, components, and methods of fastening and support.

D. For fasteners, submit product data sheet and samples.

E. Engineering Data

1. Submit Engineering Data drawings to the Commissioner for review. The Contractor is responsible for the structural engineering and supports for the cold-formed metal frame and must show his proposed system and how the Performance Criteria noted below is accommodated on these drawings.

2. These drawings must show all load conditions and engineering calculations relative to connections, fastening devices and anchorage, as well as size and gauge of members. Calculations and drawings must be prepared by a Structural Engineer licensed in the State of New York and shall be signed and sealed by this Engineer.

F. Quality Assurance Submittals: Submit the following:

1. Qualifications: Proof of manufacturer, installer, and welder qualifications.

2. Structural engineering services calculations.

3. Certificates

a. Submit mill certificates signed by framing member/accessory manufacturer certifying compliance with material requirements.
b. Welder certificates.

4. Manufacturer's installation instructions for framing members and framing accessories.

1.5 PERFORMANCE CRITERIA

A. Cold-formed metal framing system shall be engineered, fabricated, and installed to withstand a 30 psf suction and pressure load with a maximum deflection of L/360 with metal panels.

B. Engineer system to accommodate vertical deflection of structural building frame, live loading, seasonal and day/night temperature ranges and construction tolerances.

PART II - PRODUCTS

2.1 MANUFACTURER

A. Basis of Design: Subject to compliance with requirements, provide Marino Ware cold-formed metal framing or comparable product by one of the following manufacturers:
1. Dale/Incor
2. Superior Steel Studs
3. ClarkDietrich Building Systems
4. Super Stud Building Products
5. Or approved equal

2.2 METAL FRAMING: GENERAL

A. System Components: With each type of metal framing required, provide manufacturer's standard steel runners, (tracks), blocking, lintels, clip angles, shoes, reinforcements, fasteners and accessories, as recommended by manufacturer for the applications indicated, as needed to provide a complete metal framing system.

2.3 MATERIALS

A. Steel Sheet for Studs and Tracks: ASTM A 1003 Structural Grade, Type H, metallic coated, of grade and coating weight as follows:

1. Grade: As required by structural performance.

2. Coating: G90 galvanized coating.

B. Steel Sheet for Clips: ASTM A 653, structural steel, zinc coated, of grade and coating as follows:

1. Grade: As required by structural performance.

2. Coating G90 galvanized coating.

2.4 FRAMING MEMBERS

A. Steel Studs: Manufacturer's standard C-shaped steel studs, of web depths indicated, punched, with stiffened flanges; thickness and grade as required by structural performance.

B. Steel Track: Manufacturer's standard U-shaped steel track, of web depths compatible with studs, un-punched, with un-stiffened flanges; thickness and grade as required by structural performance.

2.5 FRAMING ACCESSORIES

A. Stamp manufacturer's name on each accessory item.

B. Provide screws with accessories designated for screw attachment.

C. Connector Devices

1. Vertical Deflection Clips: Subject to compliance with requirements, products that may be incorporated into the Work include the following:

   a. The Steel Network Inc.; VertiClip
   b. ClarkDietrich Building Systems; FastClip
   c. Scafco; ESC
   d. Or approved equal.

2. Rigid Clip Angles: Size as required by structural engineering calculations. Rigid attachment to structure and stud web. Subject to compliance with requirements, products that may be incorporated into the Work include the following:

   a. The Steel Network Inc.; StiffClip
   b. ClarkDietrich Building Systems; EasyClip
   c. Scafco; Secure Clip
   d. Or approved equal.

D. Bridging

1. Cold Rolled Channel: 1-1/2" by 1/2" by 56 mil thick.

   a. Bridging Clip: Provide attachment through stud punch-out clamping onto stud web and wrapping around bridging channel. Provide holes for screw attachment to stud web and channel. Subject to compliance with requirements, products that may be incorporated into the Work include the following:
      1). The Steel Network Inc.; BridgeClip
      2). ClarkDietrich Building Systems; FastBridge
      3). Scafco; Secure Bridge Clip
      4). Or approved equal.

2. Flat Strap: Width and thickness as required by structural engineering calculations. Rigid attachment to stud flange.

3. Solid Bridging: Channel shaped bridging with lipped flanges and integral formed clips. Screw attachment to stud. 33 mils minimum thickness, size as required by structural engineering calculations.

4. Bridging and accessories shall be hot dip zinc coated per ASTM A 153.

E. Header for Window and Door Openings: Provide system complete with all accessories including clips and accessories; finish and gauge to match studs.

2.6 FASTENERS

A. Screws: Corrosion resistant coated, self-drilling, pan or hex washer head. Provide screw type and size as required by structural engineering calculations.

B. Anchor Bolts and Studs: ASTM A 307, Grade A, carbon steel, with hex-head carbon steel nuts and flat steel washers. Hot-dip zinc coated in accordance with ASTM A 153. Provide bolt or stud type and size as required by structural engineering calculations.

C. Expansion Anchors: Fabricated from corrosion-resistant materials, with capability to sustain, without failure, a load equal to 5 times design load, as determined by testing per ASTM E 488 conducted by a qualified independent testing agency.

D. Power-Actuated Anchors: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with capability to sustain, without failure, a load equal to 10 times design load, as determined by testing per ASTM E 1190 conducted by a qualified independent testing agency.

2.7 GALVANIZING TOUCH-UP

A. For touching up damaged galvanized surfaces after erection. Apply to a dry film thickness of 1.5 to 3.0 mils.

1. Subject to compliance with requirements, products that may be incorporated into the Work include the following:

   a. Z.R.C. Worldwide; Silver Galv
   b. Brite Products; Brite Zinc

c. Duncan Galvanizing Corp.; ZiRP
d. Or approved equal.

2.8 GYPSUM SHEATHING AND RELATED ACCESSORIES

A. Gypsum Sheathing: 5/8" thick meeting ASTM C 1177, Type X. Subject to compliance with requirements, products that may be incorporated into the Work include the following:

1. Georgia Pacific; Dens-Glass Fireguard, Type X
2. U.S. Gypsum Co.; Securock Glass-Mat Sheathing
3. National Gypsum Co.; Gold Bond EXP Extended Exposure Sheathing
4. Or approved equal.

B. Fasteners: 1-1/4" Type S-12 screws with corrosion-resistant finish.

C. Joint Treatment: Provide a one-part high performance sealant conforming to ASTM C 920, Type S, Grade NS, Class 25 meeting with the approval of the air/vapor barrier manufacturer for compatibility; see Section 07 27 01 Weather Resistive Barriers for description. Apply a 3/8" bead of sealant to the joint and trowel flat. Apply enough of the same material to each fastener to cover completely when trowelled flat.

2.9 FABRICATION

A. Framing components may be prefabricated into panels prior to erection. Fabricate panels plumb, square, true to line and braced against racking with joints welded. Perform lifting of prefabricated panels in a manner to prevent damage or distortion in any members in the assembly.

B. Fastenings: Attach similar components by welding. Attach dissimilar components by welding, bolting or screw fasteners, as standard with manufacturer.

C. Wire tying of framing components is not permitted.

PART III - EXECUTION

3.1 EXECUTION REQUIREMENTS

A. Refer to DDC General Conditions for execution requirements.

3.2 INSTALLATION: GENERAL

A. Methods of construction shall be piece by piece.

B. Connections shall be accomplished with self-drilling screws or welding so that the connection meets or exceeds the design loads required at that connection.

C. Studs shall be installed seated squarely (within 1/16") against the web portion of the top and bottom tracks. Tracks shall rest on a continuous, uniform bearing surface.

D. Cutting of steel framing members may be accomplished with a saw or shear. Torch cutting of loaded members is not permitted. Cutting of loaded members is not permitted unless under supervision of the Commissioner.

E. Temporary bracing shall be provided and left in place until work is permanently stabilized.

F. Bridging shall be of size and type shown on the approved shop drawings and as called for in the engineering calculations.

G. Install headers in all openings that are larger than the stud spacing in that wall. Form headers as shown on the drawings.

H. Insulation meeting the requirements of Section 07 21 00, Thermal Insulation, shall be placed in all jamb and header type conditions that will be inaccessible after their installation into the wall.

I. Provide jack studs to support each end of headers. These studs shall be securely connected to the header, must seat squarely in the lower track of the wall, and be properly attached to it.

J. If a header is low in the wall, the less than full-height studs (cripples) that occur over the header shall be engineered to carry all imposed loads.

K. Wall track shall not be used support any load unless specifically engineered for that purpose.

L. All axially loaded members shall be aligned vertically, to allow for full transfer of the loads down to the foundation. Vertical alignment shall be maintained at floor/wall intersections or alternate provisions for load transfer may be made.

M. Holes that are field cut into steel framing members shall be within the limitation of the product and its engineering. Provide reinforcement where holes are cut through load bearing members in accordance with manufacturer's recommendations and as approved by the Commissioner.

N. Touch up all steel bared by welding using touch-up coating specified herein.

O. Studs shall be spaced to suit the engineering requirements and limitations of collateral facing materials.

P. Care should be taken to allow for additional studs at intersections, corners, doors, windows, control joints, etc., and as called for in the shop drawings or engineering calculations.

Q. Install supplementary framing, blocking, and bracing in metal framing system wherever walls or partitions are indicated to support fixtures, equipment, services, casework, heavy trim and furnishings, and similar work requiring attachment to the wall or partition. Where type of supplementary support is not otherwise indicated, comply with stud manufacturer's recommendations and industry standards in each case, considering weight or loading resulting from item supported.

R. Provide for structure movement, expansion shall be allowed where indicated and necessary by engineering and 2014 New York City Building Code requirements.

S. Frame both sides of expansion and control joints with separate studs; do not bridge the joint with components of stud system.

T. Install horizontal bridging in stud system, spaced (vertical distance) at not more than 48 inches on center. Fasten at each intersection.

U. Splicing of axially loaded members or floor joists shall not be permitted.

V. Wire tying of members is not permitted.

3.3 INSTALLATION OF GYPSUM SHEATHING

A. Fasten sheathing to exterior of each stud with specified fasteners spaced 3/8" from ends and edges and approx. 8" o.c. at each stud. Install fasteners in accordance with manufacturer's recommendations using 2500-RPM maximum screw gun. Sheathing board shall be installed horizontally. Apply sealant between joints and trowel flush; and apply sealant around sheathing perimeter and at interface with other materials. Cover fastener heads with sealant and trowel flush.

END OF SECTION 05 40 00

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SECTION 05 50 00
Miscellaneous Metals

PART I - GENERAL

1.1 RELATED DOCUMENTS

A. The following documents apply to all required work for the Project: (1) the Contract Drawings, (2) the Specifications, (3) the General Conditions, (4) the Addendum and (5) the Contract (City of New York Standard Construction Contract).

B. LEED / Environmentally Preferable Purchase (EPP) General Requirements:

1. Refer to DDC General Conditions and the Addendum to the General Conditions

2. LEED requirements apply to all Phase II work with the exception of the Existing Building scope. EPP requirements apply to the project's Existing Building scope only.

1.2 SUMMARY

A. Section includes:

1. Rough hardware.

2. Vertical steel ladders and ship's ladders, including platform located outside of 2nd floor egress door at boiler room.

3. Steel pipe handrails and railings not part of steel pan stair assemblies.

4. Roof freestanding (non-penetrating) guardrail system.

5. Light steel framing and supports, not included as part of work of other trades.

6. Structural steel door frames at service doors.

7. Steel bollards.

8. Miscellaneous steel trim.

9. Steel grating and frames.

10. Countertop supports.

11. Sleeves in concrete walls and slabs.

12. Steel framing, bracing, supports, anchors, bolts, shims, fastenings, and all other supplementary parts indicated on drawings or as required to complete each item of work of this Section.

13. Prime painting, touch-up painting, galvanizing and separation of dissimilar metals for work of this Section.

14. Cutting, fitting, drilling and tapping work of this Section to accommodate work of other Sections and of concrete, masonry or other materials as required for attaching and installing work of this Section.

B. Related Sections

1. Structural Steel - Section 05 12 00.
2. Carpentry - Section 06 20 00.
3. Painting and Finishing - Section 09 90 00.

1.3 QUALITY ASSURANCE

A. Refer to DDC General Conditions Section 01 40 00 "Quality Requirements".

B. Shop Assembly: Pre-assemble items in shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for re-assembly and coordinated installation.

C. Reference Standards: The work is subject to requirements of applicable portions of the following standards:

1. AISC "Manual of Steel Construction"
2. AWS D1.1 "Structural Welding Code"
3. SSPC SP-3 "Surface Preparation Specification No. 3, Power Tool Cleaning"
4. SSPC PA-1 "Painting Application Specification"
5. "Handbook on Bolt, Nut and Rivet Standards," Industrial Fasteners Institute.

D. Steel Materials: For steel to be hot dip-galvanized, provide steel chemically suitable for metal coatings complying with the following requirements: carbon below 0.25 percent, silicon below 0.24 percent, phosphorous below 0.05 percent, and manganese below 1.35 percent. Notify galvanizer if steel does not comply with these requirements to determine suitability for processing.

E. Engage the services of a galvanizer who has demonstrated a minimum of three (3) years' experience in the successful performance of the processes. The Commissioner has the right to inspect and approve or reject the galvanizer/galvanizing facility.

F. The galvanizer/galvanizing facility must have an ongoing Quality Control/Quality Assurance program which has been in effect for a minimum of three years and shall provide the Commissioner with process and final inspection documentation. The galvanizer/galvanizing facility must have an on-premise testing facility capable of measuring the chemical and metallurgical composition of the galvanizing bath and pickling tanks.

G. Inspection and testing of hot-dip galvanized coating shall be done under the guidelines provided in the American Hot-Dip Galvanizers Association (AGA) publication "Inspection of Products Hot-Dip Galvanized After Fabrication."

1.4 PERFORMANCE STANDARDS

A. Railings shall be designed to resist loads per 2014 New York City Building Code.

1.5 SUBMITTAL PROCEDURES

A. Refer to DDC General Conditions Section 01 33 00 "Submittal Procedures".

1.6 SUBMITTALS

A. Manufacturer's Literature: Submit manufacturer's specifications, load tables, dimension diagrams, anchor details and installation instructions for products to be used in the fabrication of miscellaneous metal work, including paint products.

B. Shop Drawings: Shop drawings for the fabrication and erection of all assemblies of miscellaneous iron work which are not completely shown by manufacturer's data sheets. Include plans and elevations at not less than 1" to 1'-0" scale and include details of sections and connections at not less than 3" to 1'-0" scale. Show anchorage and accessory items.

C. Engineering Data

1. Before any ladders or railings are fabricated, submit engineering data drawings to the Commissioner for review indicating how performance standards specified here shall be met. The Contractor is responsible for the structural design and supports for these systems and must show his proposed systems on these drawings.

2. These drawings must show all load conditions and design calculations relative to connections, fastening devices and anchorage, as well as size and gauge of members.

3. Contractor to engage a Structural Engineer licensed in the State of New York to prepare calculations and drawings. Calculations and drawings shall be signed and sealed by this Engineer.

D. Welding shall be indicated on shop drawings using AWS symbols and showing length, size and spacing (if not continuous). Auxiliary views shall be shown to clarify all welding. Notes such as 1/4" weld, weld and tack weld are not acceptable.

E. Certification: For items to be hot-dip galvanized, identify each item galvanized and to show compliance of application. The Certificate shall be signed by the galvanizer and shall contain a detailed description of the material processed and the ASTM standard used for the coating and, the weight of the coating. In addition, and as attachment to Certification, submit reports of testing and inspections indicating compliance with the provisions of this Section.

PART II – PRODUCTS

2.1 MATERIALS

A. Metals

1. Metal Surfaces, General: For fabrication of miscellaneous metal work which will be exposed to view, use only materials which are smooth and free of surface blemishes including pitting, seam marks, roller marks, rolled trade names and roughness.

2. Steel Plates, Shapes and Bars: ASTM A 36.

3. Steel Tubing: Cold formed, ASTM A 500; or hot rolled, ASTM A 501.

4. Structural Steel Sheet: Hot rolled, ASTM A 570; or cold rolled, ASTM A 611, Class 1; of grade required for design loading.

5. Galvanized Structural Steel Sheet: ASTM A 924, of grade required for design loading. Coating designation G90.

6. Steel Pipe: ASTM A 53, type and grade as selected by fabricator and as required for design loading; black finish unless galvanizing is indicated; standard weight (Schedule 40), unless otherwise indicated.

7. Gray Iron Castings: ASTM A 48, Class 30, unless another class is indicated or required by structural loads.

8. Malleable Iron Castings: ASTM A 47, grade as selected by fabricator.

9. Brackets, Flanges and Anchors: Cast or formed metal of the same type material and finish as supported rails, unless otherwise indicated.

10. Concrete Inserts: Threaded or wedge type; galvanized ferrous castings, either malleable iron, ASTM A 47, or cast steel, ASTM A 27. Provide bolts, washers and shims as required, hot-dip galvanized, ASTM A 153.

B. Grout: Non-shrink, non-metallic grout conforming to the requirements of Section 03 30 00, Cast-in-Place Concrete.

C. Fasteners

1. General: Provide zinc-coated fasteners for exterior use or where built into exterior walls. Select fasteners for the type, grade and class required.

2. Bolts and Nuts: Regular hexagon head type, ASTM A 307, Grade A.

3. Anchor Bolts: ASTM F 1554, Grade 36.

4. Lag Bolts: ASME B18.2.1.

5. Machine Screws: ASME B18.6.3.

6. Plain Washers: Round, carbon steel, ASME B18.22.1.

7. Masonry Anchorage Devices: Expansion shields, FS FF-S-325.

8. Toggle Bolts: Tumble-wing type, FS FF-B-588, type, class and style as required.

9. Lock Washers: Helical spring type carbon steel, ASME B18.21.1.

D. Shop Paint:

1. Shop prime all non-galvanized miscellaneous metal items

2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Series 88 Azeron Primer by Tnemec
b. ICI Devoe "Rust Guard" quick dry alkyd shop coat No. 41403
c. "Interlac 393" by International Protection Coatings
d. Or approved equal

3. If steel is to receive high performance coating as noted in Section 09 90 00, Painting and Finishing, shop prime using primer noted in Section 09 90 00, Painting and Finishing.

E. Bituminous Paint: Cold applied asphalt emulsion complying with ASTM D 1187.

F. Galvanizing Repair Coating: For touching up damaged galvanized surfaces after erection. Apply to a dry film thickness of 1.5 to 3.0 mils.

1. Manufactures: Subject to compliance with requirements, provide products by one of the following:

a. Z.R.C. Worldwide; Silver Galv
b. Brite Products; Brite Zinc
c. Duncan Galvanizing Corp.; ZiRP
d. Or approved equal

2.2 PRIME PAINTING

A. Scope: All ferrous metal (except galvanized steel) shall be cleaned and shop painted with one coat of specified ferrous metal primer. No shop prime paint required on galvanized steel or aluminum work.

B. Cleaning: Conform to Steel Structures Painting Council Surface Preparation Specification SP 3 (latest edition) "Power Tool Cleaning" for cleaning of ferrous metals which are to receive shop prime coat.

1. Steel to get high performance coating as noted in Section 09 90 00, Painting and Finishing shall be cleaned as per SSPC SP.6 "Commercial Blast Cleaning."

C. Application

1. Apply shop prime coat immediately after cleaning metal. Apply paint in dry weather or under cover. Metal surfaces shall be free from frost or moisture when painted. Paint all metal surfaces including edges, joints, holes, corners, etc.

2. Paint surfaces which will be concealed after shop assembly prior to such assembly. Apply paint in accordance with approved paint manufacturer's printed instructions, and the use of any thinners, adulterants or admixtures shall be only as stated in said instructions.

3. Paint shall uniformly and completely cover the metal surfaces, 2.0 mils minimum dry film thickness. No work shall be shipped until the shop prime coat thereon has dried.

D. Touch-Up: In the shop, after assembly and in the field, after installation of work of this Section, touch-up damaged or abraded portions of shop prime paint with specified ferrous metal primer.

E. Apply one shop coat to fabricated metal items, except apply two (2) coats of paint to surfaces inaccessible after assembly or erection. Change color of second coat to distinguish it from the first.

2.3 GALVANIZING

A. Scope: All ferrous metal exposed to the weather, and all ferrous metals indicated on drawings or in specifications to be galvanized, shall be cleaned and then hot-dipped galvanized after fabrication.

B. Avoid fabrication techniques that could cause distortion or embrittlement of steel items to be hot-dip galvanized. Fabricator shall consult with hot-dip galvanizer regarding potential warpage problems or handling problems during the galvanizing process that may require adjustment of fabrication techniques or design before finalizing shop drawings and beginning of fabrication.

C. Cleaning: Thoroughly clean metal surfaces of all mill scale, rust, dirt, grease, oil, moisture and other contaminants prior to galvanizing.

D. Application: Hot-dip galvanizing shall conform to the following:

1. ASTM A 143: Safeguarding Against Embrittlement of Hot-Dip Galvanized Structural Steel.

2. ASTM A 123: Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.

3. ASTM A 153: Galvanized Coating on Iron and Steel Hardware - Table 1.

4. ASTM A 384: Practice for Safeguarding Against Warpage and Distortion During Hot-Dip Galvanizing of Steel Assemblies.

5. ASTM A 385: Practice for Providing High Quality Zinc Coatings.

6. ASTM A 924: Galvanized Coating on Steel Sheets.

7. Minimum weight of galvanized coating shall be two (2) oz. per square foot of surface.

E. Fabricate joints which will be exposed to weather in a manner to exclude water or provide weep holes where water may accumulate.

F. All galvanized materials must be inspected for compliance with these specifications and marked with a stamp indicating the name of the galvanizer, the weight of the coating, and the appropriate ASTM number.

G. To minimize surface imperfection (e.g. flux inclusions), material to be galvanized shall be dipped into a solution of Zinc Ammonium Chloride (pre-flux) immediately prior to galvanizing. The type of galvanizing process utilizing a flux blanket overlaying the molten zinc will not be permitted.

H. After galvanizing all materials not exposed to view must be chromated by dipping material in a 0.2% chromic acid solution.

I. Galvanized surfaces, where exposed to view, must have a smooth, level surface finish. Where this does not occur, piece shall be rejected and replaced to the acceptance of the Commissioner.

2.4 PROTECTIVE COATINGS

A. Whenever dissimilar metals will be in contact, separate contact surfaces by coating each contact surface prior to assembly or installation with one coat of specified bituminous paint, which shall be in addition to the specified shop prime paint. Mask off those surfaces not required to receive protective coating.

2.5 WORKMANSHIP

A. General

1. Miscellaneous metal work shall be fabricated by an experienced fabricator or manufacturer and installed by an experienced tradesman.

2. Materials, methods of fabrication, fitting, assembly, bracing, supporting, fastening, operating devices, and erection shall be in accordance with drawings and specifications, approved shop drawings, and best practices of the industry, using new and clean materials as specified, having structural properties sufficient to safely sustain or withstand stresses and strains to which materials and assembled work will be subjected.

3. All work shall be accurately and neatly fabricated, assembled and erected.

B. Shop Assembly: Insofar as practicable, fitting and assembly of work shall be done in shop. Shop assemble work in largest practical sizes to minimize field work. Ensure that the shop-fabricated miscellaneous metal items will properly fit the field condition. In the event that shop-fabricated miscellaneous metal items do not fit the field condition, the item shall be returned to the shop for correction.

C. Cutting: Cut metal by sawing, shearing, or blanking. Flame cutting will be permitted only if cut edges are ground back to clean, smooth edges. Make cuts accurate, clean, sharp and free of burrs, without deforming adjacent surfaces or metals.

D. Holes: Drill or cleanly punch holes; do not burn.

E. Connections: Make connections with tight joints, capable of developing full strength of member, flush unless indicated otherwise, formed to exclude water where exposed to weather. Locate joints where least conspicuous. Unless indicated otherwise, weld or bolt shop connections; bolt or screw field connections. Provide expansion and contraction joints to allow for thermal movement of metal at locations and by methods approved by the Commissioner.

1. Welding

a. Shall be in accordance with AWS D1.1 and shall be done with electrodes and/or methods recommended by the manufacturer of the metals being welded.
b. Welds shall be continuous, except where spot welding is specifically permitted. Welds exposed to view shall be ground flush and dressed smooth with and to match finish of adjoining surfaces; undercut metal edges where welds are required to be flush.
c. All welds on or behind surfaces which will be exposed to view shall be done so as to prevent distortion of finished surface. Remove weld spatter and welding oxides from all welded surfaces.

2. Bolts and Screws: Make threaded connections tight with threads entirely concealed. Use lock nuts. Bolts and screw heads exposed to view shall be flat and countersunk. Cut off projecting ends of exposed bolts and screws flush with nuts or adjacent metal.

F. Operating Mechanism: Operating devices (i.e. pivots, hinges, etc.) mechanism and hardware used in connection with this work shall be fabricated, assembled, installed and adjusted after installation so that they will operate smoothly, freely, noiselessly and without excessive friction.

G. Built-In Work: Furnish anchor bolts, inserts, plates and any other anchorage devices, and all other items specified under this Section to be built into concrete, masonry or work of other trades, with necessary templates and instructions, and in ample time to facilitate proper placing and installation.

H. Supplementary Parts: Provide as necessary to complete each item of work, even though such supplementary parts are not shown or specified.

I. Coordination: Accurately cut, fit, drill and tap work of this Section to accommodate and fit work of other trades. Furnish or obtain, as applicable, templates and drawings to or from applicable trades for proper coordination of this work.

J. Exposed Work

1. In addition to requirements specified herein and shown on drawings, all surfaces exposed to view shall be clean and free from dirt, stains, grease, scratches, distortions, waves, dents, buckles, tool marks, burrs, and other defects which mar appearance of finished work.

2. Metal work exposed to view shall be straight and true to line or curve, smooth arrises and angles as sharp as practicable, miters formed in true alignment, profiles accurately intersecting, and with joints carefully matched to produce continuity of line and design.

3. Exposed fastenings, where permitted, shall be of the same material, color and finish as the metal to which applied, unless otherwise indicated, and shall be of the smallest practicable size.

K. Preparation for Hot-Dip Galvanizing: Fabricator shall correctly prepare assemblies for galvanizing in consultation with galvanizer and in accordance with applicable Reference Standards and applicable AGA publications for the "Design of Products to be Hot-Dip galvanized After Fabrication." Preparation shall include but not be limited to the following:

1. Remove welding flux.

2. Drill appropriate vent holes and provide for drainage in inconspicuous locations of hollow sections and semi-enclosed elements. After galvanizing, plug vent holes with shaped lead and grind smooth.

2.6 MISCELLANEOUS METALS ITEMS

A. Rough Hardware

1. Furnish bent or otherwise custom fabricated bolts, plates, anchors, hangers, dowels and other miscellaneous steel and iron shapes as required for framing and supporting woodwork, and for anchoring or securing woodwork to concrete or other structures. Straight bolts and other stock rough hardware items are specified in Section 06 20 00, Carpentry.

2. Fabricate items to sizes, shapes and dimensions required. Furnish malleable iron washers for heads and nuts which bear on wood connections; elsewhere, furnish steel washers.

B. Ladders

1. Vertical steel ladders shall be eighteen (18) inches wide with 3/4" diameter non-slip steel rungs spaced twelve (12) inches o.c. Stringers shall be 3/8" thick by 2-1/2" wide steel bars; rungs welded to bars. Attach ladders to walls six (6) inches from top and bottom and maximum thirty-six (36) inches o.c. from these points. At the roof, gooseneck the rails back to the structure to provide secure ladder access.

2. Provide sloping ladders (ship's ladders) where noted. Fabricate open type construction with structural steel channel or steel plate stringers, pipe handrails, and open steel grating treads. Provide all necessary brackets and fittings for installation.

3. Ladders shall be fabricated to support a live load of one hundred (100) lbs. per square foot and a concentrated load of three hundred (300) lbs. per rung; loads not to act simultaneously.

C. Steel Pipe Handrails

1. Provide Schedule 40 steel pipe of size shown on Drawings. Fittings shall be flush type, malleable of cast iron. Brackets shall be malleable iron, design as selected by the Commissioner.

2. Construction: Form direction changes in rails using solid bar stock or elbows. Connections shall be shop welded and ground smooth and flush, except where field connections and expansion joints are required. Field connections may be welded, internal sleeve and plug weld, or internal sleeve and set screw.

3. Secure handrails to walls with wall brackets. Provide brackets of malleable iron castings, with not more than three (3) inches clearance from inside face of handrail to wall surface. Neatly drill wall plate portion of the bracket into concrete or masonry to receive bolts for concealed anchorage. For installation at drywall, Drywall trades shall provide plate to receive wall plate portion of bracket and anchor or bolt wall plate through drywall to supporting steel plate. Locate brackets at not more than 5'-0" o.c. unless otherwise shown.

4. Provide wall return fittings of cast iron, flush type, with the same projection as that specified for wall brackets.

5. Longitudinal members shall be parallel with each other and with floor surface or shape of stair to a tolerance of 1/8" in 10'-0" linear feet. Center line of members within each run of railing shall be in the plane.

6. For steel pipe posts where indicated, anchor posts in concrete by means of pipe sleeves set and anchored into concrete. Provide sleeves of galvanized steel pipe, not less than six (6) inches long and having an inside diameter not less than 1/2" greater than outside diameter of the inserted pipe. Provide steel plate closure secure to bottom of sleeve and of width and length not less than one (1) inch greater than outside diameter of sleeve. After posts have been inserted into sleeves, fill annular space between post and sleeve solid with non-shrink, non-ferrous grout. Cover anchorage joint with a round steel flange welded to post. Posts shall be set plumb within 1/8" vertical tolerance.

7. Steel pipe handrails shall be capable of resisting a two hundred (200) lb. force applied to rail from any direction and a uniformly distributed load of fifty (50) lbs. per linear foot applied downward or horizontally, loads not to act simultaneously.

D. Roof Freestanding Guardrail System

1. Kee Safety, Inc.; Simplified Safety

2. Accufit; Edge Fall Protection

3. Fireguard; Flexible Lifetime System

4. Or approved equal.

E. Miscellaneous Light Steel Framing

1. Light steel framing, bracing, supports, framing, clip angles, shelf angles, plates, etc., shall be of such shapes and sizes as indicated on the drawings and details or as required to suit the condition and shall be provided with all necessary supports and reinforcing such as hangers, braces, struts, clip angles, anchors, bolts, nuts, welds, etc., as required to properly support and rigidly fasten and anchor same in place and to steel, concrete, masonry and all other connecting and adjoining work.

2. All light steel framing steel shall be furnished and erected in accordance with the applicable requirements of the "Specifications for the Design, Fabrication and Erection of Structural Steel for Buildings" by the American Institute of Steel Construction and as specified herein.

F. Structural Steel Door Frames

1. Fabricate steel door frames of structural shapes and bars, fully welded, uniform, square and true. Plug weld built-up members, continuously weld exposed joints; grind exposed welds smooth. Provide 5/8" x 1-1/2" steel bar stops. Secure removable stops to frame with countersunk machine screws, uniformly spaced at not more than ten (10) inches o.c.

2. Provide necessary reinforcements and drill and tap as required for finish hardware.

3. Provide steel strap anchors for securing door frames into adjoining concrete or masonry, using 1/8" x 2" straps of the length required for a minimum eight (8) inch embedment. Weld anchors to frame

jambs no more than twelve (12) inches from both bottom and head of frame and space anchors not more than thirty (30) inches apart.

4. Extend bottom of frames to floor elevation and secure to concrete with steel angle clips welded to frames, anchored with expansion shields and bolts.

G. Steel Bollards: Provide six (6) inches O.D. extra strong (Schedule 80) steel pipe, concrete filled, with base of steel plate for mounting to anchor bolts in concrete foundation. Rabbet top of steel pipe and insert 1/4" steel plate cap, flush with top of pipe. Weld top of cap to pipe and grind smooth and flush.

H. Miscellaneous Steel Trim: Provide shapes and sizes for profiles shown. Except as otherwise indicated, fabricate units from structural steel shapes and plates and steel bars, with continuously welded joints and smooth exposed edges. Use concealed field splices wherever possible. Provide cutouts, fittings and anchorages as required for coordination of assembly and installation with other work.

I. Steel Gratings and Frames

1. Provide hot dipped galvanized steel gratings complying with FS RR-G-661 with rectangular cross bars welded to bearing bars. Bars to have plain wearing surface.

2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. McNichols
   b. Reliance
   c. Borden
   d. Irving Subway Grating
   e. Or approved equal

3. Hinged Section: Provide hinged sections in areaway gratings where required by the drawings. Each hinged section up to 4'-0" wide shall be provided with two (2) five knuckle, fast pin, regular weight, plain bearing, wrought bronze butt hinges. Each hinged section over 4'-0" wide shall be provided with three (3) butt hinges. Hinged sections shall have provisions for padlocking on the underside.

4. Furnish grating frames, with corners mitered, welded and ground smooth, and with welded-on straps for secure anchorage into concrete. Frames and anchors to be galvanized.

5. Structural Performance: Provide gratings capable of withstanding the following structural loads without exceeding the allowable design working stress of the materials involved, including anchors and connections:

   a. Floors: Capable of withstanding a uniform load of 250 lbf/sq. ft. or a concentrated load of 3000 lbf, whichever produces the greater stress.
   b. Walkways and Elevated Platforms Other Than Exits: Capable of withstanding a uniform load of 60 lbf/sq. ft. Limit deflection to L/360 or 1/4", whichever is less.
   c. Walkways and Elevated Platforms Used as Exits: Capable of withstanding a uniform of 100 lbf/sq. ft. or a concentrated load of 300 lbf on an area of 4 sq. in., whichever produces the greater stress. Limit deflection to L/360 or 1/4", whichever is less.
   d. Sidewalks and Vehicular Driveways: Capable of withstanding a uniform load of 250 lfb/sq. ft. or a concentrated load of 8000 lbf, whichever produces the greater stress.

J. Countertop Supports: Steel framing as indicated or required to support countertops. Conceal framing under countertops and within wall behind countertops. Provide supports to withstand a concentrated load of not less than three hundred (300) lbs. applied at any point with a deflection not to exceed L/240 for the length of the countertop.

K. Masonry Support Steel: Provide galvanized steel, relieving angles, plates, accessories and other steel shapes for masonry support steel.

1. Fabricate masonry support steel to allow final adjustment with the closest tolerances possible. Relieving angles which require cutting to fit masonry flashing shall be straightened without deflections.

2. Coordinate masonry support system with concrete work for locations of wedge inserts.

3. Install to meet requirements of building masonry work, face brick coursing and stone placement. Coordinate final adjustments with masonry work as work progresses.

L. Sleeves in Concrete Walls and Slabs

1. Sleeves through concrete walls shall be of Schedule 40 steel pipe with i.d. two (2) inches larger than o.d. of pipe or conduit (including insulation, if any) to be accommodated. Sleeves shall project one-half (1/2) inch on each side of finished wall. Provide rectangular one-quarter (1/4) inch steel plate collar at center, continuously welded to the perimeter of the sleeve, and six (6) inches wider than the o.d.

2. Slots in slabs shall be 12 gauge steel sheet, galvanized, of dimensions indicated, with strap anchors welded in place not more than twelve (12) inches on centers.

PART III - EXECUTION

3.1 EXECUTION REQUIREMENTS

A. Refer to DDC General Conditions for execution requirements.

3.2 INSTALLATION

A. Fastening to In-Place Construction: Provide anchorage devices and fasteners where necessary for securing miscellaneous metal fabrications to in-place construction; including threaded fasteners for concrete and masonry inserts, toggle bolts, through-bolts, lag bolts, wood screws, and other connectors as required.

B. Cutting, Fitting and Placement: Perform cutting, drilling and fitting required for installation of miscellaneous metal fabrications. Set work accurately in location, alignment and elevation, plumb, level, true and free of rack, measured from established lines and levels. Provide temporary bracing or anchors in formwork for items which are to be built into concrete, masonry, or similar construction.

C. Fitting Connections: Fit exposed connections accurately together to form tight hairline joints. Weld connections which are not to be left as exposed joints but cannot be shop welded because of shipping size limitations. Grind exposed joints smooth and touch up shop paint coat. Do not weld, cut or abrade the

surfaces of exterior units which have been hot dip galvanized after fabrication, and are intended for bolted or screwed field connections.

D. Field Welding: Comply with AWS D1.1 for procedures of manual shielded metal-arc welding, appearance, and quality of welds made, and methods used in correcting welding work.

E. Touch-Up Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with same material as used for shop painting. Apply by brush or spray to provide a minimum dry film thickness of 2.0 mils.

F. Field Touch-Up of Galvanized Surfaces: Touch-up shop applied galvanized coatings damaged during handling and installation. Use galvanizing repair coating specified herein for galvanized surfaces.

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SECTION 05 51 00
Steel Pan Stairs

PART I - GENERAL

1.1 RELATED DOCUMENTS

A. The following documents apply to all required work for the Project: (1) the Contract Drawings, (2) the Specifications, (3) the General Conditions, (4) the Addendum and (5) the Contract (City of New York Standard Construction Contract).

B. LEED General Requirements:

1. Refer to DDC General Conditions
   a. Section 01 33 00 "Submittal Procedures"
   b. Section 01 74 19 "Construction Waste Management and Disposal"
   c. Section 01 81 13.04 "Sustainable Design Requirements for LEED v4 Buildings

1.2 SUMMARY

A. Section includes:

1. Steel pan stairs, including all clips, hangers, inserts, braces and other supports.

2. Steel pipe hand rails, guard rails and intermediate rails for steel stairs, including supports, brackets, and anchors.

B. Related Sections

1. Cast-in-Place Concrete - Section 03 30 00.

2. Structural Steel - Section 05 12 00.

3. Miscellaneous Metals - Section 05 50 00.

4. Gypsum Drywall - Section 09 29 00.

5. Painting and Finishing - Section 09 90 00.

1.3 QUALITY ASSURANCE

A. Refer to DDC General Conditions Section 01 40 00 "Quality Requirements".

B. Qualification of Welders: Use only certified welders and the shielded arc process for all welding performed in connection with the work of this Section. Protect adjacent surfaces when field welding to prevent damage or stain. Welders and welding operators must be qualified by tests as provided by AWS.

C. Codes and Standards: In addition to complying with DDC General Conditions, comply with:

1. "Specifications for Design, Fabrication and Erection of Structural Steel for Buildings" of the American Institute of Steel Construction.

2. "Code for Welding in Building Construction" of the American Welding Society.

3. "Metal Stairs Manual" of the National Association of Architectural Metal Manufacturers.

1.4 SUBMITTAL PROCEDURES

A. Refer to DDC General Conditions Section 01 33 00 "Submittal Procedures".

1.5 SUBMITTALS

A. Shop Drawings

1. Before any steel stairs are fabricated, submit shop drawings to the Commissioner for approval.

2. Show all locations, markings, quantities, materials, sizes and shapes, and indicate all methods of connecting, anchoring, fastening, bracing, for the stair construction, support and attachment to the work of other trades.

B. Engineering Data

1. Before any metal pan stairs are fabricated, submit engineering data drawings to the Commissioner for review. The Contractor is responsible for the structural design and supports for the stair system and must show his proposed system on these drawings.

2. These drawings must show all load conditions and design calculations relative to connections, fastening devices and anchorage, as well as size and gauge of stair members.

3. Contractor to engage a Structural Engineer licensed in the State of New York to prepare calculations and drawings. Calculations and drawings shall be signed and sealed by this Engineer.

C. Submit the following listed samples and other samples as may be requested by the Commissioner, to show the quality standards:

1. Railing bracket.

2. Exposed weld.

3. Exposed bolted connection.

4. Bent pipe railing.

D. Samples shall be submitted cleaned and shop primed and shall represent standards to which all respective materials used in the Project shall meet.

1.6 PERFORMANCE STANDARDS

A. Stairs and railings shall be constructed to conform to the following performance standards, unless greater required by 2014 New York City Building Code:

1. Stairs and platforms shall support a live load of one hundred (100) psf and a concentrated live load of three hundred (300) lbs. and shall have a live load deflection limited to 1/360 of the span. Loads shall not apply simultaneously.

2. Railings shall withstand a two hundred (200) lb. force applied to rail from any direction, and a uniformly distributed load of 50 lbs./lin. ft. applied downward or horizontally, loads not to act simultaneously.

PART II - PRODUCTS

2.1 MATERIALS

A. Structural Steel: ASTM A 36.

B. Steel Sheets: ASTM A 245, Grade C, minimum ten (10) gauge for platforms, twelve (12) gauge minimum for treads and risers.

C. Steel Pipe: ASTM A 53, Type E., Grade A, and ASTM A 501. Use standard malleable iron fittings for steel pipe.

D. Malleable Iron Castings: ASTM A 47, Grade 35018.

E. Bolts and Nuts: ASTM A 307, Grade A bolts.

F. Machine Screws: ASME B 18.6.3.

G. Expansion Bolts: "Cinch" type, galvanized, of approved manufacture.

H. Threaded End Hanger Rods: Minimum 3/4" diameter, ASTM A 36.

I. Shop Paint:

1. Shop prime all stairs and railings

2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. Series 88 Azeron Primer made by Tnemec
   b. ICI Devoe "Rust Guard" quick dry alkyd shop coat No. 41403
   c. "Interlac 393" by International Protection Coatings
   d. Or approved equal

J. Bituminous Paint: Cold applied asphalt emulsion complying with ASTM D1187.

K. Concrete Fill and Reinforcing Materials

1. Concrete Materials and Properties: Comply with requirements in Section 03 30 00, Cast-in-Place Concrete, for normal-weight, ready-mixed concrete with a minimum 28-day compressive strength of 3000 psi.

2. Nonslip-Aggregate Finish: Factory-packaged abrasive aggregate made from fused, aluminum-oxide grits or crushed emery; rustproof and nonglazing; unaffected by freezing, moisture, or cleaning materials.

3. Welded Wire Fabric: ASTM A 185, 6 by 6 inches – W1.4 by W1.4, unless otherwise indicated.

2.2 FABRICATION

A. General

1. Steel pan stair work shall be fabricated by an experienced manufacturer in accordance with approved shop drawings and best practices of the industry, using new and clean materials as specified, having structural properties sufficient to safely sustain or withstand strains and stresses to which material will be subjected.

2. Fabricate shop assemblies in largest practical sizes to minimize field work. All exposed surfaces shall be clean and free from all dirt, stains, grease marks, scratches, waves, dents, buckles, tool marks, rattles, and other objectionable defects which mar appearance or use of finished work.

3. Cutting: Cut materials by sawing, shearing, or blanking. Flame cutting will be permitted when ground back to clean edges. Cuts shall be made accurately, clean, sharp and free of burrs, without deforming adjacent metals.

4. Connections: Make connections with tight joints, capable of developing full strength of the members, flush. Locate joints where least conspicuous. Use concealed fasteners where possible. Weld or rivet shop connections; bolt, screw or weld field connections.

   a. Welding: Welds shall be continuous, except where spot welding is specifically permitted. Welding shall conform to the Standard Code of the American Welding Society. Exposed welds are required to be ground flush.

   b. Bolts and Screws: Make threaded connections tight with threads entirely concealed. Use lock nuts, or upset thread ends. Exposed bolts and screw head shall be flat and countersunk, unless otherwise indicated on drawings. Remove projecting ends of bolts and screws. Punch or drill holes; do not burn.

B. Stairs and Platforms

1. Provide stringers, risers, sub-treads and platforms matching profiles as shown. Form tread pan and riser in a continuous piece to receive the finished tread; tread shall be a minimum of twelve (12) gauge. Weld risers and treads to carrier angles which shall be welded to the structural steel stringers. Fasten countersunk bolts or stud welded clips through mesh for cement fill. Provide welded-on clips for the support of gypsum drywall soffits. Steel pan risers shall be closed in the bottom part and open in the top.

2. On intermediate platforms, provide metal bases formed of stringers. Miter and weld and grind smooth internal and external corners of metal bases. Form platform runs of minimum ten (10) gauge steel.

3. Countersink bolt heads and screws on finished surfaces or cut off flush with such surfaces.

4. Properly fit and securely fasten together all parts making exposed joints close fitting. Cut, drill, punch and tap as required for installation.

5. Make joints as strong and rigid as adjoining sections. Weld continuously along entire line of contact except where spot welding is indicated.

6. Separate dissimilar metals in or adjacent to work of this Section with a coat of bituminous paint on each surface prior to installation.

7. Closure and Filler Plates: Where indicated on drawings or as required, at least twelve (12) gauge sheet steel, securely fastened to top and bottom of stringer and adjacent wall, by welding or screws.

8. Struts, Hangers, Platform Headers and Subframing

   a. Provide supports as detailed and required, including all struts, clip angles, angles or hangers which are required and necessary for support of stair construction.
   b. Supports shall be of size suitable for the support load, as required. Struts, angles and hangers shall be supported by and directly connected to the structural framing. Struts and hangers, with their connections, shall be concealed.
   c. Provide other inserts, anchors and/or other subframing as may be required to complete the stair construction and properly support it on the structural framing.

C. Handrails, Railings, Posts and Brackets

1. Provide steel pipe of size shown on drawings, Schedule 40. Use heavier weight pipes and/or reinforce pipes internally as required to meet performance standards given in paragraph 1.7 herein. Fittings shall be flush type, malleable or cast iron. Wall brackets shall be steel design as detailed.

2. Handrail, post and railing spacing shall meet 2014 New York City Building Code requirements.

3. All handrails shall be stainless steel; see Section 05 70 00, Ornamental Metals.

4. Construction: Form direction changes in rails using solid bar stock or elbows. Connections shall be shop welded, except where expansion joints are required. Field connections shall be welded for continuity. All exposed welds shall be ground smooth and flush.

   a. If elbows are not available for angles shown, bends shall maintain full diameter of pipe, use mandrel, no kinks, ripples, flats are acceptable.

5. Fabricate steel tubing with wall thickness of 0.120".

6. Anchor posts to steel with steel flanges, angle type or floor type as required by conditions, welded to posts and bolted to the steel supporting members.

7. Secure handrails to walls with wall brackets. Provide brackets as shown on drawings. For installation in drywall, furnish steel plate as specified in Section 09 29 00, Gypsum Drywall, to receive wall plate portion of bracket and anchor or bolt wall plate through drywall to supporting steel plate. Locate brackets at not more than 5'-0" o.c. unless otherwise shown.

8. Anchor rail ends into adjacent walls with steel flanges welded to rail ends and anchored into the wall construction as described above.

2.3 SHOP PAINTING

A. Scope: All ferrous metal shall be cleaned, and shop painted with one coat of specified ferrous metal primer.

B. Cleaning: Conform to Steel Structures Painting Council Surface Preparation Specification SP 3 (latest edition) "Power Tool Cleaning" for cleaning of ferrous metals which are to receive shop prime coat.

C. Application

1. Apply shop prime coat immediately after cleaning metal. Apply paint in dry weather or under cover. Metal surfaces shall be free from frost or moisture when painted. Paint all metal surfaces including edges, joints, holes, corners, etc. Paint to match bar stock.

2. Paint surfaces which will be concealed after shop assembly prior to such assembly. Apply paint in accordance with approved paint manufacturer's printed instructions, and the use of any thinners, adulterants or admixtures shall be only as stated in said instructions.

3. Paint shall uniformly and completely cover the metal surfaces, 2.0 mils minimum dry film thickness. No work shall be shipped until the shop prime coat thereon has dried.

D. Touch-Up: In the shop, after assembly and in the field, after installation of work of this Section, touch-up damaged or abraded portions of shop prime paint with specified ferrous metal primer.

E. Apply one shop coat to fabricated metal items, except apply two (2) coats of paint to surfaces inaccessible after assembly or erection. Change color of second coat to distinguish it from the first.

PART III - EXECUTION

3.1 EXECUTION REQUIREMENTS

A. Refer to DDC General Conditions for execution requirements.

3.2 INSTALLATION

A. Work in the field shall comply with the same requirements as specified for shop work above.

B. Except where otherwise shown or specified for a particular item of work or for built-in work, fasten metal work to solid masonry with expansion bolts. Fastenings to wood plugs in masonry will not be accepted. Drill holes to the exact diameter of the bolts using a rotary drill for concrete and a percussion drill for other masonry. Thread screws full length to the head of the screw.

C. Provide connecting members needed for properly securing the work to masonry, drywall and structural framing, including bolts, machine screws, rods, hangers, inserts, sleeves, plates, anchors, expansion bolts, washers and other items as required. Furnish built-in items to drywall trades as required for proper anchorage.

D. Leave work exposed to view, including stair soffits, clean, smooth and neatly finished. Exposed welds shall be dressed smooth.

E. Attach wall railings to the wall construction using bolts and anchors that meet performance standards.

F. Posts shall be set plumb within 1/8" vertical tolerance. Longitudinal members shall be parallel with each other and with floor surface or slope of stair to a tolerance of 1/8" in ten (10) linear feet. Center lines of members within each run of railing shall lie in the same vertical plane. Field joints of connecting sections shall be hairline.

3.3 TOUCH-UP PAINTING

A. Immediately after erection, clean field welds, bolted connections, and abraded areas of shop coat, and paint exposed areas with same material used for shop painting. Apply by brush or spray to provide a minimum dry film thickness of 2.0 mils.

END OF SECTION 05 51 00

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SECTION 05 70 00
Ornamental Metals

PART I - GENERAL

1.1 RELATED DOCUMENTS

A. The following documents apply to all required work for the Project: (1) the Contract Drawings, (2) the Specifications, (3) the General Conditions, (4) the Addendum and (5) the Contract (City of New York Standard Construction Contract).

B. LEED General Requirements:

1. Refer to DDC General Conditions

    1. Section 01 33 00 "Submittal Procedures"
    2. Section 01 74 19 "Construction Waste Management and Disposal"
    3. Section 01 81 13.04 "Sustainable Design Requirements for LEED v4 Buildings"

1.2 SUMMARY

A. Section includes:

1. Stainless steel handrails.
2. Stainless steel base.
3. Aluminum transition strips.
4. Perforated metal cabinet doors.

B. Related Sections

1. Miscellaneous Metals - Section 05 50 00.
2. Plumbing Fixtures - Section 22 40 00.

1.3 QUALITY ASSURANCE

A. Refer to DDC General Conditions Section 01 40 00 "Quality Requirements".

B. Work of this Section shall be fabricated and installed by an experienced fabricator or manufacturer who has been engaged in work of equivalent scope and fabrication standards for at least three (3) years. Materials, methods of fabrication, fitting, assembly, bracing, supporting, fastening, operating devices, and erection shall be in accordance with drawings, specifications, and approved shop drawings, and be of highest quality practices of the industry, using new and clean materials as specified, having structural properties sufficient to safely sustain or withstand stresses and strains to which materials and assembled work will be subjected. All work shall be accurately and neatly fabricated, assembled, and erected.

C. Shop Assembly: Insofar as practicable, fitting and assembly of work shall be done in shop. Work that cannot be permanently shop assembled, shall be completely assembled, marked and disassembled in shop

before shipment to ensure proper assembly in field. Shop assemble work in largest practical sizes to minimize field work. Ensure that the shop fabricated items will properly fit the field condition. In the event that shop fabricated items do not fit the field condition, the item shall be returned to the shop for correction.

D. Mock-Up: Build mock-up of feature stair railing assembly.

1. See drawing set for scope and extents of mockup requirements.

1.4 SUBMITTAL PROCEDURES

A. Refer to DDC General Conditions Section 01 33 00 "Submittal Procedures".

1.5 SUBMITTALS

A. Shop Drawings: Submit for all items of work of this Section, as enumerated under paragraph 1.3A, showing locations, layouts, materials, thicknesses, finishes, dimensions, construction, relation to adjoining construction, erection details, profiles, jointing and all other details to fully illustrate the work of this Section.

B. Samples: Submit fabricated samples (of sufficient size to fully show construction, materials and finishes) of all items of work as enumerated under paragraph 1.3A herein.

C. Product Data: Submit manufacturer's, fabricator's and finisher's specifications and installation instructions for products used in ornamental metal work, including finishing materials and methods.

D. Samples for Verification: For each type of exposed finish required, prepared on 6-inch square samples of metal of same thickness and material indicated for the Work or profile of Work.

E. Contractor's Licensed Engineer Submittal: For installed products indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified Professional Engineer licensed in the State of New York responsible for their preparation.

F. Coordination Drawings: For decorative formed metal elements that house items specified in other Sections. Show dimensions of housed items, including locations of housing penetrations and attachments and necessary clearances.

1.6 COORDINATION

A. Coordinate installation of anchorages for decorative formed metal items. Furnish setting drawings, templates and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts and items with integral anchors, that are to be embedded in concrete to masonry. Deliver such items to Project site in time for installation.

B. Coordinate installation of decorative formed metal with adjacent construction to ensure that wall assemblies, flashings, trim and joint sealants, are protected against damage from the effects of weather, age, corrosion and other causes.

1.7 PERFORMANCE STANDARDS FOR RAILINGS AND GUARDRAILS

A. Railing and guardrail assemblies shall be designed and installed to resist the simultaneous application of a lateral force of 50 PLF and a vertical load of 100 PLF, both applied to the top of the railing. The railing shall resist a total lateral force and total vertical load of at least 200 lbs. each.

B. Submit calculations and drawings signed and sealed by a Professional Engineer licensed in the State of New York indicating that railing system can meet these performance criteria.

PART II - PRODUCTS

2.1 MATERIALS

A. Provide materials which have been selected for their surface flatness, smoothness and freedom from surface blemishes where exposed to view in the finished unit. Surfaces exposed to view that exhibit pitting, seam marks, roller marks, oil-canning, stains, discolorations, or other imperfections on the finished units will not be acceptable.

B. Stainless Steel: Comply with the following standards for the forms and types of stainless steel for the required items of work.

1. Pipe: ASTM A 312, Grade TP 304 (interior) and Type 316L (exterior).
2. Sheet, Strip, Flat Bar and Plate: ASTM A 666, Type 304 (interior) and Type 316L (exterior).
3. Tubing: ASTM A 554, Grade MT 304 (interior) and Type 316L (exterior).
4. Castings: ASTM A 743A, Grade CF 8 or CF 20.
5. Bars and Shapes: ASTM A 276, Type 304 (interior) and Type 316L (exterior).
6. Rods at level 2 shall be solid bar, up to 42" A.F.F.

C. Welding Electrodes and Filler Metal: Type and alloy of filler metal and electrodes as recommended by producer of the metal to be welded, and as required for color match, strength and compatibility in the fabricated items.

D. Fasteners: Furnish basic metal and alloy, matching finished color and texture as the metal being fastened, unless otherwise indicated. Provide Phillips square drive screws for exposed fasteners, unless otherwise indicated.

E. Anchors and Inserts: Either furnish inserts to be set in concrete or masonry work, or provide other anchoring devices as required for the installation of ornamental metal items. Provide toothed steel or lead shield expansion bolt devices for drilled-in-place anchors. Provide galvanized or cadmium-coated anchors and inserts for exterior installations.

1. Provide units with exposed surfaces matching the texture and finish of the metal item anchored.

F. Bituminous Paint: SSPC-Paint 12 (cold-applied asphalt mastic).

G. Cast-in-Place and Preinstalled Anchors: Anchors fabricated from corrosion-resistant materials with capability to sustain, without failure, a load equal to six times the load imposed when installed in unit masonry and equal to four times the load imposed when installed in concrete.

H. Sealants, Interior: Nonsag, paintable, nonstaining, latex sealant complying with ASTM C834; of type and grade required to seal joints in decorative formed metal; and as recommended in writing by decorative formed metal manufacturer.

I. Filler Metal and Electrodes: Provide type and alloy of filler metal and electrodes as recommended by produced of metal to be welded or brazed and as necessary for strength, corrosion resistance, and compatibility in fabricated items

1. Use filler metals that will match the color of metal being joined and will not cause discoloration.

2.2 FABRICATION

A. Cutting: Cut metal by sawing, shearing or blanking. Flame cutting will be permitted only if cut edges are ground back to clean, smooth edges. Make cuts accurate, clean, sharp, square and free of burrs, without deforming adjacent surfaces or metals.

B. Holes: Drill or cleanly punch holes (do not burn), so that holes will be accurate, clean, neat and sharp without deforming adjacent surfaces or metals.

C. Connections

1. Make connections with tight joints, capable of developing full strength of member, flush unless indicated otherwise, formed to exclude water where exposed to water. Locate joints where indicated on drawings. Provide connections to allow for thermal movement of metal at locations and by methods approved by the Commissioner. For work exposed to view, use concealed fasteners (unless welded or other connections indicated) with joints accurately fitted, flush and rigidly secured with hairline contacts.

2. Welding: Welding shall be in accordance with recommendations of the American Welding Society and shall be done with electrodes and/or methods recommended by the manufacturers of the metals being welded. Welds shall be continuous, except where spot welding is specifically permitted. Welds exposed to view shall be ground flush and dressed smooth with and to match finish of adjoining surfaces so that joint will not be visible; undercut metal edges where welds are required to be ground flush and dressed smooth. All welds on or behind surfaces which will be exposed to view shall be done so that finished surface will be free of imperfections such as pits, runs, splatter, cracks, warping, dimpling, depressions or other forms of distortion or discoloration. Remove weld splatter and welding oxides from all welded surfaces.

3. Bolts and Screws: Make threaded connections tight with threads entirely concealed. Use lock nuts. Bolts and screw heads, where shown to be exposed to view, shall be flat and countersunk. Cut off projecting ends of exposed bolts and screws flush with nuts of adjacent metal.

D. Operating Mechanism: Operating devices, mechanism and hardware used in connection with this work shall be fabricated, assembled, installed and adjusted after installation so that they will operate smoothly, freely, noiselessly and without excessive friction.

E. Built-In Work: Furnish anchor bolts, inserts, plates and any other anchorage devices, and all other items for ornamental metal work to be built into concrete, masonry, or work of other trades, with necessary templates and instructions, and in ample time to facilitate proper placing and installation.

F. Supplementary Parts: Provide as necessary to complete each item of work, even though such supplementary parts are not shown or specified.

G. Coordination: Accurately cut, fit, drill and tap work of this Section to accommodate and fit work of other trades. Furnish or obtain, as applicable, templates and drawings to or from applicable trades for proper coordination of this work.

H. Exposed Work: In addition to requirements specified herein or shown on drawings, all surfaces exposed to view shall be clean, and free from dirt, stains, grease, scratches, distortions, waves, dents, buckles, tool marks, burrs and other defects which mar appearance of finished work. Ornamental metal work exposed to view shall be straight and true to line or curve, smooth arrises and angles as sharp as practicable, miters formed in true alignment, profiles accurately intersecting, and with joints carefully matched to produce continuity of line and design. Exposed fastenings, where permitted, shall be of the same material, color and finish as the metal to which applied, unless otherwise indicated, and shall be of the smallest practicable size.

I. Materials used shall be of such strength, thickness and alloy that they are capable of meeting all standards and descriptions specified herein and as detailed on drawings.

J. Bending: Bend sheet metal to the required shape. Bent items shall be free of grain separation, oil canning or other distortion.

1. Square Bends: Back-cut sheets to attach maximum square bend possible, with maximum radius of 1/16 in.

2. Knife Edge Bends: Back-cut and back bevel sheets to attain sharpest bend possible, with maximum radius of 1/32 in.

2.3 SHOP FINISHING

A. General

1. Comply with NAAMM "Metal Finishes Manual" for finish designations and application recommendations, except as otherwise indicated.

2. Provide colors or color matches as indicated on selected samples.

3. Protect mechanical finishes on exposed surfaces from damage by application of strippable temporary protective covering prior to shipment.

4. Corrosion Protection: Coat concealed surfaces which will be in contact with concrete, masonry, wood or dissimilar metals, in exterior work and work to be built into exterior and below grade walls and decks, with a heavy coat of bituminous paint. Do not extend coating onto exposed surfaces.

B. Stainless Steel

1. Remove or blend tool and die marks and stretch lines into finish.

2. Grind and polish surfaces to produce uniform, directionally textured, polished finish indicated, free of cross scratches. Run grain with long dimension of each piece.

3. Bright, Directional Polish: No. 4 finish.

4. When polishing is complete, passivate and rinse surfaces. Remove foreign matter and leave surface chemically dry.

2.4 PROTECTION

A. Provide necessary protection to all exposed surfaces of ornamental metal work, so as to prevent damage, staining, discoloration, abrasion, etc., to these surfaces from time of shipment from factory to substantial completion of work of this project. Protection shall be provided by wrappings, strippable coatings, or other means. After installation, remove protective paper or strippable coating and clean exposed surfaces, and then provide additional temporary protection to protect ornamental metal work from damage during subsequent construction activities.

2.5 STEEL FRAMING, BRACING, SUPPORTS AND REINFORCEMENTS

A. Steel framing, plate reinforcing, supplementary steel framing or reinforcing, bracket assemblies, and the like required for the support, framing, reinforcing, bracing, etc., of work of this Section shall be of such sizes and shapes as indicated on the drawings, or as required to suit the conditions, and shall be provided with all necessary supports and accessory items such as inserts, hangers, braces, struts, clip angles, anchors, bolts, nuts, welds, etc., as required to properly and rigidly fasten, anchor or attach work of this Section in place and to the concrete, masonry and other connecting and adjoining work.

2.6 ORNAMENTAL HANDRAILS AND RAILINGS

A. Welded Connections: Fabricate handrails and railings for connecting members by welding. Cope components at perpendicular and skew connections to provide close fit, or use fittings designed for this purpose. Weld connections continuously to comply with the following:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.

2. Obtain fusion without undercut or overlap.

3. Remove flux immediately.

4. At exposed connections, finish exposed surfaces smooth and blended so no roughness shows after finishing and welded surface matches contours of adjoining surfaces.

5. Form changes in direction of railing members by radius bends.

6. Form simple and compound curves by bending members in jigs to produce uniform curvature for each repetitive configuration required; maintain profile of member throughout entire bend without buckling, twisting, or otherwise deforming exposed surfaces of handrail and railing components.

7. Provide wall returns at ends of wall-mounted handrails, close ends of returns.

8. Close exposed ends of handrail and railing members with prefabricated end fittings.

9. Brackets, Flanges, Fittings, and Anchors: Provide brackets, flanges, miscellaneous fittings, and anchors to interconnect handrail and railing members to other work, unless otherwise indicated.

   a. Furnish inserts and other anchorage devices for connecting handrails and railings to concrete or masonry work. Fabricate anchorage devices capable of withstanding loads imposed by handrails and railings. Coordinate anchorage devices with supporting structure.
   b. For railing posts set in concrete, provide preset sleeves of steel, not less than 6 inches long and inside dimensions not less than 1/2 inch greater than outside dimensions of post, with steel plate forming bottom closure.

2.7 ALUMINUM TRANSITION STRIPS

A. Floor Transitions: Provide satin anodized aluminum transitions strips.

1. Basis of Design - MAT to PCT: Subject to compliance with requirements, provide Schluter Systems, L.P.; Schluter Reno-Ramp or comparable product by one of the following manufacturers:
   a. Blanke Corp.
   b. Ceramic Tool Co. Inc.
   c. Or approved equal

2. Basis of Design - SC to RF: Subject to compliance with requirements, provide Schluter Systems, L.P.; Schluter Jolly or comparable product by one of the following manufacturers:
   a. Blanke Corp.
   b. Ceramic Tool Co. Inc.
   c. Or approved equal

3. Basis of Design - SC to PCT: Subject to compliance with requirements, provide Schluter Systems, L.P.; Schluter Reno-U or comparable product by one of the following manufacturers:
   a. Blanke Corp.
   b. Ceramic Tool Co. Inc.
   c. Or approved equal

4. Basis of Design - RF to PCT: Subject to compliance with requirements, provide Schluter Systems, L.P.; Schluter Reno-U or comparable product by one of the following manufacturers:
   a. Blanke Corp.
   b. Ceramic Tool Co. Inc.
   c. Or approved equal

5. Basis of Design - PCT to PCT: Subject to compliance with requirements, provide Schluter Systems, L.P.; Schluter Deco or comparable product by one of the following manufacturers:
   a. Blanke Corp.
   b. Ceramic Tool Co. Inc.
   c. Or approved equal

2.8 PERFORATED METAL CABINET DOORS (MTL-01)

A. Basis of Design: Subject to compliance with requirements, provide McNichols; perforated aluminum alloy 3003-H14 or comparable product by one of the following manufacturers:
   1. Ametco Manufacturing Corporation
   2. Ferguson Perforating
   3. Or approved equal

PART III - EXECUTION

3.1 EXECUTION REQUIREMENTS

A. Refer to DDC General Conditions for execution requirements.

3.2 INSTALLATION

A. General: Install work of this Section square, plumb, straight, true to line or radius, accurately fitted and located, with flush, tight hairline joints (except as otherwise indicated or to allow for thermal movement), with provisions for other trades, with provisions to allow for thermal movement, with provisions to exclude water where exposed to weather, and with attachment devices as required for secure and rigid installation. Ensure that shop fabricated ornamental metal items will properly fit the field condition. In cases where the shop fabricated ornamental metal items do not fit the field condition, the item shall be returned to the shop for correction.

B. Attachments

   1. Unless otherwise indicated, work to be built into concrete or masonry shall be anchored with shop welded on galvanized steel strap anchors; work to be attached to concrete or masonry shall be anchored by bolts into embedded inserts or expansion shields; work attached to structural steel shall be anchored by welds or bolts; work attached to metals other than structural steel shall be anchored by bolts or screws. Power actuated fasteners not permitted unless approved by the Commissioner. Provide all supplementary parts necessary to complete each item of work of this Section.

   2. All attachment devices shall be of type, size and spacing to suit condition and as approved by the Commissioner. Provide shims, slotted holes, or other means necessary for leveling, plumbing and other required adjustments. Attachment devices for work exposed to view shall be concealed, unless indicated otherwise. Where bolts or screws are permitted in work exposed to view, they shall be oval head and counter sunk, unless otherwise noted, with projecting end cut off flush with nuts, or adjacent material, and shall match adjacent surfaces.

   3. Do all necessary drilling, tapping, cutting or other preparations of surrounding construction in the field accurately, neatly and as necessary for the attachment and support of work of this Section, but obtain Commissioner's approval prior to such preparation to work of others.

C. Tolerances: All work of this Section shall be plumb, square, level, true to radius and correctly aligned within the following limitations:

   1. Offset from true horizontal, vertical and design location shall not exceed 1/16" per ten (10) feet of length for any component, not cumulative.

2. Maximum offset from true alignment between abutting components shall not exceed 1/32".

D. Do not cut or abrade finishes which cannot be completely restored in the field. Return items with such finishes to the shop for required alterations, followed by complete refinishing, or provide new units at Contractor's option.

E. Install concealed gaskets and joint fillers as the work progresses, so as to make the work soundproof or lightproof as required.

F. Restore protective coverings which have been damaged during shipment or installation of the work. Remove protective coverings only when there is no possibility of damage from other work yet to be performed at the same location.

G. Retain protective coverings intact and remove simultaneously from similarly finished items to preclude non-uniform oxidation and discoloration.

H. Field Welding: Comply with AWS Code for the procedures of manual shielded metal-arc welding, the appearance and quality of welds made, and the methods used in correcting welding work.

END OF SECTION 05 70 00

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SECTION 05 71 13
Ornamental Metal Stairs

PART I - GENERAL

1.1 RELATED DOCUMENTS

A. The following documents apply to all required work for the Project: (1) the Contract Drawings, (2) the Specifications, (3) the General Conditions, (4) the Addendum and (5) the Contract (City of New York Standard Construction Contract).

B. LEED General Requirements:

1. Refer to DDC General Conditions

   a. Section 01 33 00 "Submittal Procedures"
   b. Section 01 74 19 "Construction Waste Management and Disposal"
   c. Section 01 81 13.04 "Sustainable Design Requirements for LEED v4 Buildings"

1.2 SUMMARY

A. Section includes:

1. Steel stairs with precast concrete treads.

2. Steel powder coated guardrails and handrails.

B. Related Sections

1. Miscellaneous Metals - Section 05 50 00.

2. Painting and Finishing - Section 09 90 00.

1.3 QUALITY ASSURANCE

A. Refer to DDC General Conditions Section 01 40 00 "Quality Requirements".

B. Qualification of Welders: Use only certified welders and the shielded arc process for all welding performed in connection with the work of this Section. Protect adjacent surfaces when field welding to prevent damage or stain. Welders and welding operators must be qualified by tests as provided by AWS.

C. Codes and Standards: In addition to complying with all pertinent codes and regulations, comply with:

1. "Specifications for Design, Fabrication and Erection of Structural Steel for Buildings" of the American Institute of Steel Construction.

2. "Code for Welding in Building Construction" of the American Welding Society.

3. "Metal Stairs Manual" of the National Association of Architectural Metal Manufacturers.

D. Conflicting Requirements: In the event of conflict between pertinent codes and regulations and the requirements of the referenced standards of these specifications, the provisions of the more stringent shall govern.

E. Field Measurements: If construction process permits, take field measurements prior to preparation of shop drawings and fabrication, where possible. Do not delay job progress. Allow for trimming and fitting wherever taking field measurements before fabrication might delay work.

F. Tolerances: Allow for construction tolerances as required.

G. Coordination: Coordinate this work with the work of all other trades interfacing with metal pan stairs, such as structural openings, sprinklers and standpipes, and other trades as required.

1.4 SUBMITTAL PROCEDURES

A. Refer to DDC General Conditions Section 01 33 00 "Submittal Procedures".

B. Shop Drawings

1. Before any steel stairs are fabricated, submit shop drawings to the Commissioner for approval.

2. Show all locations, markings, quantities, materials, sizes and shapes, and indicate all methods of connecting, anchoring, fastening, bracing, for the stair construction, support and attachment to the work of other trades.

C. Engineering Data

1. Before any steel stairs are fabricated, submit engineering data drawings to the Commissioner for review. The Contractor is responsible for the structural design and supports for the stair system and must show his proposed system on these drawings.

2. These drawings must show all load conditions and design calculations relative to connections, fastening devices and anchorage, as well as size and gauge of stair members. Calculations and drawings must be prepared by a Structural Engineer licensed in the State of New York and shall be signed and sealed by this Engineer.

1.5 SUBMITTALS

A. Submit the following listed samples and other samples as may be requested by the Commissioner, to show the quality standards:

1. Exposed weld.

2. Exposed bolted connection.

3. Tread and stringer connection.

4. Precast tread.

5. Handrail with railing bracket.

B. Samples shall be submitted cleaned and shop primed and shall represent standards to which all respective materials used in the Project shall meet.

1.6 PERFORMANCE STANDARDS

A. Stairs shall be constructed to conform to the following performance standards:

1. Stairs and platforms shall support a live load of one hundred (100) psf and a concentrated live load of three hundred (300) lbs. and shall have a live load deflection limited to 1/360 of the span. Loads shall not apply simultaneously.

2. Railings shall withstand a two hundred (200) lb. force applied to rail from any direction, and a uniformly distributed load of 50 lbs./lin. ft. applied downward or horizontally, loads not to act simultaneously.

1.7 PRODUCT HANDLING

A. Protection: Use all means necessary to protect steel stair before, during, and after installation, and to protect the installed work and materials of all other trades.

B. Replacements: In the event of damage, immediately make all repairs and replacements necessary to the approval of the Commissioner and at no additional cost to the City of New York.

PART II - PRODUCTS

2.1 MATERIALS

A. Steel and Iron: Comply with the following standards for the forms and types of steel for the required items of work.

1. Steel Plates, Shapes and Bars: ASTM A 36.

2. Steel Tubing: Cold formed, ASTM A 500; or hot rolled, ASTM A 501.

3. Structural Steel Sheet: Hot rolled, ASTM A 570; or cold rolled, ASTM A 611, Class 1; of grade required for design loading.

4. Galvanized Structural Steel Sheet: ASTM A 924, of grade required for design loading. Coating designation G90.

5. Steel Pipe: ASTM A 53, type and grade as selected by fabricator and as required for design loading; black finish unless galvanizing is indicated; standard weight (Schedule 40), unless otherwise indicated.

6. Gray Iron Castings: ASTM A 48, Class 30, unless another class is indicated or required by structural loads.

7. Malleable Iron Castings: ASTM A 47, grade as selected by fabricator.

8. Brackets, Flanges and Anchors: Cast or formed metal of the same type material and finish as supported rails, unless otherwise indicated.

9. Concrete Inserts: Threaded or wedge type; galvanized ferrous castings, either malleable iron, ASTM A 47, or cast steel, ASTM A 27. Provide bolts, washers and shims as required, hot-dip galvanized, ASTM A 153.

   a. Inserts shall be forwarded to the precast manufacturer in order to be cast into the precast elements.

10. Bolts and nuts for stair assembly shall be high strength bolts, ASTM A 325 SC, with hardened washers.

B. All steel shall be hot dip galvanized per Section 05 50 00 Miscellaneous Metals.

C. Bituminous Paint: Cold-applied asphalt mastic, ASTM D 1187.

D. Precast Concrete Treads: 5000 psi, color selected by Commissioner.

2.2 FABRICATION

A. General

1. Steel stair work shall be fabricated by an experienced manufacturer in accordance with approved shop drawings and best practices of the industry, using new and clean materials as specified, having structural properties sufficient to safely sustain or withstand strains and stresses to which material will be subjected.

2. Fabricate shop assemblies in largest practical sizes to minimize field work. All exposed surfaces shall be clean and free from all dirt, stains, grease marks, scratches, waves, dents, buckles, tool marks, rattles, and other objectionable defects which mar appearance or use of finished work.

3. Cutting: Cut materials by sawing, shearing, or blanking. Flame cutting will be permitted when ground back to clean edges. Cuts shall be made accurately, clean, sharp and free of burrs, without deforming adjacent metals.

4. Connections: Make connections with tight joints, capable of developing full strength of the members, flush. Locate joints where least conspicuous. Use concealed fasteners where possible. Weld or rivet shop connections; bolt, screw or weld field connections.

   a. Welding: Welds shall be continuous, except where spot welding is specifically permitted. Welding shall conform to the Standard Code of the American Welding Society. Exposed welds are required to be ground flush.
   b. Bolts and Screws: Make threaded connections tight with threads entirely concealed. Use lock nuts, or upset thread ends. Exposed bolts and screw head shall be flat and countersunk, unless otherwise indicated on drawings. Remove projecting ends of bolts and screws. Punch or drill holes; do not burn.

B. Stairs and Platforms

1. Provide stringers and supports for risers, treads and platforms matching profiles as shown. Form tread support in a continuous piece to receive the finished tread. Weld carrier angles to the structural steel stringers.

2. On intermediate platforms, provide metal bases formed of stringers. Miter and weld and grind smooth internal and external corners of metal bases. Form platform runs of minimum ten (10) gauge steel.

3. Properly fit and securely fasten together all parts making exposed joints close fitting. Cut, drill, punch and tap as required for installation.

4. Make joints as strong and rigid as adjoining sections. Weld continuously along entire line of contact except where spot welding is indicated.

5. Give ferrous metal surfaces a shop coat of primer. Before painting, thoroughly clean surfaces with wire brushes or other proper and effective means of removing loose scale, filings or other objectionable materials.

6. Remove grease prior to painting. Separate dissimilar metals in or adjacent to work of this Section with a coat of bituminous paint on each surface prior to installation.

7. Struts, Hangers, Platform Headers and Subframing

   a. Provide supports as detailed and required, including all struts, clip angles, angles or hangers which are required and necessary for support of stair construction.
   b. Supports shall be of size suitable for the support load, as required. Struts, angles and hangers shall be supported by and directly connected to the structural framing. Struts and hangers, with their connections, shall be concealed.
   c. Provide other inserts, anchors and/or other subframing as may be required to complete the stair construction and properly support it on the structural framing.

8. All surfaces of steel stringers, guardrails, brackets, connections, inserts, supports, etc. shall be shop primed to receive paint as specified in Section 09 90 00 Painting and Finishing.

2.3 SHOP FINISHING

A. Steel support shop primed per Section 05 50 00 Miscellaneous Metals and finish paint per Section 09 90 00 Painting and Finishing.

B. Stair Handrails/Railings and Guardrails

1. Powder-Coat Finish: Prepare, treat, and coat nongalvanized ferrous metal to comply with resin manufacturer's written instructions and as follows:

   a. Prepare uncoated ferrous-metal surfaces to comply with SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
   b. Treat prepared metal with iron-phosphate pretreatment, rinse, and seal surfaces.
   c. Apply thermosetting polyester or acrylic urethane powder coating with cured-film thickness not less than 1.5 mils (0.04 mm).
   d. Color: Color selected by Commissioner.

PART III - EXECUTION

3.1 EXECUTION REQUIREMENTS

A. Refer to DDC General Conditions for execution requirements.

3.2 INSTALLATION

A. Work in the field shall comply with the same requirements as specified for shop work above.

B. Except where otherwise shown or specified for a particular item of work or for built-in work, fasten metal work to solid masonry with expansion bolts. Fastenings to wood plugs in masonry will not be accepted.

Drill holes to the exact diameter of the bolts using a rotary drill for concrete and a percussion drill for other masonry. Thread screws full length to the head of the screw.

C. Provide connecting members needed for properly securing the work to masonry, drywall and structural framing, including bolts, machine screws, rods, hangers, inserts, sleeves, plates, anchors, expansion bolts, washers and other items as required. Furnish built-in items to drywall trades as required for proper anchorage.

D. Leave work exposed to view, including stair soffits, clean, smooth and neatly finished. All exposed welds shall be dressed smooth.

E. Include supplementary parts necessary to complete each item even though such work is not definitively shown or specified.

F. Coordinate and schedule the work of this Section with the work of other trades. Furnish anchors, sockets, fastenings and other miscellaneous items to be embedded in concrete or masonry, or required for securing metal work to other construction so as not to delay job progress.

G. Attach wall railings to the wall construction, using appropriate bolts and anchors to meet performance standards.

H. Install work plumb and true to the exact lines and levels, in the correct location and in proper relation to adjoining work.

I. Touch up marred and abraded shop paint of exposed surfaces after erection in the field.

J. Posts shall be set plumb within 1/8" vertical tolerance. Longitudinal members shall be parallel with each other and with floor surface or slope of stair to a tolerance of 1/8" in ten (10) linear feet. Center lines of members within each run of railing shall lie in the same vertical plane. Field joints of connecting sections shall be hairline.

3.3 TOUCH-UP PAINTING

A. Immediately after erection, clean field welds, bolted connections, and abraded areas of shop coat, and paint exposed areas with same material used for shop painting. Apply by brush or spray to provide a minimum dry film thickness of 2.0 mils.

END OF SECTION 05 71 13

SECTION 06 20 00
Carpentry

PART I - GENERAL

1.1 RELATED DOCUMENTS

A. The following documents apply to all required work for the Project: (1) the Contract Drawings, (2) the Specifications, (3) the General Conditions, (4) the Addendum and (5) the Contract (City of New York Standard Construction Contract).

B. LEED / Environmentally Preferable Purchase (EPP) General Requirements:

1. Refer to DDC General Conditions and the Addendum to the General Conditions

2. LEED requirements apply to all Phase II work with the exception of the Existing Building scope. EPP requirements apply to the project's Existing Building scope only.

1.2 SUMMARY

A. Section includes:

1. Blocking and miscellaneous wood.

2. Plywood backing panels for telephone and electrical closets.

3. Rough hardware.

4. Installation only of finish hardware.

5. Installation only of doors and hollow metal frames.

B. Related Sections

1. Unit Masonry - Section 04 20 00.

2. Architectural Woodwork - Section 06 40 23.

3. Thermal Insulation - Section 07 21 00.

4. Steel Doors and Frames - Section 08 11 13.

5. Door Hardware - Section 08 71 00.

6. Interior Glass and Glazing - Section 08 80 10.

1.3 QUALITY ASSURANCE

A. Refer to DDC General Conditions Section 01 40 00 "Quality Requirements".

B. Lumber Standard: Comply with PS 20.

C. Plywood Standard: Comply with PS 1 and American Plywood Assoc. (APA).

D. Shop fabricate carpentry work to the extent feasible and where shop fabrication will result in better workmanship than feasible for on-site fabrication.

E. Grade Marks: Identify lumber and plywood by official grade mark.

1. Lumber: Grade stamp to contain symbol of grading agency certified by Board of Review, American Lumber Standards Committee, mill number or name, grade of lumber, species grouping or combination designation, rules under which graded where applicable, and condition of seasoning at time of manufacture.

a. S-Dry: Maximum nineteen (19) percent moisture content as per ASTM D 2016.
b. MC-15 or KD: Maximum of fifteen (15) percent moisture content.

F. Installation of doors, frames and hardware shall conform to the minimum standards of "Installation Guides for Doors and Hardware" of the Door and Hardware Institute.

1.4 SUBMITTAL PROCEDURES

A. Refer to DDC General Conditions Section 01 33 00 "Submittal Procedures".

1.5 SUBMITTALS

A. Pressure Treatment: Include certification by treating plant stating chemicals and process used, net amount of salts retained and conformance with applicable standards.

B. Fire-Retardant Treatment: Include certification by treating plant that treatment material complies with 2014 New York City Building Code and that treatment will not bleed through finished surfaces.

1.6 PRODUCT HANDLING

A. Deliver carpentry materials to the site ready to use with each piece of lumber clearly marked as to grade, type and mill, and place in an area protected from the elements.

B. Deliver rough hardware in sealed kegs and/or other containers which shall bear labels as to type and kind.

C. Pile lumber for rough usage, when delivered to the site in stacks to ensure drainage and with a minimum clearance of six (6) inches above grade. Cover stacks with tarpaulins or other watertight coverings. Store grounds and similar small sized lumber inside the building as soon as possible after delivery.

D. Do not store seasoned lumber in wet or damp portions of the building.

E. Protect fire retardant treated materials against high humidity and moisture during storage and erection.

F. Remove delivered materials which do not conform to specified grading rules or are otherwise not suitable for installation from the job site and replace with acceptable materials.

G. All items specified in Section 08 71 00, Door Hardware, shall be received, accounted for, stored and applied under this Section.

H. Hardware shall be sorted and stored in space assigned by Contractor and shall be kept at all times under lock and key. The safety and preservation of all items delivered will be the responsibility of the Contractor.

1.7 JOB CONDITIONS

A. Installer must examine the substrates and supporting structure and the conditions under which the carpentry work is to be installed and notify the Contractor in writing of conditions detrimental to the work. Do not proceed with the installation until unsatisfactory conditions have been corrected in a manner acceptable to the Installer and the Commissioner.

B. Coordination: Fit carpentry work to other work; scribe and cope as required for accurate fit. Correlate location of furring, nailers, blocking, grounds and similar supports to allow proper attachment of other work.

PART II - PRODUCTS

2.1 WOOD MATERIAL

A. General

1. All wood shall be sound, flat, straight, well seasoned, thoroughly dry and free from all defects. Warped or twisted wood shall not be used.

2. For miscellaneous wood blocking, grounds, furring as required, use Utility Grade Coastal Douglas Fir or Southern Pine, free from knots, shakes, rot or other defects, straight, square edges and straight grain, air seasoned with maximum moisture content of nineteen (19) percent. Wood shall be S4S, S-Dry, complying with PS-20.

3. Plywood and rough carpentry for telephone and electrical closets, provide 3/4" thick C-D EXT-APA plywood, fire retardant treated as specified herein.

B. Wood Treatment

1. All interior wood material specified herein shall be fire retardant treated to comply with the AWPA standard U1 to achieve a flame spread rating of not more than 25 (UL Class "FR-S") when tested in accordance with UL Test 723 or ASTM E 84. The fire retardant chemicals used to treat the lumber must comply with FR-1 of AWPA Standard P49 and be free of halogens, sulfates and ammonium phosphate.

   a. After treatment, kiln dry to a moisture content of fifteen (15) percent; if wood is to be painted or finished, kiln dry to a moisture content of twelve (12) percent. Treatment shall be equal to "Dricon" made by Arch Wood Protection Inc., Koppers, Hoover or approved equal. Provide UL approved identification on treated materials.

2. For exterior blocking, roofing and sheet metal, pressure treat wood with copper azole, Type B (CA-B); ammoniacal copper quat (ACQ) or similar preservative product that contains no arsenic or chromium. Preservative shall comply with AWPA Standard U1, (.25 lbs./cubic foot of chemical in wood).

   a. After treatment, kiln dry to a maximum moisture content of fifteen (15) percent. Treatment shall be equal to "Wolmanized Natural Select" made by Arch Wood Protection Inc., Koppers, Hoover or approved equal.

3. Treated wood which is cut or otherwise damaged shall be further treated in accordance with the AWPA Standard M-4.

2.2 HARDWARE

A. Rough Hardware for Treated Woods and Exterior Use: Hot-dipped galvanized or Type 304 stainless steel.

B. Nails: Common steel wire, untreated for interior work as per ASTM F 1667.

C. Bolts: Standard mild steel, square head machine bolts with square nuts and malleable iron or steel plate washers or carriage bolts with square nuts and cut washers conforming to the following:

1. Bolts: ASTM A 307, Grade A.

2. Nuts: ASTM A 563.

3. Lag Screws and Bolts: ASME B 18.2.1.

D. Expansion Anchors: Anchor bolt and sleeve assembly of material indicated below with capability to sustain, without failure, a load equal to 6 times the load imposed when installed in unit masonry assemblies and equal to 4 times the load imposed when installed in concrete as determined by testing per ASTM E 488 conducted by a qualified independent testing and inspecting agency.

1. Material: Carbon-steel components, zinc plated to comply with ASTM B 633, Class Fe/Zn 5.

2. Material for Treated Woods and Exterior Use: Stainless steel with bolts and nuts complying with ASTM F 593 and ASTM F 594, Alloy Group 1 or 2.

E. Wood Screws: ASME B 18.6.1.

F. Concrete and Masonry Anchors: Standard expansion-shield self-drilling type concrete anchors where so shown or noted on the drawings, or where approved by the Commissioner.

PART III - EXECUTION

3.1 EXECUTION REQUIREMENTS

A. Refer to DDC General Conditions for execution requirements.

3.2 INSTALLATION OF FINISH HARDWARE

A. Hardware shall be carefully fitted and securely attached, in accordance with these specifications and the instructions of the various manufacturers.

B. Unless otherwise noted, mount hardware units at heights established in Section 08 11 13, Steel Doors and Frames.

C. Install each hardware item in compliance with the manufacturer's instructions and recommendations. Wherever cutting and fitting is required to install hardware onto or into surfaces which are later to be painted or finished in another way, install each item completely and then remove and store in a secure place

during the finish application. After completion of the finishes, re-install each item. Do not install surface-mounted items until finishes have been completed on the substrate.

D. Set units level, plumb and true to line and location. Adjust and reinforce the attachment substrate as necessary for proper installation and operation.

E. Drill and countersink units which are not factory prepared for anchorage fasteners. Space fasteners and anchors in accordance with industry standards.

F. Cut and fit threshold and floor covers to profile of door frames, with mitered corners and hair-line joints. Join units with concealed welds or concealed mechanical joints. Cut smooth openings for spindles, bolts and similar items, if any.

G. All keys used shall be construction keys which are to be tagged with fiber discs as approved, clearly labeled with identifying inscriptions and then neatly arranged in a temporary cabinet. All construction keys shall be returned to the City of New York.

H. Adjusting and Cleaning

1. Adjust and check each operating item of hardware and each door, to ensure proper operation and function of every unit. Lubricate moving parts with type lubrication recommended by manufacturer (graphite type if no other recommended). Replace units which cannot be adjusted and lubricated to operate freely and smoothly as intended for the application made.

2. Final Adjustment: Wherever hardware installation is made more than one month prior to substantial completion or occupancy of a space or area, return to the work during the week prior to substantial completion or occupancy, and make a final check and adjustment of all hardware items in such space or area. Clean and re-lubricate operating items as necessary to restore proper function and finish of hardware and doors. Adjust door control devices to compensate for final operation of heating and ventilating equipment.

3.3 INSTALLATION OF DOORS AND FRAMES

A. Preparation

1. Remove welded-in shipping spreaders installed at factory..

2. Prior to installation and with installation spreaders in place, adjust and securely brace standard steel door frames for squareness, alignment, twist, and plumb to the following tolerances:

   a. Squareness: Plus or minus 1/16 inch, measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
   b. Alignment: Plus or minus 1/16 inch, measured at jambs on a horizontal line parallel to plane of wall.
   c. Twist: Plus or minus 1/16 inch, measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
   d. Plumbness: Plus or minus 1/16 inch, measured at jambs on a perpendicular line from head to floor.

3. Drill and tap doors and frames to receive non-templated mortised and surface-mounted door hardware.

B. Installation

1. General: Provide doors and frames of sizes, thicknesses, and designs indicated. Install steel doors and frames plumb, rigid, properly aligned, and securely fastened in place.

2. Set frames accurately in position; plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is complete, remove temporary braces, leaving surfaces smooth and undamaged.

   a. Install frames in accordance with ANSI 250.11, Recommended Erection Instructions for Steel Frames, unless more stringent requirements are specified herein.
   b. At fire-protection-rated openings, install frames according to NFPA 80.
   c. Where frames are fabricated in sections due to shipping or handling limitations, field splice at approved locations by welding face joint continuously; grind, fill, dress, and make splice smooth, flush, and invisible on exposed faces.
   d. Install frames with removable glazing stops located on secure side of opening.
   e. Frames set in masonry walls shall have door silencers installed in frames before grouting.
   f. Remove temporary braces necessary for installation only after frames have been properly set and secured.
   g. Check plumb, squareness, and twist of frames as walls are constructed. Shim as necessary to comply with installation tolerances.

3. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor and secure with post-installed expansion anchors.

   a. Floor anchors may be set with powder-actuated fasteners instead of post-installed expansion anchors if so indicated and approved on Shop Drawings.

4. Metal-Stud Partitions: Solidly pack mineral-fiber insulation behind frames conforming to the requirements of Section 07 21 00, "Thermal Insulation."

5. Masonry Walls: Coordinate installation of frames to allow for solidly filling space between frames and masonry with mortar; refer to Section 04 20 00 "Unit Masonry" for installation of frames in masonry walls.

6. Ceiling Struts: Extend struts vertically from top of frame at each jamb to supporting construction above, unless frame is anchored to masonry or to other structural support at each jamb. Bend top of struts to provide flush contact for securing to supporting construction above. Provide adjustable wedged or bolted anchorage to frame jamb members.

7. Installation Tolerances: Adjust steel door frames for squareness, alignment, twist, and plumb to the tolerance given in HMMA 841 of ANSI/NAAMM, current edition.

8. Steel Doors: Fit hollow metal doors accurately in frames to the tolerances given in HMMA 841 of ANSI/NAAMM, current edition.

   a. Fire-Rated Doors: Install doors with clearances according to NFPA 80.

9. Glazing: Comply with installation requirements in Section 08 80 10 "Interior Glass and Glazing" and with standard steel door and frame manufacturer's written instructions.

   a. Secure stops with countersunk flat- or oval-head machine screws spaced uniformly not more than 9 inches o.c., and not more than 2 inches o.c. from each corner.

C. Adjustments: Check and readjust operating finish hardware items just prior to final inspection. Leave work in complete and proper operating condition.

3.4 BLOCKING AND MISCELLANEOUS WOOD

A. General

1. Erect rough carpentry true to line, levels and dimensions required; squared, aligned, plumbed, and securely fastened in place.

2. Shim where required to true up furring, blocking and the like. Use wood or metal shims only.

3. Do all cutting, fitting, drilling and tapping of other work as required to secure work in place and to perform the work included herein. Do all the cutting and fitting of carpentry work, for the work of other trades as required.

B. Blocking and Miscellaneous Wood

1. Furnish and install all wood grounds, furring, blocking, curbs, bucks, nailers, etc., that may be necessary and required in connection with the carpentry and with the work described for any other trades and including required carpentry for electrical fixtures. All blocking and nailers shall be continuous wherever required, whether or not so indicated.

2. Blocking shall be as required for the proper installation of the finished work and for items in mechanical sections as required. Blocking, edgings, stops, nailing strips, etc., shall be continuous, unless distinctly noted otherwise. Provide blocking as required to install all equipment. Provide blocking and nailers where shown or required to fasten interior sheet metal work.

3. Fastening for wood grounds, furring and blocking shall be of metal and of type and spacing as best suited to conditions. Hardened steel nails, expansion screws, toggle bolts, self-clinching nails, metal plugs, inserts or similar fastenings shall be used, of suitable type and size to draw the members into place and securely hold same.

C. Rough Lumber for Roofing and Sheet Metal

1. Furnish and install all wood nailing strips and wood blocking required in connection with respective types of roofing, fans, flashings, and sheet metal work, using preservative treated wood as herein before specified.

2. Wood blocking shall be of sizes and shapes as indicated on the drawings and/or designed for the reception of curb flashings for roof ventilators and similar items.

3. All nailing strips and blocking shall be carried out in accordance with the printed installation instructions, and/or recommendations of the accepted manufacturer of the roofing materials, and in coordination and cooperation with the sheet metal work trades.

4. All blocking and nailing strips shall be firmly secured in place using counter bored bolt and nut fastenings or secured by any other proposed flush surfaced fastenings.

5. Wood nailing strips or blocking required to be embedded in concrete work shall be furnished in time due for placing, prior to start of concrete operations. Locations and spacings of nailing strips or blocking shall be performed in coordination with the concrete trades, as required for respective installations.

3.5 TELEPHONE AND ELECTRICAL EQUIPMENT MOUNTING BOARDS

A. Furnish and install 3/4" thick plywood panels to the walls of the telephone and electrical equipment rooms in accordance with ConEdison requirements.

B. Secure to wall using proper devices for substrates encountered, spaced twelve (12) inches o.c., maximum around the edges, 1-1/2" from corners, and in three (3) rows of three (3) each in the field. Recess fastening devices flush with the plywood surface. Adjacent panels shall be butted with 1/16" space between without lapping.

3.6 ROUGH HARDWARE

A. Securely fasten rough carpentry together. Nail, spike, lag screw or bolt as required by conditions encountered in the field and the Contract Documents.

B. Provide rough or framing hardware, such as nails, screws, bolts, anchors, hangers, clips, inserts, miscellaneous fastenings, and similar items of the best quality and of the proper size and kind to adequately secure the work together and in place, in a rigid and substantial manner.

C. Secure rough carpentry to masonry with countersunk bolts in expansion sleeves or other acceptable manner, with fastenings not more than sixteen (16) inches apart. Secure woodwork to hollow masonry with toggle bolts spaced not more than sixteen (16) inches apart.

D. Countersink bolts in nailers and other rough woodwork and include washers and nuts. Cut bolts off flush with surfaces and peen as may be required to receive finished work.

E. Inserts to secure wood nailers to concrete shall be malleable iron threaded inserts with 3/8" diameter bolts of length to allow for countersinking. Locate at end of each nailer and at intervals not exceeding thirty (30) inches o.c.

F. Furnish to the mason for building into the work or attaching the work which is to be built in, anchors, bolts, wall plates bolted to masonry, corrugated wall plugs, nailing blocks, etc., which are required for the proper fastening and installation for the work or other items as called for in this Section.

G. Detailed instructions with sketches of necessary requirements, shall be given to the masonry trade showing the location and other details of such nailing devices.

END OF SECTION 06 20 00

SECTION 06 40 23
Architectural Woodwork

PART I - GENERAL

1.1 RELATED DOCUMENTS

A. The following documents apply to all required work for the Project: (1) the Contract Drawings, (2) the Specifications, (3) the General Conditions, (4) the Addendum and (5) the Contract (City of New York Standard Construction Contract).

B. LEED / Environmentally Preferable Purchase (EPP) General Requirements:

1. Refer to DDC General Conditions and the Addendum to the General Conditions

2. LEED requirements apply to all Phase II work with the exception of the Existing Building scope. EPP requirements apply to the project's Existing Building scope only.

1.2 SUMMARY

A. Section includes:

1. Wood millwork and counters with plastic laminate finish.

2. Metal mesh cabinet doors and associated hardware and framing.

3. Hardware for architectural woodwork.

4. Shelving.

5. Benches.

6. Solid surfacing fabrications, including countertops, cabinet doors and wall panels.

7. Wood framing and rough lumber as required for work of this Section.

8. Wood grounds, blocking, nailers, furring as required for work of this Section.

9. All rough hardware and fastenings for work of this Section.

10. Drilling concrete and masonry, drilling and/or tapping metal work, as required, for the installation of work of this Section.

11. Back painting as specified herein.

12. Shop finish of work of this Section, except items indicated herein to be shop primed only.

B. Related Sections

1. Ornamental Metals - Section 05 70 00.

2. Carpentry - Section 06 20 00.

3. Interior Joint Sealants - Section 07 92 00, for caulking between architectural woodwork and any wall, floor, or ceiling joints.

4. Interior Glass and Glazing - Section 08 80 10.

5. Painting and Finishing - Section 09 90 00, for field finishing of architectural woodwork.

1.3 QUALITY ASSURANCE

A. Refer to DDC General Conditions Section 01 40 00 "Quality Requirements".

B. The quality standards of the Architectural Woodwork Institute, "Architectural Woodwork Standards" (AWS), 1st Edition, dated October 1, 2009, shall apply to all workmanship, including materials and installation, for architectural woodwork, and by reference are made a part of this specification. All work shall conform to "Premium" grade requirements of the AWS unless otherwise modified herein.

C. Employ only tradesmen experienced in the fabrication and installation of architectural woodwork.

1.4 SUBMITTAL PROCEDURES

A. Refer to DDC General Conditions Section 01 33 00 "Submittal Procedures".

1.5 SUBMITTALS

A. Shop Drawings

1. Submit shop drawings of all woodwork specified and indicated on the drawings. Shop drawings shall indicate room plans and elevations at 3/4" equals 1'-0" scale and typical construction details at 3" equals 1'-0" scale. Shop drawings shall indicate all materials, thicknesses and finishes.

2. Shop drawings shall show all finish hardware, anchors, fastenings and accessories.

3. Shop drawings shall show all jointing, joint treatment and butt jointing in plastic laminate.

4. Shop drawings for cabinet work must show centerline height and horizontal location of all required internal wall blocking.

5. Where architectural woodwork deviates from AWI standards noted herein, shop drawings must identify these deviations.

B. Samples: Submit samples of each of the following items:

1. Plastic laminate, twelve (12) inches square, including a section of outside corner.

2. Metal finish cabinet door, twelve (12) inches square, with corner construction including a hinge and door pull.

3. Solid surface cabinet door, twelve (12) inches square, with corner construction including a hinge and door pull.

4. Each type and finish of solid surface base, eight (8) inches long, finish as specified.

5. Cabinet hardware.

1.6 QUALIFICATIONS

A. The work of this Section shall be provided by a firm having a minimum of three (3) years' experience on projects of similar size and quality to that specified and shown.

1.7 DELIVERY, STORAGE AND HANDLING

A. All materials and work of this Section shall be protected from damage from time of shipment from shop to substantial completion of work. Cover, ventilate, and protect work of this Section from damage caused by weather, moisture, heat, staining, dirt, abrasions, any other causes which may adversely affect appearance or use, or which may cause deterioration of finish, warping, distortion, twisting, opening of joints and seams, delamination, loosening, etc., of work of this Section.

B. Keep all finish carpentry, millwork, and cabinet work under cover both in transit and at the premises. Do not deliver any finish carpentry, millwork or cabinet work before it is required for installation. Protect such work to avoid damage in transit, during erection and after erection until acceptance of the building; use all such methods to provide the proper protection.

C. Deliver finish carpentry, millwork, and cabinet work in a dry stable condition; protect same against injury and dampness. Do not store or install finish carpentry, millwork or cabinet work until after the concrete, masonry and plaster work are thoroughly dry.

1.8 JOB CONDITIONS

A. Humidity Controls: The ambient relative humidity at the site, including both the storage and the installation areas, shall be maintained between 25% and 55% prior to delivery and through the life of the installation.

B. Determine equilibrium moisture content and maintain required temperature and relative humidity as required for a tolerance of plus or minus one (1) percent of the specified optimum moisture content until woodwork receives specified finishes. Refer to "Guide to Wood Species Selection," AWI, for method of determining equilibrium moisture content values.

C. Areas to receive architectural woodwork must be fully enclosed with windows and/or curtain wall installed and glazed, exterior doors in place, HVAC systems operational, and temporary openings closed. Any plaster, wet grinding and concrete work shall be fully dry.

D. Architectural woodwork shall be allowed to come to equilibrium on site for 7 days prior to installation.

PART II - PRODUCTS

2.1 BASIC REQUIREMENTS

A. Wood Moisture Content: Provide kiln-dried (KD) lumber with an average moisture content range of nine (9) to twelve (12) percent for exterior work and six (6) to eleven (11) percent for interior work.

B. Compatibility of Grain and Color: Commissioner reserves the right to select materials for best compatibility between visually related members and veneers.

C. Machine and sand woodwork to comply with requirements of Standards for specified grade.

D. Fabricate woodwork to dimensions, profiles and details shown. Rout or groove back of flat trim members, kerf backs of other wide flat members except plywood or veneered members.

E. Miter joints by joining, splining and gluing to comply with requirements for the specified grade.

F. Inspect each piece of lumber and plywood or each unit of woodwork after drying; do not use twisted, warped, bowed or otherwise damaged or defective wood.

2.2 GENERAL - MATERIALS

A. Softwood lumber shall conform to the requirements of the latest edition of American Lumber Standards Simplified Practice Recommendation R-16. Grades shall conform to the grading rules of the Architectural Woodwork Institute and shall bear the labels and certificates from the AWI certification program indicating that woodwork complies with requirements of grades specified, and a mark of mill identification.

B. Framing and Rough Lumber: No. 1 KD grade Southern Pine or Dense Construction grade Douglas Fir, having extreme fiber in bending stress of at least 1700 psi, surfaced four sides (S4S). Provide fire retardant treatment meeting requirements of Section 06 20 00, Carpentry.

C. Grounds, Blocking, Nailers, Furring: Southern Pine, Douglas Fir or Sitka Spruce, grade to suit particular purpose and to be straight, square edged, straight grained, surfaced four sides (S4S), and which will retain nails and screws without splitting. Provide fire retardant treatment.

D. Lumber: AWS Section 3 with the following requirements:

1. Hardwood for Opaque Finish: Any hardwood which, when finished, will not show any grain, imperfection or other surface defects when used with the opaque finish specified.

E. Plywood: AWS Section 4; veneer core, particleboard or plywood core unless otherwise specified, and with the following requirements:

1. Hardwood: Premium Grade, face veneers as shown or specified.

2. Particleboard: Premium Grade, fire retardant for wall paneling only. In addition, particleboard and MDF shall be certified to the following EPP CPA 3-08 formaldehyde emission limits:

   a. Particleboard meets 0.18 ppm.
   b. MDF meets 0.21 ppm.

3. Edges: Banded with hardwood in accordance with Premium Grade Standards.

4. Provide marine grade plywood or moisture resistant MDF under countertop surfaces, and MDF for the cabinet bases for normal use/wear areas.

2.3 PLASTIC LAMINATE

A. Face Sheets: NEMA Publication LD3, Grade GP50, Type I, 0.05" thick.

1. Basis of Design: Subject to compliance with requirements, provide Abet Laminati; Color, Pattern and Finish as indicated on Finish Schedule, or comparable product by one of the following:

   a. Wilsonart
   b. Nevamar
   c. Or approved equal

B. Backing Sheets: Non-decorative, high-pressure plastic laminate, NEMA LD3, Grade BK20, 0.02" thick.

C. Edges: Finish with plastic laminate to match face and applied before face sheets are applied, unless otherwise shown or specified.

D. Through-Color Plastic Laminate: NEMA Publication LD3, Solid Color Laminates.

1. Basis of Design: Subject to compliance with requirements, provide Formica; ColorCore2 Laminate or comparable product by one of the following:
   a. Wilsonart
   b. Nevamar
   c. Or approved equal

2. Color, Pattern and Finish: See Finish Schedule.

2.4 METAL

A. Steel

1. Structural Steel Shapes and Plates: ASTM A 36.

2. Hot-Rolled Carbon Steel Sheets: Commercial quality, ASTM A 569, may be used for concealed parts only.

B. Primer for Unexposed Metal: Zinc chromate primer.

C. Metal Mesh Cabinet Doors: See Finish Schedule and Section 05 70 00, Ornamental Metals.

2.5 MISCELLANEOUS PRODUCTS

A. Fasteners

1. Wood Screws: FS FF-S-111, type, size, material and finish as required for the condition of use.

2. Nails: FS FF-N-105, type, size, material and finish as required for the condition of use.

3. Anchors: Type, size, material and finish as required for the condition of use.

4. Staples: Upholstery type staples of sufficient strength to hold fabric taut in place without sagging.

B. Adhesives

1. For Laminating Plastic Laminate Surfaces: Urea resin, Type II, as recommended by fabricator.
2. For All Other Uses: Polyvinyl acetate resin emulsion or other type as recommended by the fabricator.

2.6 CABINETS WITH PLASTIC LAMINATE FINISH

A. General

1. Fabricate all cabinetry and millwork to the "Premium Grade" standards of the AWS, Section 10.
2. Face construction of cabinets shall be "Flush Overlay."
3. Provide 3/4" thick doors, drawer fronts and fixed panels (including thickness of plastic) except where required to be thicker by Standards; and provide flush units.
4. Provide dust panels of 1/4" thick plywood or tempered hardboard above compartments and drawers, except where located directly below countertops.
5. Exposed Edges: Plastic laminate matching exposed panel surfaces. Ease exposed edge of overlap sheet.

B. Plastic Laminate

1. Plastic Laminate for Horizontal Surfaces: 0.050" thick, general purpose type (high pressure).
2. Plastic Laminate for External Vertical Surfaces: 0.028" thick, general purpose type (high pressure).
3. Plastic Laminate for Post Forming: 0.042" thick, post forming (high pressure).
4. Plastic Laminate for Cabinet Linings: 0.020" thick, cabinet liner (high pressure).
5. Plastic Laminate for Concealed Panel Backing: 0.020" thick, backer type (high pressure).
6. Plastic Laminate Colors and Patterns: As scheduled.

C. Shop Assembly: All work shall be shop assembled. Work that is too large for entrance into the use area shall be fabricated in attachable sections with provisions for reconnection in the using space.

D. Material Thicknesses: See drawings for general material thicknesses. Minimum thickness of solid lumber for web frames, trim, bases, etc., shall be 3/4". Minimum thickness of plywood and particleboard shall be 3/4".

E. Sizes: See drawings for woodwork sizes required. The manufacturer shall check field dimensions and verify all openings and actual field conditions prior to fabrication of work.

F. Manufacturer is responsible for rigidity and structural stability.

2.7 HARDWARE

A. Architectural Woodwork Hardware: Provide millwork hardware as selected by Commissioner, and as follows:

1. Basis of Design Hinge for Solid Surface Cabinet Doors: Subject to compliance with requirements, provide: Blum Clip Top Blumotion 110 degrees, Finish as indicated on Finish Schedule, or comparable product by one of the following:

   a. Sugatsune
   b. Salice
   c. Or approved equal

2. Basis of Design Slides for Solid Surface Cabinet Drawer Fronts: Subject to compliance with requirements, provide: KV 8400 Full extension box or file drawer slide, or comparable product by one of the following:

   a. Blum
   b. Sugatsune
   c. Or approved equal

3. Basis of Design Hinge for Metal Cabinet Doors: Subject to compliance with requirements, provide: Blum Clip Top Blumotion 95 Degrees thick door hinges, or comparable product by one of the following:

   a. Sugatsune
   b. Salice
   c. Or approved equal

4. Provide cam locks at all cabinet doors, but no cabinet interior latches. All doors shall be free to open when unlocked.

5. Basis of Design for Door Pulls for SSM and PL Cabinet Doors: Subject to compliance with requirements, provide: Mockett DP54C Series

   a. Sugatsune
   b. Colonial Bronze
   c. Or approved equal

6. Finish: Angled Bar Drawer Pull: 6-3/4" long, satin stainless steel.

7. Basis of Deisn for Door Pulls for MTL Cabinet Doors: Subject to compliance with requirements, provide: Mockett DP3 Series

   a. Sugatsune
   b. Colonial Bronze
   c. Or approved equal

8. Finish: Tab Drawer and Door Pull - 1-1/2" profile - 4" long tab style, color to be satin chrome.

2.8 SOLID SURFACING FABRICATIONS

A. Provide products as indicated on Finish Legend.

1. SSM-01: 1/2" thick, used as wall cladding and cabinet doors.
2. SSM-02: 1/2" thick, used as counstertops.
3. Basis of Design: Subject to compliance with requirements, provide DuPont; Corian or comparable product by one of the following:
   a. Samsung Chemical
   b. Wilsonart Contract
   c. Or approved equal

B. Rout and finish component edges to a smooth, uniform finish. Rout cutouts, then sand edges and smooth. Reject defective or inaccurate work.

C. All seams shall be fused.

D. Wall Cladding Applications: Fused seams, locations as indicated on architectural drawings; substrate to be cement backer board.

E. Cabinet Door Applications: All edges to be eased, build up edges per architectural drawings; faces of cabinet doors to be one panel (no seams).

F. Comply with manufacturer's installation and finishing guidelines.

2.9 FABRICATION - GENERAL

A. Provide lumber framing for architectural woodwork, complete with all bracing and fastening devices as required for a rigid installation, and as required to sustain the imposed loads.

B. Fabricate architectural woodwork to dimensions, profiles, and details indicated.

C. Fabricate units in largest practicable sections. Assemble in the shop for trial fit, disassemble for shipment and reassemble with concealed fasteners. Where necessary for fitting at site, provide for scribing, trimming and fitting.

D. Maintain relative humidity and temperature during fabrication, storage and finishing operations matching that of the areas of installation.

E. Details indicate the required type and quality of construction. Modifications to conform to manufacturer's standards will be considered provided that they comply with the Contract Documents and maintain the profiles shown.

F. Reinforcing shown is minimum. Provide additional reinforcing as required to ensure a rigid assembly. Exposed surfaces shall be free from dents, tool marks, warpage, buckle, glue and open joints, or other defects affecting serviceability or appearance. Accurately fit all joints, corners and miters. Conceal all fasteners. Make threaded connections up tight so that threads are entirely concealed.

G. Factory finish all items where possible. Defer final touch-up, cleaning and polishing until after delivery and installation.

H. Comply with AWI, Premium Grade, for sanding, filling countersunk fasteners, back priming and similar preparations for the finishing of architectural woodwork, as applicable to each unit of work.

I. Prepare all countersunk wood screw attachments for wood plugs. Wood plugs shall match surrounding species and grain direction; putty filling is not acceptable.

2.10 FABRICATION - SPECIFIC ITEMS

A. Millwork

1. Include all preparations for mechanical, electrical, telephone and plumbing work required.
2. Provide cabinet hardware for millwork as shown.
3. Provide dust panels in body webs and between drawer units.
4. Hollow core doors will not be permitted unless specified by Commissioner.
5. Provide drawers with slides as specified. Drawers shall not rest on web body frames.

PART III - EXECUTION

3.1 EXECUTION REQUIREMENTS

A. Refer to DDC General Conditions for execution requirements.

3.2 FRAMING

A. Use specified framing lumber, sizes and spacing as indicated on drawings and as required to support loads.

B. Framing shall be cut square on bearings, closely fitted, accurately set to required lines and levels, rigidly secured in place at bearings and connection with nails, lag screws and/or bolts as required by conditions.

3.3 GROUNDS, BLOCKING, NAILERS AND FURRING

A. Provide all wood grounds, blocking, nailers, furring, and the like for work of this Section, where shown and where required, dressed to size indicated or required to suit the condition. Install grounds, blocking, nailers, furring, etc., rigidly, in proper alignment, trued with a long straight edge.

3.4 ROUGH HARDWARE

A. Provide all rough hardware, such as nails, screws, bolts, anchors, hangers, clips and similar items. Hardware shall be of the proper size and kind to adequately secure the work together and in place, in a rigid and substantial manner. Use galvanized hardware at exterior walls, and at other locations where subject to moisture or where water will be present.

B. Secure wood to concrete and to solid masonry with countersunk bolts in expansion sleeves or other approved manner, to steel with countersunk bolts, to hollow masonry and to drywall with heavy duty countersunk toggle bolts. Space fastenings not more than sixteen (16) inches apart. Hardened cut nails, power-driven fastenings, or other suitable devices may be used where approved by the Commissioner.

C. Connections and fastenings shall be made in such manner as will compensate for swelling and shrinkage and shall permit the work to remain permanently in place without any splitting or opening of joints.

3.5 INSTALLATION OF CABINET FINISH HARDWARE

A. All items of finish hardware furnished under this Section shall be carefully fitted and secured in place as part of the work of this Section. Ensure operation without forcing.

B. After preliminary fitting of hardware, the Contractor shall remove trim for painting and finishing work; after which he shall reinstall the hardware in a permanent manner.

C. Upon completion of the work, before substantial completion of the building, the Contractor shall, in the presence of the Commissioner, show that all hardware is in satisfactory working order; fit all keys in their respective locks and, upon acceptance of the work, shall tag and deliver all keys to the Commissioner and the City of New York.

3.6 GENERAL INSTALLATION

A. Wall anchorage and general installation procedures for cabinetry work shall conform to AWS Section 10, Article entitled "Execution," Sub-Article 6.1, with all related sub-paragraphs.

B. Install the work plumb, level, true and straight with no distortions. Shim as required using concealed shims. Install to a tolerance of 1/8" in 8'-0" for plumb and level (including countertops), and with 1/16" maximum offset in flush adjoining surfaces, 1/8" maximum offset in revealed adjoining surfaces.

C. Scribe and cut work to fit adjoining work; refinish cut surfaces or repair damaged finish at cuts.

D. Anchor woodwork to anchors or blocking built in or directly attached to substrates. Secure to grounds, stripping and blocking with countersunk, concealed fasteners and blind nailing as required for a complete installation.

3.7 CABINET WORK AND MILLWORK

A. General

1. Materials and workmanship shall conform to the Quality Standards of the Architectural Woodwork Institute specified herein and to the drawings.

2. Fabricate all cabinet work and millwork completely in the shop, in complete and/or as large units as practical, leaving only fitting, assembly, installation and a minimum of fabrication and finishing to be done at the building. Assembled work shall be rigidly secured and permanently fastened together with concealed fasteners.

3. Afford the Commissioner every facility for inspection of work at shop or mill at such times as the Commissioner may select.

4. As far as practicable, use concealed fastenings for joining and assembling the work. Where this is impossible, the means of securing shall be placed in inconspicuous places and methods of joining and assembling submitted for Commissioner's approval prior to fabrication.

5. Mill all finish wood accurately to detail, with clean cut moldings, profiles and lines, machined, sanded smooth, housed, jointed, blocked, put together in the best manner, with provision for swelling and shrinkage, and to ensure the work remaining in place without warping, splitting or opening of joints.

6. Cut trim to dimensions and profiles shown, from solid stock.

7. Make all trim and the like in single lengths wherever possible; joints mitered, glued and splined. Continuous members shall have tight flush joints, doweled or splined and glued.

8. Make all joints hairline tight, fitted accurately and joined with hardwood splines or dowels, glued together, or by other method approved by the Commissioner. Use screws, not nails, for fastenings.

9. Gluing shall, where practicable, be by the hot plate press method and glued surfaces shall be in close contact throughout. Glue stains on finished work will not be permitted.

10. Cover surface fastenings, where permitted, with matching wood plugs or wood putty. Finish exposed edges of plywood with matching solid stock. Lock miter external corners; tongue and groove internal corners to allow for contraction and expansion.

11. Machine sand with grain, finish with hand sanding, leave exposed surfaces free from machine or tool marks that will show through the finish.

12. Work which adjoins drywall, concrete, or other finish shall be fitted and scribed in a careful manner and ample allowance shall be given for cutting and scribing.

13. Erect work true to lines, levels and dimensions, square, aligned and plumb, securely and rigidly fastened in place.

B. Cabinet Work: Provide all items of cabinet work indicated on drawings and as herein specified.

1. Tops, sides, backs, bottoms, dividers, shelves, fronts, doors and drawer fronts shall be of plywood or MDF core, with the specified plastic laminate as indicated on drawings.

2. Drawer sides and backs shall be 3/4" thick MDF with plastic laminate finish. Drawer bottom shall be 3/4" thick MDF with plastic laminate finish. Color varies by location.

3. Cabinet doors and drawers shall be flush mounted.

4. Adjustable shelves in cabinets shall have metal grommets spaced 2" o.c.

5. Fixed shelves shall be dadoed into side supports and glued.

6. Shelves shall be 3/4" thick for spans up to 30"; for spans in excess of 30" to 48" shelves shall be 1" thick.

7. All cabinets shall have closed top, sides, bottom, and back to match face work. Cabinets to fit accurately into indicated locations; scribe moldings permitted only where indicated.

8. Countertops, counters, counter fronts, shelves, etc., indicated on drawings to have plastic laminate, shall have plastic laminate shop applied to 3/4" thick MDF core, with plastic laminate backing sheet on underside or back of countertops, counters and shelves. Plastic laminate shall be pressure laminated to

core with laminate at external corners. Provide concealed wood framing to support plastic laminate counters, securely fastened to wall and to underside of counters.

C. Countertops shall be installed to support a minimum concentrated live load of 150 lbs. acting downward at mid span at outer edge of counter without causing deformation and damage.

3.8 PAINTING AND FINISHING

A. General: All painting and finishing work of this Section shall be shop applied, unless otherwise noted, as specified below. All painting and finishing shall match approved samples. Field finish painting, where specified below, shall be as specified in Section 09 90 00, Painting and Finishing.

B. Back-Painting: All work of this Section in contact with concrete or masonry or other moisture areas and all concealed surfaces of cabinet and millwork, shall be back-painted with one (1) coat of oil based paint prior to installation, shop applied where practicable.

C. Field Touch-Up: Provide field touch-up including the filling and touch-up of exposed job-made nail or screw holes, refinishing of raw surfaces resulting from job fitting, repair of job inflicted scratches and mars, and final cleaning up of the finished surfaces.

END OF section 06 40 23

SECTION 07 00 01
Rainscreen System

PART I – GENERAL

1.1 RELATED DOCUMENTS:

A. The following documents apply to all required work for the Project: (1) the Contract Drawings, (2) the Specifications, (3) the General Conditions, (4) the Addendum, and (5) the Contract (City of New York Standard Construction Contract).

B. LEED General Requirements

1. Refer to DDC General Conditions.

   a. Section 01 33 00 – Submittal Procedures.

   b. Section 01 74 19 – Construction Waste Management and Disposal.

   c. Section 01 81 13.04 – Sustainable Design Requirements for LEED v4 Buildings.

1.2 SUMMARY:

A. Refer to Building Enclosure System Matrix for a description of the systems included in this Section as well as the requirements listed there.

B. For all Work described, provide the following components and their subcomponents of work:

1. Framing systems (as applicable) which may include:

   a. Fabricated steel framing.

   b. Backup support precast concrete panels.

2. Weather resistive barriers, back pans, and insulation.

3. Sealants and gaskets.

4. Cladding panels which may include:

   a. Formed metal panels.

   b. Precast concrete cladding panels.

   c. Louvers panels.

5. Fixings and fastenings.

6. Flashings.

7. Finishes, coatings, and surface treatments.

8. Anchors and inserts used to attach to building structure.

   a. Supply anchors and/or inserts to be cast or fabricated into/onto the building structure by others.

9. Penetrations for other services.

10. Pre-construction mockups, Samples, and testing.

11. Field testing.

C. This Section requires Engineering Services.

D. The work in this Section incorporates the work of the following Sections. Requirements specified in this Section are in addition to those in the following Sections:

1. Section 03 45 00 – Architectural Pre-Cast Concrete.

2. Section 07 27 01 – Weather Resistive Barriers.

3. Section 07 42 14 – Metal Panels.

4. Section 07 62 01 – Facade Sheet Metal Flashings.

5. Section 07 92 01 – Exterior Joint Sealants.

E. The following Sections describe systems that are adjacent to that of this Section, and will require coordinated interfaces:

1. Section 02 01 02 – Vapor Barrier Installation.

2. Section 03 45 00 – Architectural Pre-Cast Concrete.

3. Section 04 20 00 – Unit Masonry.

4. Section 05 40 00 – Cold-Formed Metal Framing.

5. Section 05 50 00 – Miscellaneous Metals.

6. Section 07 20 00 – Thermoplastic Membrane Roofing.

7. Section 07 95 00 – Expansion Control.

8. Section 08 11 13 – Steel Doors and Frames.

9. Section 08 33 23 – Overhead Coiling Doors.

10. Section 08 33 24 – Roll-Up Doors

11. Section 08 40 01 – Glazed Storefronts and Curtain Wall System.

12. Section 08 90 00 – Louvers.

13. Reference Documents

a. Building Enclosure System Matrix: Refer to Drawing EN1-003.

b. Samples Matrix: Refer to Drawing EN1-003.

1.3 REFERENCE STANDARDS AND REGULATIONS:

A. Refer to DDC General Conditions.

B. The Contractor's design, materials, and workmanship shall comply with 2014 New York City Building Code and 2016 New York City Energy Conservation Code. Where their recommendations or requirements are to a lower standard than required by this Contract Document, the Contract Documents shall take precedence.

C. Comply with applicable provisions and recommendations of the standards listed below. Where standards conflict with each other or conflict with the provisions of these Specifications, the more stringent shall apply. Unless otherwise noted, the latest editions of the standards shall apply:

1. American Architectural Manufacturers Association (AAMA)

a. AAMA CW-DG-1 – Aluminum Curtain Wall Design Guide Manual.

b. AAMA CW-10 – Care and Handling of Architectural Aluminum from Shop to Site.

c. AAMA TIR-A9 with amendments – Metal Curtain Wall Fasteners.

d. AAMA 501.1 – Standard Test Method for Water Penetration of Windows, Curtain Walls and Doors Using Dynamic Pressure.

e. AAMA 501.2 – Quality Assurance and Diagnostic Water Leakage Field Check of Installed Storefronts, Curtain Walls, and Sloped Glazing Systems.

f. AAMA 501.4 – Recommended Static Test Method for Evaluating Curtain Wall and Storefront Systems Subjected to Seismic and Wind Induced Interstory Drifts.

g. AAMA 501.5 – Test Method for Thermal Cycling of Exterior Walls.

h. AAMA 503 – Voluntary Specification for Field Testing of Newly Installed Storefronts, Curtain Walls and Sloped Glazing Systems.

i. AAMA 508 – Voluntary Test Method and Specification for Pressure Equalized Rain Screen Wall Cladding Systems.

j. AAMA 611 – Voluntary Specification for Anodized Architectural Aluminum.

k. AAMA 2605 – Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels.

2. Aluminum Association (AA)

a. AA Aluminum Standards and Data.

b. AA ADM-1 – The Aluminum Design Manual.

3. American Institute of Steel Construction (AISC)
   a. AISC Steel Construction Manual.
4. American Iron and Steel Institute (AISI)
   a. AISI North American Specification for the Design of Cold-Formed Steel Structural Members.
5. American Society of Civil Engineers (ASCE)
   a. ASCE 7 – Minimum Design Loads for Buildings and Other Structures.
6. American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE)
   a. ASHRAE 90.1 – Energy Standards for Buildings Except Low-Rise Residential Buildings.
   b. ASHRAE Fundamentals Handbook.
7. ASTM International (ASTM)
   a. ASTM A1008/A1008M – Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Solution Hardened, and Bake Hardenable.
   b. ASTM A1011/A1011M – Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength.
   c. ASTM A108 – Standard Specification for Steel Bar, Carbon and Alloy, Cold-Finished.
   d. ASTM A123/A123M – Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
   e. ASTM A153/A153M – Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
   f. ASTM A240/A240M – Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications.
   g. ASTM A307 – Standard Specification for Carbon Steel Bolts and Studs, 60 000 PSI Tensile Strength.
   h. ASTM A325 – Standard Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength.
   i. ASTM A370 – Standard Test Methods and Definitions for Mechanical Testing of Steel Products.
   j. ASTM A380 – Standard Practice for Cleaning, Descaling, and Passivation of Stainless Steel Parts, Equipment, and Systems.
   k. ASTM A47/A47M – Standard Specification for Ferritic Malleable Iron Castings.

l. ASTM A500 – Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.

m. ASTM A568 – Standard Specification for Steel, Sheet, Carbon, Structural, and High-Strength, Low-Alloy, Hot-Rolled and Cold-Rolled, General Requirements for.

n. ASTM A572/A572M – Standard Specification for High-Strength Low-Alloy ColumbiumVanadium Structural Steel.

o. ASTM A653/A653M – Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

p. ASTM A780/A780M – Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings.

q. ASTM A923 – Standard Test Methods for Detecting Detrimental Intermetallic Phase in Duplex Austenitic/Ferritic Stainless Steels.

r. ASTM A967 – Standard Specification for Chemical Passivation Treatments for Stainless Steel Parts.

s. ASTM A992 – Standard Specification for Structural Steel Shapes.

t. ASTM A1046 – Standard Specification for Steel Sheet, Zinc-Aluminum-Magnesium Alloy-Coated by the Hot-Dip Process.

u. ASTM B209 – Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.

v. ASTM B221 – Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.

w. ASTM B308/B308M – Standard Specification for Aluminum-Alloy 6061-T6 Standard Structural Profiles.

x. ASTM B429/B429M – Standard Specification for Aluminum-Alloy Extruded Structural Pipe and Tube.

y. ASTM B449 – Standard Specification for Chromates on Aluminum.

z. ASTM C272 – Standard Test Method for Water Absorption of Core Materials for Sandwich Constructions.

aa. ASTM C509 – Standard Specification for Elastomeric Cellular Preformed Gasket and Sealing Material.

bb. ASTM C518 – Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Low Meter Apparatus.

cc. ASTM C612 – Standard Specification for Mineral Fiber Block and Board Thermal Insulation.

dd. ASTM C1087 – Standard Test Method for Determining Compatibility of Liquid-Applied Sealants with Accessories Used in Structural Glazing Systems.

ee. ASTM C1115 – Standard Specification for Dense Elastomeric Silicone Rubber Gaskets and Accessories.

ff. ASTM C1193 – Standard Guide for Use of Joint Sealants.

gg. ASTM C1401 – Standard Guide for Structural Sealant Glazing.

hh. ASTM C1513 – Standard Specification for Steel Tapping Screws for Cold-Formed Steel Framing Connections.

ii. ASTM D523 – Standard Test Method for Specular Gloss.

jj. ASTM D635 – Standard Test Method for Rate of Burning and/or Extent and Time of Burning of Plastics in a Horizontal Position.

kk. ASTM D1400 – Standard Test Method for Nondestructive Measurement of Dry Film Thickness of Nonconductive Coatings Applied to a Nonferrous Metal Base.

ll. ASTM D1929 – Standard Test Method for Determining Ignition Temperature of Plastics.

mm. ASTM D2244 – Standard Practice for Calculation of Color Tolerances and Color Differences from Instrumentally Measured Color Coordinates.

nn. ASTM D3363 – Standard Test Method for Film Hardness by Pencil Test.

oo. ASTM D4214 – Standard Test Methods for Evaluating the Degree of Chalking of Exterior Paint Films.

pp. ASTM E84 – Standard Test Method for Surface Burning Characteristics of Building Materials.

qq. ASTM E90 – Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements.

rr. ASTM E136 – Standard Test Method for Behavior of Materials in a Vertical Tube Furnace at 750°C.

ss. ASTM E330 – Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference.

tt. ASTM E331 – Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference.

uu. ASTM E413 – Classification for Rating Sound Insulation.

vv. ASTM E488 – Standard Test Methods for Strength of Anchors in Concrete Elements.

ww. ASTM E754 – Standard Test Method for Pullout Resistance of Ties and Anchors Embedded in Masonry Mortar Joints.

xx. ASTM E783 – Standard Test Method for Field Measurement of Air Leakage through Installed Exterior Windows and Doors.

yy. ASTM E1105 – Standard Test Method for Field Determination of Water Penetration of Installed Exterior Windows, Skylights, Doors, and Curtain Walls, by Uniform or Cyclic Static Air Pressure Difference.

zz. ASTM E1332 – Standard Classification for Rating Outdoor-Indoor Sound Attenuation.

aaa. ASTM E2357 – Standard Test Method for Determining Air Leakage of Air Barrier Assemblies.

8. American Welding Society (AWS)

   a. AWS A5.10 – Specification for Bare Aluminum and Aluminum-Alloy Welding Electrodes and Rods.

   b. AWS D1.1 – Structural Welding Code – Steel.

   c. AWS D1.2 – Structural Welding Code – Aluminum.

   d. AWS D1.3 – Structural Welding Code – Sheet Steel.

   e. AWS D1.6 – Structural Welding Code – Stainless Steel.

9. International Organization for Standards (ISO)

   a. ISO 2815, Paints and Varnishes – Buchholz Indentation Test.

   b. ISO 3231, Paints and Varnishes – Determination of Resistance to Humid Atmospheres Containing Sulfur Dioxide.

10. National Association of Architectural Metal Manufacturers / National Ornamental & Miscellaneous Metals Association (NAAMM/NOMMA)

    a. NAAMM/NOMMA 500-06 – Metal Finishes Manual for Architectural and Metal Products.

11. National Fire Protection Association (NFPA)

    a. NFPA 259 – Standard Test Method for Potential Heat of Building Materials.

    b. NFPA 268 – Standard Test Method for Determining Ignitability of Exterior Wall Assemblies Using a Radiant Heat Energy Source.

    c. NFPA 285 – Standard Fire Test Method for Evaluation of Fire Propagation Characteristics of Exterior Non-Load-Bearing Wall Assemblies Containing Combustible Components.

12. Society for Protective Coatings (SSPC)

    a. SSPC-Paint 42 – Epoxy Polyamide/Polyamidoamine Primer, Performance-Based.

    b. SSPC-PS Guide 12 – Guide to Zinc-Rich Systems.

    c. SSPC-PS 28.01 – Two-Coat Zinc-Rich Polyurethane Primer / Aliphatic Polyurea Topcoat System, Performance-Based.

d. SSPC-PS 28.02 – Three-Coat Moisture-Cured Polyurethane Coating System, Performance-Based.

1.4 PERFORMANCE REQUIREMENTS:

A. General Prescriptive Requirements

1. For all elements outside of the weather resistive barrier plane, use materials suitable for external conditions that will not deteriorate as a result of weathering:

   a. Elements shall resist deleterious effects of water, cleaning agents, temperature variations expected from the anticipated temperature ranges, gaseous pollutants (including ozone), and weak acids deriving from gaseous pollutants dissolved in water and ultraviolet (UV) radiation exposure during installation and in service.

   b. Include separators to prevent bimetallic corrosion.

   c. Use suitable grade of stainless steel for all fasteners outside or through the weather resistive barrier.

      1) Seal all fasteners that penetrate through weather resistive barrier with material chemically compatible with fastener and adjacent materials.

   d. Use suitable grade of stainless steel or aluminum for all brackets outside the weather resistive barrier.

   e. Do not use different metals for significant structural connections that occur outboard of the weather resistive barrier plane unless:

      1) The connection can incorporate dielectric separators.

      2) The connection can be fully inspected after installation is complete using the Project's maintenance access system.

2. Use materials in the Work chemically compatible with their adjacent materials.

   a. Where flexible or sheet vapor control materials are connected together or to other systems, lap and continuously seal with chemically compatible materials and mechanically restrain.

3. Where insulation must be locally reduced in thickness, provide high-performance insulation to match the overall performance of the surrounding insulation.

4. Site-applied sealant is not acceptable as part of the primary weather sealing system unless shown on the Architectural Drawings or noted within this Section.

5. Engineer the air / weather resistive barrier to resist the maximum design wind load.

6. All external areas of the Work shall be accessible for maintenance and repair.

   a. Adjust loads imposed on the Work as necessary for the type and orientation of maintenance equipment anticipated. The Work shall sustain safely, and without damage, access and specified maintenance loads.

b. All gaskets, where possible, shall be accessible for inspection / replacement.

B. General Performance

1. Comply with performance requirements specified.

2. Work shall:

a. Withstand and accommodate the stresses and movements induced by the specified cambers, estimated deflections, relative deflections, and the long-term movements associated with the settlement of the foundations, or any other movements of the structure, changes in temperature, moisture content, and chemical changes.

b. Include suitable allowances for the specified construction tolerances.

c. Withstand the specified deleterious and degrading effects of radiation from the sun, weathering, atmospheric pollution, vermin, fungi, and other growths for the service life without maintenance in excess of routine cleaning and minor repairs.

d. Have a resistance to combustion and fire spread appropriate to each part.

e. Prevent casual and unlawful entry into the building.

f. Cleaning and maintenance of the Work shall be carried out easily, without interfering with building function.

g. Panels, structural silicone assemblies, and decorative capping pieces shall remain securely held and gaskets shall not be displaced.

3. Failure includes inability of the Work to meet the performance requirements set forth in this Section in addition to the following:

a. Noise or vibration created by wind, and thermal and structural movements.

b. Staining of adjacent components or wetting of interior building components. Water penetration into the system (beyond the exterior rainscreen layer) is acceptable only if all of the following conditions are satisfied; any other water penetration is considered water leakage and is unacceptable:

1) Water is immediately contained and drained to exterior.

2) There is no wetting of a surface that could be damaged by moisture or that would be visible to building occupants.

3) There is no staining or other damage to completed building or its furnishings.

4) This definition of water leakage takes precedence over other definitions that may appear in referenced documents.

C. Detailed Engineering Requirements

1. The Work adopts a rainscreen system, complete with cladding Panels and supporting framing; insulation; weather resistive, air, and vapor barriers.

2. This system shall be:

   a. Engineered to allow Panels to be shop-fabricated and field-installed.

   b. Engineered to incorporate bracket assemblies as required to support the attached Panels and resist the full loads applied to the system. Pressure equalized to the air and weather resistive barrier plane of the system. Incorporate a drainage system behind the rainscreen Panels that drains to the exterior. This system shall:

      1) Allow complete drainage of water to outside.

      2) Eliminate standing water on or around Panels.

      3) Allow ventilation behind the rainscreen Panels.

      4) Prevent water infiltration at weeps.

   c. Incorporate a continuous thermal, water and weather resistive barriers.

      1) All interfaces with adjacent systems shall accommodate the integration of the transitional waterproofing, air and weather resistive barrier into the equivalent plane of the system. This transition shall consist of a membrane and shall not rely on sealant alone. This integration shall provide for a continuous thermal, water, air and weather barrier system from the glazing system to that of adjacent building enclosure systems.

   d. Provide accommodation for the most onerous movement when all tolerances are accounted for.

   e. Incorporate thermal isolation devices / thermal breaks to minimize thermal bridging.

   f. Allow for Panel replacement from the outside of the building.

   g. Sealed with joint sealants between cladding Panels where indicated, with Panel joint reveals; allow sufficiently deep edge profile to accommodate sealant joint.

D. Structural Performance

1. The Work shall transmit the design loads as specified below to the building structure via the points of attachment as engineered and built, with an adequate margin of safety appropriate to each material and product as required by 2014 New York City Building Code and the listed Reference Standards.

2. As required by 2014 New York City Building Code, consider the various load cases and combinations of load cases acting on structural elements.

   a. Permanent deformation or damage to any components of the Work, adjacent elements, or supporting structure is not accepted under any of the above load cases and combinations of load cases, excluding blast and impact loads.

b. Consider buckling and overall structural system stability in the engineering of all elements. Engineer framing members and systems not to buckle under the design load cases and their combinations.

c. Consider wind reinforced vibrations in the engineering of the Work. The Work shall not resonate at or under the design load conditions.

d. Consider the effects of ice accumulation, including the impact on gravity and wind loads, in the engineering of the Work. Derive load combinations and methodology of developing Atmospheric Ice Loads from the latest edition of ASCE-7.

3. Coordinate all loads imposed on the building structure with the Commissioner. See Structural Drawings for structural movements and limiting loading at interface to structure.

4. Coordinate and verify access and maintenance loads with the maintenance equipment manufacturer and Commissioner. Loads shall not be less than the following and shall be applied to any external or internal surface of the Work subject to access for maintenance purposes:

a. A vertical uniformly distributed load of 12.5 psf, and a concentrated load of 250 lbf acting on a 6 in. diameter contact area applied to any gutters, copings, or flat and near-flat surfaces with horizontal projections greater than 6 in.

b. A 115 lbf load applied horizontally through a 6 in. diameter contact area on any vertical or near-vertical building enclosure surface required to support a ladder.

c. 600 lbf in any direction at building maintenance equipment restraint points.

d. Where maintenance and safety ropes will be draped over elements of the Work, engineer those elements to support, without damage, a point load of 675 lbf or the anchorage load limits provided, applied over the length of contact of the cladding.

E. Movement Performance

1. The Work shall accommodate the movements as per 2014 New York City Building Code and as developed by the building structure without any reduction in performance below the minimum levels required herein. These include the following:

a. Movements due to design gravity and live loads.

b. Movements under repeated cycles of the design wind loads.

c. Movements due to seismic loads.

d. Changes in dimension and shape arising from specified building movements, including settlement, shrinkage, elastic shortening, floor beam deflections, creep, wind sway, twisting and racking, and thermal and moisture movement. These include movements due to any joint in the supporting structure or building frame.

2. Coordinate all building movement assumptions with the Commissioner and the Project Structural Engineer.

3. Applicable Testing Requirements

   a. Interstory Drift Performance

      1) The Work shall demonstrate compatibility with the building structure interstory drifts when tested to the procedures outlined in AAMA 501.4 at the design displacement, and for not less than ten (10) full cycles.

F. Deflection Performance

1. Provide Work that accommodates the dimensional construction tolerances of building structure and other adjacent constructions.

2. Under design loads and their combinations, the deflections of elements shall be less than following:

   a. Normal to the face of the wall plane:

      1) Elements Supporting Plaster, Masonry, or Brittle Items: Less than span/500.

      2) Non-Glass Supporting Elements: Less than Span/175.

   b. Parallel to the face of the wall plane, limited to the lesser amount of either:

      1) That which reduces edge clearance between framing members and Panel or other fixed components to less than 1/8 in.

   c. Engineer cantilevered elements to deflect less than 2L/175, where L represents the length of the cantilevered element.

3. The Work shall accommodate thermal deflections and movements resulting from the following maximum change (range) in ambient and surface temperatures. Changes in dimension resulting from changes in temperature in any of its parts, its supporting framework, and brackets shall not result in any reduction in the specified performance.

4. Base engineering calculation on surface temperatures of materials due to both solar heat gain and night-time-sky heat loss. As per AAMA 501.5, all system components shall noiselessly withstand thermal movements and shall not buckle, distort, crack, cause failure of glass and/or joint seals, or develop undue stresses on the finished surfaces, materials, fixing assemblies, or building structure.

   a. Engineer Work to meet these requirements under the following conditions:

      1) Total Temperature Range: 120°F, ambient; 180°F, material surfaces.

      2) Test Interior Ambient Air Temperature: 70°F.

5. The Work shall accommodate deflections and/or movements resulting from moisture without any reduction in the specified performance. This includes:

   a. Changes in moisture content of Work components, including those due to wetting from rain.

   b. Expansion of absorbed or retained moisture due to freezing.

6. The Contractor shall avoid, in their engineering and detailing, introducing locked-in stresses that may be detrimental to the performance of the Work during the service life.

   a. Stresses include, but are not limited to, those that can develop in an individual Panel, if the various fasteners and connections that secure that Panel in position are so rigid that they do not allow for thermal or other movement in that Panel.

7. Applicable Testing Requirements

   a. Uniform Load Structural Deflection Performance

      1) The Work shall demonstrate compliance with the deflection criteria listed in this Section when tested according to ASTM E330.

   b. Uniform Ultimate Load Structural Deflection Performance

      1) The Work shall not show evidence of material failures, structural distress, or permanent deformation exceeding 0.2% of span when tested according to ASTM E330 at 150% of the peak design load (positive or negative).

G. Weatherproofing Performance

1. The Work, including all weatherproof joints between it and other elements of Work, shall prevent leakage of water into the interior of the building from the weathering line of the assembly, under the action of wind pressure, kinetic energy, gravity, surface tension, or capillary action as per Code. It shall also prevent water entering into those parts of the Work that would be adversely affected by the presence of water.

   a. All weatherproof joints within the Work shall maintain their watertightness under the loads and movements specified herein.

   b. Incorporate weathering principles within the Work and interfacing with adjacent elements of Work compatible with the weathering principles adopted by the adjacent elements.

   c. Detailing and waterproofing must ensure that water from ponding or reservoirs is directed away from the Work such that water will not build up a pressure head or impose forces onto the building enclosure seals and components.

   d. Detailing must ensure that water collected within elements of the Work is positively drained to the outside of the Work.

2. Incorporate elements and details in the Work to provide for a continuous weather resistive barrier system.

   a. Engineer elements exterior of the weather resistive barrier plane so they are suitable for exterior conditions and experience weathering without any loss in performance as specified.

      1) No element of the Work shall be encapsulated between two weather resistive barrier planes.

b. Air and vapor control elements shall maintain their performance and properties for the expected service life of the system.

c. Where air and vapor control elements will be exposed to interior conditions during construction, select suitable materials to ensure the elements are not easily damaged during installation of the Work or adjacent constructions.

1) Easily damaged materials include but are not limited to foil facing attached to other products, including insulation.

3. Applicable Testing Requirements

a. Static Pressure Water Infiltration

1) The Work shall demonstrate compliance with the weatherproofing performance criteria when tested according to ASTM E331 at a minimum static air pressure differential of 20% of the peak positive wind-load design pressure, but not less than 15 psf.

2) No evidence of water infiltration inboard of the weathering line or weather resistive barrier plane when tested.

b. Dynamic Pressure Water Infiltration

1) The Work shall demonstrate compliance with the weatherproofing performance criteria when tested according to AAMA 501.1 at a minimum static air pressure differential of 20% of the peak positive wind-load design pressure, but not less than 15 psf.

2) No evidence of water infiltration inboard of the weathering line or weather resistive barrier plane when tested.

H. Energy Performance

1. Work and components shall have certified energy performance ratings as determined by the standards referenced by 2014 New York City Building Code and 2016 New York City Energy Conservation Code.

2. Incorporate thermal breaks in the Work.

3. The design environmental conditions are:

a. Exterior extreme annual dry bulb temperature and coincident wind speed:

1) Maximum Dry Bulb: 95.6°F at 6 mph.

2) Minimum Dry Bulb: 2.3°F at 6 mph.

b. Interior design dry bulb temperature, relative humidity (RH), and interior air film coefficient:

1) 70°F ± 2°F at 25% to 60% RH and 0.7 Btu/hr - sq ft - °F

4. Thermal Transmittance (U-Factor)

a. U-factor of the Work shall not be more than specified in the Building Enclosure System Matrix, accounting for all frame effects.

5. Condensation Resistance

a. Provide systems whose internal condensation and drainage systems will prevent uncontrolled condensation inboard of the weather resistive barrier plane, under the most onerous environmental conditions specified in this Section.

1) Exterior: Dry bulb 13°F at 17 mph.

2) Interior: Dry bulb 72°F at 25% RH and 0.7 Btu/hr - sq ft - °F.

6. Static Pressure Air Infiltration

a. Maximum air leakage through the Work areas of the Project shall be the lesser of the requirements determined according to 2014 New York City Building Code and 2016 New York City Energy Conservation Code or the following:

1) For non-operable portions of the Work, the maximum air infiltration rate shall be one half of that as required and determined according to the standards referenced by 2014 New York City Building Code and 2016 New York City Energy Conservation Code.

7. Applicable Testing Requirements

a. Static Pressure Air Infiltration

1) The Work shall be capable of demonstrating compliance with the air infiltration criteria listed in this Section when tested according to ASTM E2357 and to the pressure differential referenced by 2014 New York City Building Code and 2016 New York City Energy Conservation Code.

I. Fire Performance

1. The Work shall comply with relevant fire resistance, smoke sealing, and firestopping recommendations stated in the 2014 New York City Building Code and 2016 New York City Energy Conservation Code, but not less than the following.

a. ASTM E84: Flame Spread Index must be less than 25, Smoke Developed Index must be less than 450.

b. ASTM D1929: Self ignition temperature of 650°F or greater.

c. ASTM D635: Requires a CC1 classification.

d. Tested and comply with NFPA 285 acceptance criteria.

2. Component materials shall not give off toxic fumes.

J. Lightning Protection and Grounding Performance

1. Coordinate as necessary with the Trade responsible for the lightning protection and grounding systems as required by 2014 New York City Building Code for the building and agree on appropriate connection points with it for review by the Commissioner.

    a. No external tapes or visible connections will be accepted.

    b. Provide electrically continuous vertical and horizontal metallic framework elements and supporting structures of the Work for the purposes of lightning protection and grounding. Provide bonding of the framework to the rest of the lightning protection and grounding system. Ensure all non-conductive thermal breaks are electrically continuous.

K. Infestation

1. Design materials used in the Work against attack or infestation by micro-organisms, fungi, insects, or other vermin.

1.5 SUBMITTAL PROCEDURES:

A. Refer to DDC General Conditions Section 01 33 00 – Submittal Procedures.

1.6 SUBMITTALS:

A. Shop Drawings

B. Calculations

1. Provide structural calculations as required.

2. Provide thermal calculations as required to describe:

    a. U-value performance of Work.

    b. Condensation resistance of all elements of Work where requested by the Commissioner.

C. Product Data

1. Metal Panels.

2. Sealant, including structural sealant.

3. Gaskets.

4. Supporting framing.

5. Anchorage used to attach to supporting structure.

6. Insulation.

D. LEED submittals.

E. Samples.

F. Quality control plan.

G. Welding certificates.

H. Product Test Reports

1. Indicating compliance with performance requirements.

I. Quality Control Reports

1. Fabricator reports.

2. Field reports.

J. Completion of Work: Upon completion of installation of the Work, submit written certification that the manufacturer's representative has supervised the work of this Section and that all materials are correctly installed.

1.7 QUALITY ASSURANCE

A. Refer to DDC General Conditions Section 01 40 00 – Quality Requirements.

B. Installer Qualifications: The Contractor must be licensed or approved by the manufacturer.

1.8 WARRANTY:

A. Unless stated otherwise in these Specifications, Warranty shall state that the Work is free from defects in materials and workmanship and weathertight for a period of 1 yr from the date of Substantial Completion. Contractor shall agree to promptly repair or replace defective materials and workmanship to "like new condition," including such exploratory work, required to determine the cause, during the Guarantee period, at no additional cost to the City of New York

B. In addition to Contractor's Guarantee, the paint finish manufacturer shall guarantee the finish for a period of 20 yrs from the date of Substantial Completion of the Work against defects, including full labor and material.

C. In addition to Contractor's Guarantee, the framing manufacturer shall guarantee the framing system for a period of 10 yrs from the date of Substantial Completion against defects, including full labor and material costs. Contractor shall include with his proposal, copy of warranty from proposed framing manufacturer.

D. The Contractor shall be responsible for repairing damage to the building and furnishings occasioned by defective materials or workmanship or damage as part of repairs to the Work.

1.9 PROJECT CONDITIONS:

A. Adjacent Trade Shop Drawing Review and Field Measurements: Verify actual locations of structural supports for Work by review of supporting structure Shop Drawings or field measurements before fabrication and indicate measurements on Shop Drawings.

PART II – PRODUCTS

2.1 MATERIALS:

A. Aluminum Components

1. Manufacturer's recommended alloy and temper, meeting the requirements and standards listed herein for type of use and finish indicated in accordance with:

   a. Sheet and Plate: ASTM B209.

   b. Extruded Bars, Rods, Profiles, and Tubes: ASTM B221.

   c. Extruded Structural Pipe and Tubes: ASTM B429.

   d. Structural Profiles: ASTM B308/B308M.

B. Steel Components

1. Manufacturer's recommended alloy and temper, meeting the requirements and standards listed herein for type of use and finish indicated in accordance with:

   a. Structural Shapes, Plates, and Bars: ASTM A36/A36M/A572.

   b. Cold-Rolled Sheet and Strip: ASTM A1008/A1008M.

   c. Hot-Rolled Sheet and Strip: ASTM A1011/A1011M.

   d. Galvanized Sheet: ASTM A653/A653M.

C. Stainless Steel

1. Alloy and temper recommended by manufacturer and meeting the requirements and standards listed herein for type of use and finish indicated in accordance with:

   a. Plate, Sheet and Strip: ASTM A240/A240M.

2. With a Pitting Resistance Equivalence Number (PREN) greater than 24.5 calculated using the formula 'PREN = %Cr + 3.3 x %Mo + 16 x %N' based on the minimum compositions for Chromium, Molybdenum, and Nitrogen given in ASTM A240 or equivalent.

3. In areas where stainless steel may be used in proximity to a water feature, sea spray, or salts, the alloy chosen will not corrode or exhibit any surface pitting in its installed condition, or require regular maintenance to prevent corrosion.

   a. Non-austenitic alloys including the following shall be used:

      1) Duplex stainless steel Type 2205 (UNS S32205).

      2) 317L.

2.2 FINISHES:

A. Refer to Building Enclosure System Matrix for finish selection for each system.

B. Aluminum Components

1. Anodized Finish

a. Carry out anodizing under conditions of acceptable good practice for architectural applications. Hold the processing conditions constant for the period required for completion of the Work. Keep records of these conditions and make available for inspection in the event of a dispute as to the quality of the finished anodic coating.

b. Clear Anodic Finish: AA-M12C22A41, Class I, 0.71 mil or thicker, as complying with AAMA 611.

c. Color Anodic Finish: AA-M12C22A42/A44, Class I, 0.71 mil or thicker, as complying with AAMA 611.

1) Color: Refer to Building Enclosure System Matrix.

2. High-Performance Organic Finish

a. Three-coat fluoropolymer finish complying with AAMA 2605 and containing not less than 70% PVDF resin by weight in color coat and clear topcoat.

b. Prepare, pretreat, and apply coating to exposed metal surfaces complying with coating and resin manufacturers' written instructions.

c. Color and Gloss: Refer to Building Enclosure System Matrix.

d. Manufacturers: Subject to compliance with requirements provide products by one of the following:

1) PPG Industries Inc., Duranar XL Extrusion Coating.

2) Akzo Nobel Coatings Inc., Trinar Ultra TEC/TMC.

3) The Valspar Corporation, Fluropon Premiere.

4) Or approved equal.

3. Powdercoat Finish

a. Shop-applied Superior Performance powder coating finish for architectural aluminum extrusions complying with AAMA 2605.

b. Prepare, pretreat, and apply coating to exposed metal surfaces complying with coating and resin manufacturers' written instructions.

c. Color and Gloss: Refer to Building Enclosure System Matrix.

1) One-coat dry system with 70% fluoropolymer resin, meeting performance requirements of AAMA 2605 and the following:

2) Dry Film Thickness, ASTM D1400: Not less than thickness applied to tested specimens meeting specified performance requirements, and as recommended by manufacturer for application.

3) Specular Gloss, ASTM D523 at 60°: To be selected by the Commissioner.

4) Dry Film Hardness, ASTM D3363: Pass.

5) Sulphur Dioxide, ISO 3231 (Kesternich): Pass – no blistering, loss of gloss, or discoloration.

d. Manufacturers: Subject to compliance with requirements provide products by one of the following:

1) Akzo Nobel Coatings Inc., Interpon D3000 Series Fluoromax Powder Coating.

2) PPG Industries Inc., Duranar Powder Coatings.

3) The Jotun Group, Jotun Durasol.

4) Or approved equal.

4. Concealed Components

a. Provide either High-Performance Organic Finish, Powdercoat Finish, or Clear Anodic Finish.

C. Steel Components

1. Zinc coated by hot-dip process according to ASTM A123/A123M, ASTM A653/A653M or ASTM A153/A153M, after fabrication as applicable.

a. Galvanized sheet shall have a minimum coating designation of G90 according to ASTM A653/A653M.

b. Formed steel components shall have a minimum coating designation of ZM90 according to ASTM A1046/A1046M.

c. Following pickling operations, hold steel at more than 212°F to ensure a uniform temperature, either prior to or after fluxing.

2. Exposed Components

a. Framing system shall include the manufacturer's standard coating and finish system.

b. Where other components are exposed provide a high-performance organic or Powdercoat finish meeting the requirements specified for aluminum components and in accordance with the finish manufacturer's procedures.

3. Concealed Components

a. Utilize a zinc-rich, corrosion-resistant primer, complying with SSPC-PS Guide applied immediately after surface preparation and pretreatment.

b. Select surface preparation methods according to recommendations in SSPC-PS and prepare surfaces according to applicable SSPC standard.

D. Stainless Steel Components

1. Exposed Components

   a. Surface Preparation

      1) Remove tool and die marks and stretch lines, or blend into finish.

   b. Polished Finishes

      1) Grind and polish surfaces to produce uniform finish, free of cross scratches.

      2) Run grain of directional finishes with long dimension of each piece.

      3) When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.

   c. Finish: Refer to Building Enclosure System Matrix.

E. General

1. Choose finishes such that touch-up finishes match factory finish.

2. Discoloration, fading, chalking, excessive non-uniformity, pitting, cracking, peeling, corrosion, or crazing of finish is not allowed.

3. The terms below used in conjunction with finish Guarantee are defined as follows:

   a. "Excessive Fading": Means a change in appearance that is perceptible and objectionable as determined by the Commissioner when viewed visually in comparison with the original color range standards.

   b. "Excessive Non-Uniformity": Means non-uniform fading during the Guarantee period to the extent that adjacent parts have a color difference greater than the original acceptable color range.

   c. "Will Not Pit or Otherwise Corrode": Means no pitting or other type of corrosion of finish discernible from a distance of 10 ft, resulting from the natural elements in the atmosphere at the Project site.

   d. Deterioration includes, but is not limited to, the following:

      1) Color fading more than 5 Hunter units when tested according to ASTM D2244.

      2) Chalking in excess of a No. 8 rating when tested according to ASTM D4214.

      3) Cracking, checking, peeling, or failure of paint to adhere to bare metal.

2.3 FRAMING:

A. Framing members shall comply with the profiles and angles shown in the Architectural Drawings and comply with the performance requirements set forth in these Specifications.

B. Provide thermally broken framing members at metal panel systems.

2.4 BRACKETS, FASTENERS, AND ANCHORAGE:

A. Fasteners

1. Fastener engineering shall be no less than the most stringent standards as required by 2014 New York City Building Code and its reference standards, or the following requirements:

   a. Fastener engineering for aluminum components as per the Aluminum Association Aluminum Design Manual (AA-ADM1).

      1) Allowable loads for fasteners shall be the lesser of the fastener manufacturers' requirements or per AAMA TIR-A9 with the most recent amendments.

   b. Fasteners Used in Cold-Formed Steel Framing Backup Construction

      1) Fastener selection and sizing shall be in accordance with the AISI Cold-Formed Steel Design Manual and ASTM C1513.

   c. Fasteners Used in Cast-in-Place Concrete and Concrete Masonry Unit (CMU) Backup Construction

      1) Fastener selection and sizing shall be based on applicable ICC-ES Evaluation Reports and testing according to ASTM E488 and ASTM E754 (for CMU construction) with the same backup wall construction used on the Project.

      2) Post installed anchors shall be subject to Special Inspections as required by 2014 New York City Building Code.

   d. When utilizing a fastener not included in any of the above references, available standards, or design guides, use a minimum factor of safety of 4 for permissible load design of anchoring assemblies.

2. Fastener engineering shall account for any reduction in safe working loads due to their spacing, edge distance, embedment, location in areas of tension, or proximity to cast-in inserts/existing fasteners, or thickness of shims. Fastener engineering shall also consider condition, thickness, and material properties of substrate. Adhesive anchoring systems shall not be used for fasteners supporting loads in tension.

3. Unless shown in the Architectural Drawings, no exposed fasteners shall be visible.

   a. Where exposed fasteners are shown and required, use countersunk security heads.

4. All exterior fasteners or fasteners in wet areas shall be of a suitable grade of stainless steel. Weather coatings for corrosion resistance may only be used with the Commissioner's approval.

5. All exterior fasteners that penetrate a self-sealing weatherproofing system shall be selected and coordinated with the weatherproofing system manufacturer to ensure self-sealing occurs. Set all fasteners penetrating the weatherproofing system in sealant.

6. Where post drilled or site-drilled fasteners are used for connections to the external structural steel frame, do not compromise the integrity of the steel corrosion protection system.

7. Highlight the general requirement for torqueing of bolts in the Shop Drawings and clearly state tightening torque values.

8. Contractor shall provide for Commissioner's review, documentation demonstrating that the use of all fasteners installed has been reviewed and approved by the fastener manufacturer and shall, prior to installation, submit manufacturer's written certification that details proposed by the Contractor are appropriate for their intended use.

B. Brackets and Anchorage

1. Engineer brackets and anchorage to allow for adjustments by 1 in. in small increments in and out, up and down, and side to side in the position of the Work supports relative to other constructions to accommodate the full variations in the underlying construction and fabrication tolerances.

2. Shimming required to accommodate local variations in construction tolerances only. State the maximum allowable shim dimension in the Shop Drawings.

3. Concrete and masonry inserts shall be hot-dip galvanized cast-iron, malleable-iron, or steel inserts as required by ASTM A123/A123M or ASTM A153/A153M.

C. General

1. Engineer all brackets and fasteners so there is no risk of loosening due to the effects of vibrations, or to the cyclic effects of load, deflections, and thermal movements.

2. Engineer brackets for site-drilled fasteners to allow for the possibility of reinforcement or other obstructions being encountered and the fixing position being moved as a result.

3. Do not cut reinforcement or other obstructions without the approval of the Commissioner.

2.5 FLASHING:

A. Refer to Section 07 62 01 – Facade Sheet Metal Flashings for performance requirements.

2.6 GASKETS:

A. General

1. Do not install gaskets/dry weather seals in a pre-stretched condition.

2. Gaskets shall be accessible for inspection/replacement.

3. Select gaskets and seals used to achieve the required weather and airtightness in accordance with referenced standards to fully accommodate the range of dimensional tolerances associated with fabrication and installation of the Work. Form with materials capable of maintaining their elastic qualities, dimensions, and resistance to physical and chemical attack sufficient to maintain the full performance during the design life. Gaskets shall be free from contact and migration stain and shall be compatible with all substrate, Sealant, and finishes which they may contact.

4. Gaskets shall maintain their performance and properties for the expected service life of the product.

5. Gaskets shall be free of mold flash.

B. Extruded rubber gaskets shall comply with ASTM C509.

1. Dense compression gaskets shall be molded or extruded of profile and hardness required to maintain watertight seal, made from silicone complying with ASTM C1115.

a. Use where soft compression gaskets will be compressed by inserting dense compression gaskets on opposite side of glazing or pressure applied by means of pressure-glazing stops on opposite side of glazing.

2. Soft compression gaskets shall be extruded or molded, closed-cell, integral-skinned silicone gaskets complying with ASTM C509, Type II, black; of profile and hardness required to maintain watertight seal.

2.7 SEALANTS:

A. Refer to Section 07 92 01 – Exterior Joint Sealants for performance requirements.

2.8 INSULATION:

A. Overall insulation thickness as shown in the Drawings and as needed to meet 2016 New York City Energy Conservation Code requirements.

B. Semi-Rigid Insulation: Unfaced, Mineral-Wool Board Insulation.

1. Manufacturers: Subject to compliance with requirements provide products by one of the following:

a. Rockwool, Inc.

b. Thermafiber, Inc.

c. Johns Manville.

d. Or approved equal.

C. Provide product with the following properties:

1. Complying with ASTM C612; with maximum flame-spread and smoke-developed indexes of 15 and 0, respectively, per ASTM E84.

2. Passing ASTM E136 for combustion characteristics.

3. Nominal density of 6 lb per cubic foot. Type II, with a minimum thermal resistivity of 4.2°F x h x sq ft/Btu x in. at 75°F.

4. Recycled Content: Postconsumer recycled content plus one-half of pre-consumer recycled content not less than 10%.

5. Fiber Color: Darkened, where indicated.

D. Insulation Fasteners

1. Design fasteners to fully restrain insulation against all design loads.

2. Provide fastener materials suitable for the environmental conditions the insulation will be exposed to.

3. Spindle-type anchors plate welded to projecting spindle and capable of holding insulation of specified thickness securely in position indicated with self-locking washer in place.

4. Anchor adhesive demonstrating capability to bond insulation anchors securely to substrates indicated without damaging insulation, fasteners, and substrates.

E. Thermal insulation shall be inert, durable, not water soluble, rot and vermin proof, CFC and HCFC free, shall be inorganic and not support mold, fungal, or bacteria growth, and shall provide the specified performance for the service life of the Work. Make due allowance for the reduced performance of insulation due to the effects of moisture and aging.

F. Thermal insulation shall be sufficiently robust and cohesive to allow for removal and replacement in service without loss of material or performance. It shall not be injurious to human health when properly installed, when in service, and when removed or replaced.

2.9 METAL WALL PANELS:

A. Metal Wall Panels are to be incorporated into the Work. Refer to Building Enclosure System Matrix for Metal Wall Panel types and Section 07 42 14 – Metal Panels for performance requirements.

2.10 METAL PANEL COMPONENTS:

A. Panels shall not have any visible fasteners, telegraphing, or fastening on the Panel faces or any other compromise of a neat and flat appearance unless specified as exposed fastener assemblies per the Building Enclosure Matrix. Include stiffeners as required to limit panel deflections.

B. Stiffener Ribs, Reinforcements and Brackets: Manufacturer's recommended components with non-staining, nonferrous shims for aligning system components. Select materials to ensure compatibility with Metal Panels. Stiffeners shall be structurally fastened or restrained at the ends and secured to the rear face of the Panel with silicone of sufficient size and strength to maintain Panel flatness.

1. Size: As recommended by SMACNA's Architectural Sheet Metal Manual or metal plate Panel manufacturer for application, but not less than thickness of metal being secured.

C. Reinforcing Frame: Extruded aluminum mechanically fastened to perimeter of Panel with fasteners number and spacing sufficient to provide adequate reinforcement of the Panel. Manufacturer's recommended components with non-staining, nonferrous shims for aligning system components. Materials selected to ensure compatibility with Panels.

1. Provide Panel return edge of sufficient size to allow for Sealant joint installation where sealant joints are indicated for use.

2.11 EXTERIOR LOUVER PANELS:

A. Exterior Louver Panels are to be incorporated into the Work. Refer to Building Enclosure System Matrix for Exterior Louver Panel types and Section 08 90 00 – Louvers for performance requirements.

2.12 EXTERIOR ARCHITECTURAL PRE-CAST CONCRETE PANELS:

A. Refer to Section 03 45 00 – Architectural Pre-Cast Concrete..

2.13 WEATHER RESISTIVE BARRIER:

A. Refer to Section 07 27 01 – Weather Resistive Barriers..

2.14 ACCESSORY MATERIALS:

A. Bituminous Paint: Cold-applied asphalt-mastic paint complying with SSPC-Paint 12 requirements except containing no asbestos, formulated for 30 mil thickness per coat.

B. Separating / Isolating Materials

1. The Contractor shall select, provide, and install each material so it is, and will remain, compatible with other materials around it within its range of influence. Contractor shall ensure adequate measures are taken to prevent bimetallic corrosion between dissimilar metals. Where different metallic materials are used, fit separators to eliminate the risk of corrosion.

2. Butyl Tape: Preformed butyl-based elastomeric tape with 100% solids content. Non-staining, with or without spacer rod (as approved by Commissioner), with release paper backing. Provide where shown on the Drawings.

3. Aluminum or Foil Faced Tape: Provide where shown on the Drawings and with various widths as required.

PART 3 - EXECUTION

3.1 EXECUTION REQUIREMENTS

A. Refer to DDC General Conditions for execution requirements.

3.2 FABRICATION:

A. General

1. Fabricate and finish assembly and accessories at the factory to the greatest extent possible, by manufacturer's standard procedures and processes, as necessary to fulfill indicated performance requirements.

2. Profiles shall be sharp, straight, and free of defects or deformations.

3. Fabricate all formed or extruded shapes prior to finishing.

4. Accurately form joints without lipping or offsets in visible surfaces unless engineered otherwise. Rigidly secure other joints to prevent all but engineered movement, unless engineered otherwise.

5. Accurately fitted joints with ends coped or mitered.

B. Cutting

1. Grind, cut, and shape metals using tools which will not contaminate them with particles which could stain or corrode them.

2. Steel Components

   a. Minimize use of arc cutting and acetylene gas cutting as much as feasible. If required, Contractor shall submit full welding procedures to demonstrate hardness remains within the required limits.

   b. Mild steel cut or shaped by either flame cutting or plasma cutting shall be to procedures agreed by the Commissioner. Procedures shall demonstrate that the surface hardness is less than 270 Hv 10. Require random inspection of the steel to ensure the hardness level is not exceeded. Alternatively, surface dress all cut edges to remove hardened material.

   c. All punched holes shall be undersized by 40 mil and be reamed to the finished size.

C. Welding

1. Weld in concealed locations to greatest extent possible to minimize distortion or discoloration of finish. Remove weld spatter and welding oxides from exposed surfaces by descaling or grinding.

2. Weld metals in accordance with relevant standards using methods to avoid distortion. Show type, size, and spacing of welds on Drawings for Commissioner's review prior to fabrication.

3. Fully bond welds throughout their length without holes, inclusions, cracks, or porosity so that long-term performance is not compromised and the welds are strong enough for the engineered requirements.

4. Grind all welds smooth and flush with adjoining surfaces where visible or impinging on other work.

5. Do not site weld except where approved by the Commissioner.

6. Finish completed welded construction to prevent corrosion. Clean all welds as necessary to ensure the durability of the connections.

7. All radius edges used in changes of section shall be no less than the thickest member being welded.

8. All welding procedures and welding procedure specifications shall limit the hardness in the weld, parent metal, or heat-affected zone to less than 270 Hv 10.

D. Pressing and Folding

1. Fold and form aluminum sheets over dies or mandrels with the minimum radii recommended by the Aluminum Association in such publications as Aluminum Design Manual. Make trial bends on scrap material of the alloy, temper, and thickness being used to ensure that it is not cracked, torn, unevenly stretched, or separated at grain membranes.

E. Sealants and Adhesives

1. Prepare surfaces that will contact sealants and/or adhesives according to the manufacturer's written instructions to ensure compatibility and adhesion.

2. Preparation includes, but is not limited to, cleaning and priming surfaces.

F. Gaskets

1. Gaskets jointed by bonding with adhesive are not accepted as a substitute for molded frame gaskets. In the event that adhesive bonded joints are required, notify the Commissioner for review before such work is carried out.

2. All gasket frames should be normally manufactured to a small but predetermined oversize tolerance, to ensure that when seated into position, the lineal lengths and corners of the gaskets are in slight compression.

3. Install gaskets in accordance with the manufacturer's recommendations and utilizing the correct tools.

G. Fabrication Tolerances

1. Metal cutting tolerances for framework:

a. ± 1/16 in. on length of vertical members.

b. ± 1/32 in. on length of horizontal members.

c. ± 1/64 in. on the length and width of spandrel Panels, back pans, and aluminum sheets.

d. ± 1/32 in. on length of diagonal of spandrel Panels, back pans, and aluminum sheets and not more than ± 1/16 in. difference in the length between the two diagonals.

3.3 INSTALLATION:

A. Comply with all requirements and product manufacturer's recommended guidelines.

B. Do not install damaged components.

C. Fit joints to produce joints free of burrs and distortion.

D. Rigidly secure all non-moving elements.

E. Install anchors with separators and isolators to prevent metal corrosion and electrolytic deterioration, and to prevent impeding movement of moving joints.

F. Metal Protection

1. Where aluminum will contact dissimilar metals, protect against galvanic action by painting contact surfaces with primer or by applying sealant or tape or installing nonconductive spacers as recommended by manufacturer for this purpose.

2. Where aluminum will contact concrete or masonry, protect against corrosion by painting contact surfaces with bituminous paint.

3.4 INSTALLATION TOLERANCES:

A. Install Work to comply with the following maximum tolerances:

1. Plumb: 1/8 in. in 10 ft; non-cumulative.

2. Level: 1/8 in. in 20 ft; non-cumulative.

3. Alignment: End-to-end or edge-to-edge offset of adjoining consecutive element to 1/16 in.

4. Location and Plane: Limit variation from plane to 1/8 in. in 12 ft; 1/2 in. over total length.

5. Diagonal Measurements: Limit difference between diagonal measurements to 1/8 in.

B. Inspect substrate for erection tolerances and other conditions that would adversely affect installation of Panels.

1. Confirm that wall substrate is within tolerances acceptable to system manufacturer.

3.5 FIELD QUALITY CONTROL:

A. Test and inspect representative areas of the Work as installation proceeds to determine compliance of installed assemblies with specified requirements.

B. Testing shall be performed by a qualified Independent Testing and Inspection Agency.

1. The Independent Testing and Inspection Agency shall prepare and submit an inspection and test report.

C. Work is considered defective if it does not pass tests and inspections.

1. There shall be no evidence of water penetration as per the weatherproofing requirements specified.

a. No increase in the allowable rate of air infiltration or increase in the volume of water leakage, nor any decrease in the specified test pressures will be permitted in the evaluation of field testing. This requirement is more restrictive than AAMA standards.

2. Repair or remove work where test results and inspections indicate that it does not comply with specified requirements.

3. For each failure condition discovered, make remedial and corrective action approved by the Commissioner. All failures shall be considered systemic failures requiring corrective work at all similar conditions and locations. Remedial measures shall maintain standards of quality and durability and are subject to approval by the Commissioner.

4. Additional testing and inspecting shall be at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

D. Field Testing Support

1. Refer to DDC General Requirements Section 019115 Building Enclosure Commissioning Requirements and the Project building enclosure commissioning plan.

2. An Independent Testing Agency shall perform field testing of the Work and prepare test reports. Testing will include those performed to ASTM E1105, ASTM E2357, AAMA 501.2 standards. The Contractor shall assist the Independent Testing and Inspection Agency with testing, including providing safe access, water, power, constructing interior test chambers, etc.

a. Provide two days of support for field air and water infiltration testing at multiple locations selected by the Commissioner.

b. If failures occur, provide additional test assistance as needed to obtain Commissioner's approval at no additional cost.

3. Testing Services: Testing and inspecting of representative areas to determine compliance of installed system with specified requirements shall take place as follows and in successive stages as indicated by the City of New York. The City of New York will perform some of this testing during the early stages of Work installation. Complete all related installation work, in areas selected by the Commissioner, as needed to allow air and water testing to be performed during the early stages of the work (including installation of glazing, framing, gaskets, etc.). Do not proceed with the installation of the next area until test results for previously completed areas show compliance with requirements.

   a. Air Infiltration: Areas shall be tested for air leakage of 1.5 times the rate specified under Static Pressure Air Infiltration Article, but not more than 0.09 cfm per square foot of fixed wall area when tested according to ASTM E783 at a minimum static-air-pressure differential of 6.24 lbf per square foot.

   b. Water Penetration: Areas shall be tested according to ASTM E1105 at minimum cyclic static-air-pressure difference (Method B) equal to the pressure specified under Static Pressure Water Infiltration Article and shall not evidence water penetration.

   c. Water Spray Test: After the installation of minimum area of 75-ft-by-2-story Work has been completed but before installation of interior finishes has begun, a two-bay area of system designated by Commissioner shall be tested according to AAMA 501.2 and shall not evidence water penetration.

END OF SECTION 07 00 01

SECTION 07 13 26
Sheet Membrane Waterproofing

PART I - GENERAL

1.1 RELATED DOCUMENTS

A. The following documents apply to all required work for the Project: (1) the Contract Drawings, (2) the Specifications, (3) the General Conditions, (4) the Addendum and (5) the Contract (City of New York Standard Construction Contract).

B. LEED / Environmentally Preferable Purchase (EPP) General Requirements:

1. Refer to DDC General Conditions and the Addendum to the General Conditions

2. LEED requirements apply to all Phase II work with the exception of the Existing Building scope. EPP requirements apply to the project's Existing Building scope only.

1.2 SUMMARY

A. Section includes:

1. Sheet membrane waterproofing for underslab conditions.

2. Sheet membrane waterproofing for foundation wall surfaces.

3. Sheet membrane waterproofing for blindside of foundation wall surfaces.

B. Related Sections

1. Cast-in-Place Concrete - Section 03 30 00.

2. Earthwork - Section 31 00 00.

1.3 SUBMITTAL PROCEDURES

A. Refer to DDC General Conditions Section 01 33 00 "Submittal Procedures".

1.4 SUBMITTALS

A. Shop Drawings: Typical installation details, showing details at flashings, at terminations, at joints, at intersection of horizontal and vertical surfaces, and at penetrations in membrane system.

B. Samples - Submit

1. Membrane, 6" x 6" samples of each membrane.

2. 6" x 6" sample of flashing.

3. 6" x 6" sample of drainage board.

C. Manufacturer's Literature: Submit manufacturer's technical, safety data sheets, and installation literature for all materials of this Section. Submit Independent Test data indicating that membrane meets properties specified herein.

1.5 QUALITY ASSURANCE

A. Refer to DDC General Conditions Section 01 40 00 "Quality Requirements".

B. Preinstallation Conference: Approximately 2 weeks prior to scheduled commencement of waterproofing installation, meet at Project site with Waterproofing Installer; preparer of substrate to receive waterproofing; installers of other work in and around waterproofing that must precede, follow, or penetrate waterproofing (including Mechanical and Electrical Installers as applicable); Commissioner; City of New York; and waterproofing manufacturer's representative to review materials, procedures, schedules, and other requirements and conditions related to installing waterproofing.

C. Manufacturer's Representative/Contractor's Certification

1. Representative of the waterproofing material manufacturer shall be required to provide field instructions and supervision for the installation of the waterproofing systems at the start of the work of this Section.

2. The manufacturer's representative shall be required to make sure that the workmen for waterproofing systems on the site of the Project are fully instructed and trained in the handling and application of all the materials and shall see that all the materials are correctly installed.

3. Upon completion of the Installation, submit to the Commissioner written certification that the representative of the manufacturer of the waterproofing material has supervised the work of this Section and that all materials were correctly installed.

1.6 JOB CONDITIONS

A. No application of waterproofing shall commence or proceed during inclement weather, or the threat of imminent precipitation.

B. All surfaces to receive the system shall be thoroughly dry and free of dew or frost.

C. Materials shall be stored until time of mixing at temperatures above 60 deg. F. to maintain a consistency suitable for mixing. Do no work below 40 deg. F.

D. Prior to and during application, all dirt and dust shall be removed from surfaces either by vacuuming, sweeping, blowing with compressed air, or similar methods.

E. Surfaces not designated to receive the system shall be properly masked or otherwise protected against accidental spillage or application of the material to those areas.

1.7 STORAGE OF MATERIALS

A. All materials shall be stored in their original tightly sealed containers or unopened packages; shall be clearly labeled with the manufacturer's name, brand name and number, and batch number of the material with expiration date where appropriate.

B. Materials shall be stored in a neat and safe manner so as not to exceed the allowable live load of the storage area.

C. Material shall be stored out of the weather in a clean, dry area.

1.8 PROTECTION

A. Against Loads: Protect work of this Section against concentrated loads and any other loads or equipment that would damage the materials or work.

B. Against Traffic: Do not permit traffic on horizontally installed work of this Section, except for workmen doing the work, during the installation, and after the installation until membrane systems are covered with protective boards or with the specified finishing materials.

C. Against Damage: Protect vertically installed work of this section from damage by reinforcing and placement.

1. Take and maintain necessary preventive measures to protect work of this Section from damage until Project is accepted.

2. Rejection of Damaged Work

a. Damaged materials or work will be rejected.
b. Rejected materials or work must be immediately removed and replaced with new materials.

1.9 FIELD QUALITY CONTROL

A. Construction Traffic:

1. Limit construction traffic over completed membrane.

2. General Contractor shall provide 1/2 in. plywood protection layer, where construction traffic is unavoidable.

B. Inform Commissioner in writing on a daily basis of any of the following events. State specific location of each occurrence.

1. Buckling to the waterproofing and other deformations as a result of ground water events.

2. Leakage through the finished waterproofing installation.

3. Damage by other trades.

C. Provide Manufacturer's Representative's report (prior to backfill) stating that the waterproofing has been inspected and is acceptable and eligible for manufacturer's warranty.

1.10 WARRANTY

A. The manufacturer of the waterproofing system executed under this Section warrants the waterproofing system to be watertight and free from defects in materials and workmanship for a period of ten (10) years from date of Substantial Completion, and that he, at his own expense, repair and/or replace all other work

which may be damaged as a result of such defective work, and which becomes defective during the warranty period.

B. Contractor's Two-Year Workmanship Warranty: Provide a written Warranty for all work of this Section, stating that if, within two years after the Date of Substantial Completion of the Work, any of the work is found to be defective or not in accordance with the Contract Documents, the Contractor shall correct it promptly after receipt of a written notice from the City of New York to do so.

PART II - PRODUCTS

2.1 WATERPROOFING MEMBRANE

A. Waterproofing Membrane for Accessible Foundation Walls

1. Subject to compliance with requirements, products that may be incorporated into the Work include the following:

   a. GCP Applied Technologies; Bituthene 4000 sheet waterproofing membrane, 60 mils thick and Bituthene Liquid Membrane 60 mils thick, for flashing.
   b. Carlisle Coatings & Waterproofing; CCW MiraDri sheet waterproofing membrane, 60 mils thick, and CCW LiquiSeal V Liquid Membrane.
   c. WR Meadows; MEL-ROL sheet waterproofing 60 mils thick and BEM 60 mils thick, for flashing with MEL-ROL Sheet Membrane accessory products - MEL-PRIME NE or MEL-PRIME WB, BEM, POINTING MASTIC.
   d. Or approved equal.

B. Waterproofing Membrane at Underslab Conditions

1. Subject to compliance with requirements, products that may be incorporated into the Work include the following:

   a. GCP Applied Technologies; Preprufe 300R Plus System
   b. Carlisle Coatings & Waterproofing; CCW MiraPly H with SeamLock Technology
   c. WR Meadows; PRECON composite sheet membrane with Plasmatic Matrix
   d. Or approved equal.

C. Waterproofing Membrane at Blind Side Waterproofing Conditions

1. Subject to compliance with requirements, products that may be incorporated into the Work include the following:

   a. GCP Technologies; Preprufe 160R Plus System
   b. Carlisle Coatings & Waterproofing; CCW MiraPly V with SeamLock Technology
   c. WR Meadwos; PRECON composite sheet membrane with Plasmatic Matrix
   d. Or approved equal.

D. HDPE membrane shall have a protective layer to protect the membrane from the weather and U.V. for up to 56 days before casting concrete against it.

E. Latex/water-based primer specifically formulated to provide adhesion of waterproofing membranes.

1. Subject to compliance with requirements, products that may be incorporated into the Work include the following:

    a. GCP Technologies; Bituthene 4000 Conditioner
    b. Carlisle Coatings & Waterproofing; CCW 702 LV Adhesive
    c. WR Meadows; MEL-PRIME NE/Solvent based or MEL-PRIME WB/water based used as adhesive for MEL-ROL sheet waterproofing
    d. Or approved equal.

F. Bituthene Elastomeric Mastic: Rubberized asphalt base mastic.

G. Waterproofing Tape: Double sided synthetic adhesive tape.

H. Protection Board

1. Subject to compliance with requirements, products that may be incorporated into the Work include the following:

    a. GCP Technologies; 1/4" thick semi-rigid protection board, Bituthene Asphaltic Hardboard
    b. Carlisle Coatings & Waterproofing; CCW Protection Board HS
    c. WR Meadows; WR Meadows 1/4" PC-3
    d. Or approved equal.

I. Two-component 100% solids trowel grade asphalt modified urethane.

1. Subject to compliance with requirements, products that may be incorporated into the Work include the following:

    a. GCP Technologies; Bituthene Liquid Membrane
    b. Carlisle Coatings & Waterproofing; CCW LiquiSeal V
    c. WR Meadows; MEL-ROL Liquid Membrane
    d. Or approved equal.

J. Drainage Board/Composite: Prefabricated dimpled polystyrene drainage core with a non-woven filter fabric on one side and a polymer film on the reverse side

1. Vertical Applications: Subject to compliance with requirements, products that may be incorporated into the Work include the following:

    a. GCP Technologies; Hydroduct 220
    b. Carlisle Coatings & Waterproofing; CCW MiraDrain 6000
    c. WR Meadows; MEL-DRAIN 5035
    d. Or approved equal.

2. Horizontal Applications: Subject to compliance with requirements, products that may be incorporated into the Work include the following:

    a. GCP Technologies; Hydroduct 660
    b. Carlisle Coatings & Waterproofing; CCW MiraDrain 9000
    c. WR Meadows; MEL-DRAIN 9055

d. Or approved equal.

PART III - EXECUTION

3.1 EXECUTION REQUIREMENTS

A. Refer to DDC General Conditions for execution requirements.

3.2 INSPECTION

A. Examine the areas and conditions where membrane waterproofing is to be installed and correct any conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions are corrected to permit proper installation of the work. Starting of work implies acceptance of substrate.

3.3 PREPARATION OF SURFACES TO RECEIVE WATERPROOFING

A. Conform to the requirements of specified manufacturer.

B. Earth or crushed stone substrates shall be compacted to produce an even, sound substrate. Loose aggregate, sharp protrusions and standing water shall be removed.

3.4 INSTALLATION

A. General: Conform to recommendations and published specifications of the manufacturer, including environmental requirements and preparation requirements to receive waterproofing.

B. Foundation Walls (Accessible Walls)

1. General: The membrane, when in place must withstand a minimum static ground water pressure in accordance with ASTM D5385

2. Priming: Application of primer shall be limited to what can be covered with waterproofing membrane in a given work day. Primed areas not covered by membrane during the work day will be reprimed. Apply primer by spray, roller or brush at a rate of 250 - 350 sq. ft. per gallon. Roller shall be natural material such as lamb's wool, having a nap of approximately one inch. Primer shall be applied to a clean, dry, frost-free and dust-free surface. Sufficient primer must be used on the day surface to condition it to a dust-free state suitable for the application of waterproofing membranes.

   a. Surface conditioner should not be applied below 25 deg. F. on vertical surfaces. Allow primer to dry 30 minutes. Conditioner is considered dry when the substrate returns to its original color.
   b. Re-prime areas that become dusty or dirty prior to membrane installation.

3. Membrane Installation: Apply waterproofing membrane vertically in sections of 8' in length or less. On higher walls apply two or more sections with the upper overlapping the lower by a least 2-1/2". Press all membrane in place with heavy hand pressure or rollers during application.

4. Sealing Edges: Waterproofing membrane shall be applied over the edge of the slab or over the top of the foundation or parapet wall. If the membranes are terminated on the vertical surface, a reglet or counter flashing may be used or the membrane may be terminated directly on the vertical surface by

pressing very firmly to the wall. Press edges with a metal or hardwood tool such as a hammer or knife handle. Apply a troweled bead of mastic to all vertical and horizontal terminations. Liquid membrane can be used as an alternative method at the Contractor's option.

5. Sealing Seams: All edges and end seams must be overlapped at least 2-1/2". Apply succeeding sheets with a minimum 2-1/2" overlap and stagger end laps. Roll or press the entire membrane firmly and completely as soon as possible. Patch misaligned or inadequately lapped seams with membrane. Slit any fish mouths, overlap the flaps, and repair with a patch of membrane and press or roll in place. The edges of the patch shall be sealed with a troweling of mastic. Laps within 12" of all corners shall be sealed with a troweling of mastic.

6. Corner Forming: Outside corners must be free of sharp edges. Inside corners shall receive a fillet formed with liquid membrane, latex modified cement mortar mixed with cement mortar or epoxy mortar. Do not use fiber or wood cants. One of two methods may be used for treating corners at the Contractor's option:

   a. Apply liquid membrane 6" in each direction from the corner and form a fillet with a minimum 3/4" face.
   b. Install an 11" minimum strip of waterproofing membrane centered on the corner. Install membrane over the treated inside and outside corners.

7. Over waterproofing, apply drainage composite board by adhering board to cured membrane using tape or adhesive per manufacturer's recommendations; lap all edges 4" and conform to the following:

   a. Install drainage layer directly over the membrane. Start at the low points on the wall and shingle all laps to the flow of water.
   b. Splice drainage panels together by butting longitudinal edges of adjacent sheets and peeling back fabric to expose the cores of the panels. Install precut "lock strips" consisting of 4 dimple x 5 dimple sections of the drainage panel centered on the joint between the panels and spaced every 10 dimples along the length of the joint. Snap dimples of "lock strip" to dimples of each panel and reattach fabric over the panel joint.
   c. Cut the core of the drainage panels around penetrations, and cut an 'X' in the filter fabric and tape the fabric to the sides of the penetration.
   d. Cover all terminal edges of the drainage composite with an integral fabric flap by tucking the fabric around the edge of the core and adhering the fabric to the bottom of the core.

3.5 INSTALLATION OF WATERPROOFING FOR BLINDSIDE WALLS AND BELOW GRADE UNDERSLAB WATERPROOFING

A. General: Install adhesive coated HDPE composite sheet according to waterproofing manufacturer's written instructions.

1. Install drainage layer directly over the membrane. Start at the low points on the wall and shingle all laps to the flow of water.

2. Splice drainage panels together by butting longitudinal edges of adjacent sheets and peeling back fabric to expose the cores of the panels. Install precut "lock strips" consisting of 4 dimple x 5 dimple sections of the drainage panel centered on the joint between the panels and spaced every 10 dimples

along the length of the joint. Snap dimples of "lock strip" to dimples of each panel and reattach fabric over the panel joint.

3. Cut the core of the drainage panels around penetrations, and cut an "X" in the filter fabric and tape the fabric to the sides of the penetration.

4. Cover all terminal edges of the drainage composite with an integral fabric flap by tucking the fabric around the edge of the core and adhering the fabric to the bottom of the core.

B. Preparation

1. Surfaces to receive blind side membranes must be smooth and sound, with no gaps or voids in excess of 1/2 in. Earth and stone substrates must be compacted to produce an even, solid substrate. If required by membrane manufacturer, provide an additional layer of underlayment protection board over sharp or angular stone substrates. Surfaces to receive waterproofing shall be thoroughly dry and free of moisture.

2. General: Comply with manufacturer's instructions for preparing surface including joint or crack treatment.

3. Apply primer to substrate surfaces at rate recommended by manufacturer of primary waterproofing materials. Prime only area that will be covered by waterproofing membrane in same working day. Re-prime areas not covered by waterproofing membrane within 24 hours.

C. Wall Applications

1. Refer to manufacturer's literature for complete installation instructions but not limited to the following:

   a. Apply drainage composite to a point 6" below grade line. Fasten drainage composite to the adjacent buildings foundation wall or soil retention system.
   b. Peel back bottom flap of filter fabric and place core behind discharge pipe. Wrap loose filter fabric over and around discharge pipe. Tuck excess filter fabric behind pipe. Fold excess filter fabric at top termination down between drainage board/composite and membrane.
   c. Apply membrane with the HDPE film facing the soil retention system or adjacent foundation. Remove the release liner and fasten membrane to drainage board/composite with large head nails or staples. All nail heads or staples must be covered with overlapping sheets of membrane.
   d. Apply succeeding sheets by overlapping the previous sheet 3 inches along the uncoated edge of the membrane.
   e. Overlap the ends of the membrane 3 inches. Apply waterproofing tape centered over the end lap and roll firmly. Remove release liner.
   f. Seal all transition, penetrations, tie down bracing and other conditions with initial membrane layer plus manufacturer's recommended accessory materials, prior to application of the full membrane.
   g. Concrete must be poured within 30 days of membrane application. Protect membrane until concrete pour.
   h. If membrane ties into a vertical membrane, leave an additional 12" flap of Preprufe membrane to tie into waterproof membrane.

D. Underslab Applications

1. Apply horizontal drainage composite board as recommended by manufacturer over the compacted sub-grade.

2. Apply the membrane over the drainage composite board with the HDPE side facing the drainage composite board and the treated white coating surface facing the concrete to be poured. The membrane may be installed at any convenient length. Apply succeeding sheets by overlapping previous sheets 3" along the self-adhesive edge of the membrane. Remove the silicone coated release liner covering the membrane and roll the side lap to ensure a tight seal.

3.6 SEAM REINFORCEMENT FOR HDPE COMPOSITE SHEETS ONLY

A. Provide a 6 in. strip of modified bituminous sheet membrane centered behind all laps.

B. At locations where a salvage edge is not present and at end laps, lap sheets 6 in., apply a 1/8 in. thick by 6 in. wide application of liquid membrane between sheets, to provide a 6 in. wide seal.

C.. Integration of old onto new pre-applied sheet membrane.

1. Integration of Sheet Membrane onto Sheet Membrane that has been installed in excess of 30 days prior

   a. Lap sheets 12 in., apply a 1/8 in. thick by 12 in. wide application of fluid membrane between sheets, to provide a 12 in. wide seal at this location.
   b. Install waterproofing tape centered at edge of lap and roll firmly into place with an approved roller.
   c. Install additional waterproofing tape to cover white film that has been installed over 30 days prior.

2. Repair of pre-applied sheet membrane

   a. Scratch on white coating exposing underlying black surface of Sheet Membrane. Install waterproofing tape at areas where the white coating of the membrane is damaged, including boot scuff marks and abrasions by rebar.
   b. Damage or Puncture of Sheet Membrane: Install patch of short membrane set in liquid membrane. Patch must extend 3 in. in every direction around extent of damaged area. Install waterproofing tape centered over the edge of the patch. If the damaged area does not have 5 in. of sound material around it, inject liquid membrane into puncture until liquid membrane backs out, and proceed with patch as space allows.

3.7 CLEAN-UP

A. Upon completion of the waterproofing system, the Contractor shall remove all equipment, material and debris from the work and storage area, and leave those areas in an undamaged and acceptable condition.

END OF SECTION 07 13 26

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SECTION 07 18 16
Vehicular Traffic Coatings

PART I - GENERAL

1.1 RELATED DOCUMENTS

A. The following documents apply to all required work for the Project: (1) the Contract Drawings, (2) the Specifications, (3) the General Conditions, (4) the Addendum and (5) the Contract (City of New York Standard Construction Contract).

B. LEED General Requirements:

1. Refer to DDC General Conditions

a. Section 01 33 00 "Submittal Procedures"
b. Section 01 81 13.04 "Sustainable Design Requirements for LEED v4 Buildings"
c. Section 01 81 13.13 "Volatile Organic Compound Limits for Adhesives, Sealants, Paints and Coatings for LEED Buildings"
d. Section 01 81 19 "Indoor Air Quality Requirements for LEED Buildings"

1.2 SUMMARY

A. Section includes vehicular traffic coating at wash bays, repair bays, and repair rooms directly adjacent to repair bay.

B. Related Sections

1. Cast-in-Place Concrete - Section 03 30 00.

1.3 QUALITY ASSURANCE

A. Refer to DDC General Conditions Section 01 40 00 "Quality Requirements".

1.4 SUBMITTAL PROCEDURES

A. Refer to DDC General Conditions Section 01 33 00 "Submittal Procedures".

1.5 SUBMITTALS

A. Product Data: Submit manufacturer's product literature and installation instructions.

B. Samples: Submit samples of specified traffic deck coating system. Samples shall be construed as examples of finished color and texture of traffic deck coating system only.

1.6 DELIVERY, STORAGE AND HANDLING

A. Storage and Handling: Recommended material storage temperature is 75 deg. F. Do not store for long periods in direct sunlight.

1.7 JOB CONDITIONS

A. Environmental Conditions

1. Do not proceed with application of materials when deck temperature is less than 40 deg. F.

2. Do not apply materials unless surface to receive coating is clean and dry, or if precipitation is imminent.

B. Protection

1. Keep products away from heat, sparks, and flames. Do not allow use of spark producing equipment during application and until vapors are gone. Post "No Smoking" signs.

2. The overspray and/or solvents from coatings can carry considerable distances and care should be taken to do the following:

   a. Post warning signs a minimum of 100 feet from the work area.
   b. Cover all intake vents near the work area.
   c. Set up wind breaks when needed.
   d. Minimize or exclude all personnel not directly involved with the coating application.
   e. Have CO_2 or other dry chemical fire extinguishers available at the job site.
   f. Provide adequate ventilation.

3. After completion of application, do not allow traffic on coated surfaces for a period of at least 48 hours at 75 deg. F. and 50% R.H., or until completely cured.

1.8 WARRANTY

A. Provide manufacturer's standard warranty with available options and flashing endorsement, signed by Applicator and authorized representative of manufacturer, and warranting decking materials against failures resulting from normal exposure for a period of five (5) years.

PART II - PRODUCTS

2.1 MATERIALS

A. Basis of Design: Subject to compliance with requirements, provide Sika; Sikadur Epoxy Broadcast Overlay System or comparable product by one of the following:

1. Mameco International, Inc.
2. Neogard, a Division of Hempel (USA), Inc.
3. Or approved equal

B. Description - Epoxy Binder and Broadcast Aggregate Overlay System (2 Coat Application): 2-component, moisture-tolerant, 100% solids epoxy resin consisting of primer, binder, aggregate and sealer to create a traffic-bearing, skid-resistant, seamless and protective coating system. Provide broadcast-applied aggregate overlay finish on new concrete surfaces cured for a minimum of 28 days by applying an epoxy binder to the

prepared surface and broadcasting clean, dry aggregate to full saturation. Prepared floor surface shall be sound and made free of foreign contamination, deleterious materials and laitance prior to epoxy binder application. Apply two coats of epoxy binder and broadcast aggregate to achieve the minimum coverage of each material recommended by the manufacturer. Broom or vacuum excess aggregate after binder has cured. Apply materials in strict accordance with the manufacturer's instructions.

C. Primer: Manufacturer's standard factory-formulated primer recommended for substrate and conditions indicated.

D. Base/Binder Coats: Manufacturer's standard liquid epoxy elastomer.

1. Basis of Design: Subject to compliance with requirements, provide Sika; Sikadur 22 Lo-Mod binder coat or comparable product by one of the following:

a. Mameco International, Inc.
b. Neogard
c. Or approved equal

E. Aggregate: Uniformly graded washed #8 or #9 silica sand, flint rock, or basalt of particle sizes, shape, and minimum hardness recommended in writing by traffic coating manufacturer.

F. Component Coat Thicknesses and Composition: As recommended by manufacturer for substrate and service conditions indicated, but not less than the following (measured excluding aggregate):

1. Average total system coating 40 dry mil thickness assembly, as follows:

a. Primer: 200-250 sq. ft./gal.
b. Base Coat: 32 sq. ft./gal. (50 mils).
c. Broadcast Aggregate: 2 lb./sq. ft. to excess.

PART III - EXECUTION

3.1 EXECUTION REQUIREMENTS

A. Refer to DDC General Conditions for execution requirements.

3.2 EXAMINATION

A. Examine substrates, for compliance with requirements and for other conditions affecting performance of traffic coatings.

1. For the record, prepare written report, listing conditions detrimental to performance.

2. Verify compatibility with and suitability of substrates.

3. Begin coating application only after minimum concrete curing and drying period recommended by traffic coating manufacturer has passed, after unsatisfactory conditions have been corrected, and after surfaces are dry.

4. Verify that substrates are visibly dry and free of moisture. Test for moisture by method recommended in writing by manufacturer.

5. Application of coating indicates acceptance of surfaces and conditions.

3.3 PREPARATION

A. Clean and prepare substrates according to manufacturer's written recommendations to produce clean, dust-free, dry substrate for traffic coating application.

B. Mask adjoining surfaces not receiving traffic coatings, deck drains, and other deck substrate penetrations to prevent spillage, leaking, and migration of coatings.

C. Concrete Substrates: Mechanically abrade concrete surfaces to a uniform profile according to ASTM D 4259. Do not acid etch.

1. Remove grease, oil, paints, and other penetrating contaminants from concrete.

2. Remove concrete fins, ridges, and other projections.

3. Remove laitance, glaze, efflorescence, curing compounds, concrete hardeners, form-release agents, and other incompatible materials that might affect coating adhesion.

4. Remove remaining loose materials to provide a sound surface, and clean surfaces according to ASTM D 4258.

3.4 TERMINATIONS AND PENETRATIONS

A. Prepare vertical and horizontal surfaces at terminations and penetrations through traffic coatings and at expansion joints, drains, and sleeves according to ASTM C 1127 and manufacturer's written recommendations.

B. Provide sealant cants at penetrations and at reinforced and nonreinforced deck-to-wall butt joints.

C. Terminate edges of deck-to-deck expansion joints with preparatory base-coat strip.

D. Install sheet flashings at deck-to-wall expansion and dynamic joints, and bond to deck and wall substrates according to manufacturer's written recommendations.

3.5 JOINT AND CRACK TREATMENT

A. Prepare, treat, rout and fill joints and cracks in substrates according to ASTM C 1127 and traffic coating manufacturer's written recommendations. Before coating surfaces, remove dust and dirt from joints and cracks according to ASTM D 4258.

1. Comply with recommendations in ASTM C 1193 for joint sealant installation.

3.6 TRAFFIC COATING APPLICATION

A. Apply traffic coating material according to ASTM C 1127 and manufacturer's written recommendations.

1. Start traffic coating application in presence of manufacturer's technical representative.
2. Verify that wet film thickness of each component coat complies with requirements every 100 sq. ft.
3. Apply traffic coatings to prepared wall terminations and vertical surfaces to height indicated and omit aggregate on vertical surfaces.

B. Apply traffic paint for striping and other markings with mechanical equipment to produce uniform straight edges. Apply at manufacturer's recommended rates for a 15-mil minimum wet film thickness.

3.7 CURING AND PROTECTING

A. Cure traffic coatings according to manufacturer's written recommendations. Prevent contamination and damage during application and curing stages.

B. Protect traffic coatings from damage and wear during remainder of contruction period.

END OF SECTION 07 18 16

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SECTION 07 20 00
Thermoplastic Membrane Roofing

PART I – GENERAL

1.1 RELATED DOCUMENTS:

A. The following documents apply to all required work for the Project: (1) the Contract Drawings, (2) the Specifications, (3) the General Conditions, (4) the Addendum, and (5) the Contract (City of New York Standard Construction Contract).

B. LEED General Requirements

1. Refer to DDC General Conditions.

a. Section 01 33 00 – Submittal Procedures.

b. Section 01 81 13.04 – Sustainable Design Requirements for LEED v4 Buildings.

c. Section 01 81 13.13 – Volatile Organic Compound Limits for Adhesives, Sealants, Paints, and Coatings for LEED Buildings.

1.2 SUMMARY:

A. Refer to Building Enclosure System Matrix for a description of the systems included in this Section as well as the requirements listed there.

B. For all Work described, provide the following components and their subcomponents of work including, but not limited to:

1. Install new single-ply thermoplastic roofing system as shown on the Drawings and specified herein, including the following components:

a. Fully adhered 60 mil reinforced Polyvinyl Chloride (PVC) membrane.

b. Fully adhered cover board.

c. Rigid polyisocyanurate tapered insulation.

d. Self-adhering vapor retarder.

e. Mechanically fastened cover board on corrugated metal deck.

f. Flashing membrane and accessories at all penetrations, walls, parapets, curbs, and other features on the roof deck for the PVC membrane roofing system.

g. Electric Field Vector Mapping (EFVM) testing of completed waterproofing system.

h. Sealants.

2. Install new single-ply thermoplastic Protected Roof Membrane Assembly (PRMA)as shown on the Drawings and specified herein, including the following components:

   a. Overburden.

   b. Filter fabric.

   c. Drainage layer.

   d. Protection layer.

   e. Rigid extruded polystyrene foam insulation.

   f. Root barrier.

   g. Fully adhered 60 mil reinforced PVC membrane.

   h. Flashing membrane and accessories at all penetrations, walls, parapets, curbs, and other features on the roof deck for the PVC membrane roofing system.

   i. Sealants.

C. This Section requires Engineering Services.

D. The work in this Section incorporates the work of the following Sections. Requirements specified in this Section are in addition to those in the following Sections:

   1. Section 06 10 00 – Rough Carpentry.

   2. Section 07 27 01 – Weather Resistive Barriers.

   3. Section 07 62 01 – Facade Sheet Metal Flashings.

   4. Section 07 71 00 – Roof Specialties and Accessories

   5. Section 07 92 01 – Exterior Joint Sealants.

   6. Section 07 95 00 – Expansion Control.

   7. Section 22 14 23 – Storm Drainage Piping Specialties.

E. The following Sections describe systems that are adjacent to that of this Section, and will require coordinated interfaces:

   1. Section 07 00 01 – Rainscreen System.

   2. Section 08 40 01 – Glazed Storefronts and Curtain Wall System.

   3. Section 08 63 01 – Aluminum-Framed Skylight System.

1.3 REFERENCE DOCUMENTS

A. Building Enclosure System Matrix: Refer to Drawing EN1-003.

1.4 **DEFINITIONS:**

A. Referenced System: Building enclosure system as specified by the Building Enclosure System Matrix.

B. The term "Panels" is used to describe the infill panels of the system.

1.5 **REFERENCE STANDARDS AND REGULATIONS:**

A. Refer to DDC General Conditions.

B. The Contractor's engineering, materials, and workmanship shall comply with 2014 New York City Building Code and 2016 New York City Energy Conservation Code. Where their recommendations or requirements are to a lower standard than required by this Contract Document, the Contract Documents shall take precedence.

C. Comply with applicable provisions and recommendations of the standards listed below. Where standards conflict or conflict with the provisions of these Specifications, the more stringent shall apply. Unless otherwise noted, the latest editions of the standards shall apply:

1. American National Standards Institute (ANSI).

   a. ANSI/FM 4474 – American National Standard for Evaluating the Simulated Wind Uplift Resistance of Roof Assemblies Using Static Positive and/or Negative Differential Pressures.

2. ASTM International (ASTM)

   a. ASTM C209 – Standard Test Methods for Cellulosic Fiber Insulating Board

   b. ASTM C1153 – Standard Practice for Location of Wet Insulation in Roofing Systems Using Infrared Imaging.

   c. ASTM C1289 – Standard Specification for Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board

   d. ASTM D1621 – Standard Test Method for Compressive Properties Of Rigid Cellular Plastics

   e. ASTM E108 – Standard Test Methods for Fire Tests of Roof Coverings.

3. National Roofing Contractors Association (NRCA)

   a. NRCA Roofing and Waterproofing Manual.

4. Sheet Metal and Air Conditioning Contractor's National Association (SMACNA)

   a. SMACNA Architectural Sheet Metal Manual.

5. Underwriters Laboratories Inc. (UL)

   a. UL 580 – Standard for Tests for Uplift Resistance of Roof Assemblies.

   b. UL 790 – Standard Test Methods for Fire Tests of Roof Covering.

1.6 PERFORMANCE REQUIREMENTS:

A. General Prescriptive Requirements

1. Provide fully adhered PVC roofing system as shown on the Drawings and as specified herein.

2. Use materials in the Work chemically compatible with their adjacent materials.

3. Site-applied Sealant is not acceptable as part of the primary weather sealing system unless shown on the Architectural Drawings or noted within this Section.

B. General Performance

1. Install PVC roofing system according to the intended use, appropriate standards, as specified herein, and per the manufacturer's recommendations.

2. Provide protection, separation layers, and/or compatible products where required by the manufacturer to prevent damage or chemical incompatibility of the membrane.

C. Durability Performance

1. PVC roofing membrane shall withstand degrading effects of radiation from the sun, weathering, atmospheric pollution, vermin, fungi, and other growths for the required service life without maintenance. Cover all surfaces and protect to prevent damage to the membrane.

2. Provide tapered insulation as specified herein and per approved tapered insulation Shop Drawing to adequately drain water to roof drains and to prevent excess water accumulation on the roofing membrane.

3. Provide temporary protection to protect the membrane from damage during construction, installation of surrounding flashings, and cladding components. Permanent walkway pads shall be provided for protection of the roofing membrane during service.

4. Failure includes inability of Work to meet the performance requirements set forth in this and all referenced systems, in addition to the following:

   a. Wrinkles in the roofing membrane and flashings.

   b. Gaps in the welded seams of the roofing membrane and flashings.

   c. Loss of adhesion in the roofing membrane and flashings.

   d. Improperly installed mechanical fasteners.

   e. Non-asphalt-resistant PVC membrane contact with asphalt-based materials.

D. Structural Performance

1. The Work shall transmit the design loads as specified below to the building structure via the points of attachment as engineered and built, with an adequate margin of safety appropriate to each material and product as required by 2014 New York City Building Code and the listed Reference Standards.

a. New Roofing system shall meet or exceed the following uplift pressures:

1) Field of Roof: 58 psf.

2) Perimeters of Roof: 96 psf.

3) Corners of Roof: 144 psf.

2. As required by 2014 New York City Building Code, the various load cases and combinations of load cases acting on structural elements shall be considered.

a. No permanent deformation or damage to any components of the Work, adjacent elements, or supporting structure shall be accepted under any of the above load cases and combinations of load cases, excluding blast and impact loads.

1.7 SUBMITTAL PROCEDURES:

A. Refer to DDC General Conditions Section 01 33 00 – Submittal Procedures.

1.8 SUBMITTALS:

A. Shop Drawings

1. Provide a tapered insulation Shop Drawing showing the proposed layout of the tapered insulation and crickets at the main roof level and any other roof area with a flat roof deck. The engineering Drawings show the locations of drains and obstructions based on available drawings produced by others, which may or may not be entirely accurate; the tapered insulation Shop Drawing shall be based on field measurements of all drains and obstructions. Shop Drawings shall include all existing roof penetrations, dunnage, bulkheads, skylights, roof access doors, and any other roof features.

2. Provide roof plan Drawings showing proposed layout of all roofing components from the roof deck to roofing membrane, indicating their respective attachment methods per the manufacturer's instructions that meet the 2014 New York City Building Code required wind uplift pressures.

a. Indicate all fastener locations and spacing on Drawings.

b. Provide adhesive application rates for adhered layers.

B. Product data.

C. Samples

1. Provide Samples for all products used for the Work. Provide a minimum of a 6 in. x 6 in. Sample. Provide a 6 in. long sample where products are less than 6 in. in one dimension.

D. Quality Control Plan

1. Work Sequence Plan: Provide a comprehensive work sequence plan showing areas where work will be performed by trades involved in each area and the time required to complete each area. Do not commence work until Commissioner's written approval of work plan is received. Indicate water testing and EFVM testing in the work sequence plan. The plan shall include the following as a minimum:

a. Notify Commissioner in writing at least 72 hrs prior to the initial installation of the roofing system.

b. Inspect conditions and materials to ensure conformity to the Contract requirements.

c. Inspect substrate conditions and coordinate with Contractor to ensure proper substrate preparation in conformance with manufacturer's requirements and Contract requirements.

d. Inspect work in progress to ensure the work is in compliance with approved procedures.

e. Inspect all completed and any corrected work for compliance with the Contract Documents and membrane manufacturer's recommendations.

E. Product Test Reports

1. Indicating compliance with performance requirements as required and specified herein.

F. Quality Control Reports

1. Manufacturer site visit reports.

2. Field reports by Contractor and/or other third-party inspectors.

3. Results of substrate adhesion tests to confirm that roofing membrane is adhered in accordance with the manufacturer's requirements. Tests shall be conducted by the Contractor, at minimum, shall comply with the roofing system manufacturer's recommendations for testing.

4. Results of continuous probe tests of all heat-welded seams in the roofing membrane and flashings to confirm that all seams are welded watertight and in accordance with the manufacturer's requirements or as specified herein, whichever is more stringent. Provide a roof plan Drawing showing all roof membrane and flashings seams and indicating all locations tested.

5. Results and physical Samples of all destructive tests on seams in the finished sheet. Submit physical Samples of all test cuts to the Commissioner, clearly labeled by date, time of day, roof location, and roof level/area, and any unique conditions. Submittal shall include any failed tests, a description of any adjustments made, and results of the follow-up test.

6. Written report of all EFVM testing performed on the roof.

G. Manufacturer's Certification: Written certification (in time to prevent delay of the Contract Work) by the manufacturers of the roofing materials that the materials supplied to the Contractor for this Project comply with all requirements of the Reference Standards, and that all materials are suitable for uses specified herein.

1. Manufacturer's Letters

a. Letter from proposed roofing manufacturer stating that substrates and conditions are acceptable for the purpose of providing specified warranty, and that the proposed system is eligible for the specified warranty or the warranty selected by the City of New York.

b. Letter from proposed roofing manufacturer confirming that the proposed roofing system materials are compatible with adjacent materials, and that all materials are suitable for their intended purpose.

c. Letter from proposed roofing manufacturer confirming that the proposed new roofing system and attachment will provide a Class A fire rating and meet the wind uplift requirements for the Project.

d. Letter of certification from roofing system manufacturers stating that the specified/approved EFVM system is compatible with the roofing products and will not affect the roofing system performance.

e. Letters from the manufacturer shall be on letterhead and signed by an officer of the company, not by a local sales representative.

H. Maintenance Data: For roofing system to include in maintenance manuals.

I. Provide closeout submittals as specified in DDC General Conditions.

1.9 QUALITY ASSURANCE:

A. Refer to DDC General Conditions Section 01 40 00 – Quality Requirements.

B. Field Inspection Services: Commissioner shall arrange with the Manufacturer to have the services of a competent manufacturer's field representative at the Project site. The manufacturer's field representative shall review the substrate conditions, instruct work crews in the proper mixing and application procedures, and provide written recommendations to the Commissioner regarding special conditions related to the work. At a minimum, the manufacturer's technical representative shall provide the following inspections of the membrane:

1. Project start inspection at the beginning of each phase of the Project to review special detailing conditions and substrate preparation.

2. Periodic in-progress inspections throughout the Project to evaluate membrane and flashing application.

3. Final punch-list inspection at the completion of each phase of the Project prior to installation of surfacing or overburden materials.

4. Warranty inspection to confirm completion of all punch-list items, membrane and flashing installation, and general quality of the roofing work.

5. The manufacturer's field representative shall provide the Contractor, and Commissioner with written reports outlining observations and required corrections from each site visit.

C. Single Source: Obtain materials through one source from a single manufacturer for the Contract Work. Products from alternate manufacturers shall be approved in writing by the primary manufacturer.

D. Probe Testing: Conduct continuous probe tests of all heat-welded seams in the roofing membrane and flashings to confirm that all seams are welded watertight and in accordance with the manufacturer's

B. Provide as specified in DDC General Conditions.

1.12 **WARRANTY:**

A. Unless stated otherwise in these Specifications, Warranty shall state that the Work is free from defects in materials and workmanship and weathertight for a period of 2 yrs from the date of Substantial Completion of the Work.Contractor shall agree to promptly restore or replace defective materials and workmanship to "like new condition," including such exploratory work, required to determine the cause, during the Warranty period, at no additional cost to the City of New York.

B. Manufacturer's Warranty: Provide 20-yr manufacturer's roofing warranty under provisions of this Section from Substantial Completion. This roofing warranty provides for cost of labor and materials for loss of watertightness, limited to amounts necessary to effect restoration necessitated by either defective material or defects in related installation workmanship, with no dollar limitation ("NDL"). The warranty shall also include all layers of the roofing system when they are supplied or approved by membrane manufacturer and installed in accordance with manufacturer's general installation guidelines.

C. The Contractor shall be responsible for damage to the building and furnishings occasioned by defective materials or workmanship or damage as part of restoration to the Work.

PART II - PRODUCTS

2.1 **MANUFACTURERS:**

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Sika Corporation – Sarnafil.
2. Fibertite Roofing Membranes.
3. Johns Manville.
4. Or approved equal.

2.2 **ROOFING SYSTEM:**

A. Roofing System: Thermoplastic membrane with polyester reinforcing fabric and lacquer coating. Provide all necessary roofing system accessories, including flashing materials, primers, cleaners, sealants, and termination materials, for a complete roofing system and application including, but not limited to, the following:

B. Roofing Membrane

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Sarnafil G476-15 SA – 60 mil.
   b. Fibertite-XT membrane – 60 mil.
   c. Johns Manville PVC FB – 60 mil.
   d. Or approved equal.

C. Membrane Flashing: Provide wall, curb, parapet flashings per manufacturer's requirements and as required by the Contract Documents:

1. Flashing Membrane Type 1

a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1) Sarnafil Sarnaclad: A PVC-coated heat-weldable sheet metal capable of being formed into a variety of shapes and profiles. 24 gauge, G90 galvanized metal sheet with a 20 mil unsupported Sarnafil membrane laminated on one side.

2) Fibertite Fiberclad metal.

3) Johns Manville PVC Coated Metal.

4) Or approved equal.

2. Flashing Membrane Type 2

a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1) Sarnafil G410 Flashing Membrane.

2) Fibertite Flashing Membrane.

3) Johns Manville PVC Detail Membrane.

4) Or approved equal.

3. Flashing Membrane Type 3

a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1) Sarnafil G459 Flashing Membrane: 60 mil thick, white-colored, fiberglass reinforced membrane adhered to asphalt, other contaminated surfaces, or approved substrates using Sarnacol adhesive. The tan side of the membrane must be the side exposed to the contamination.

2) Fibertite FB Membrane.

3) Johns Manville PVC Detail Strip.

4) Or approved equal.

D. Vapor Retarder

a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1) 32 mil thick self-adhesive vapor barrier; Sarnavap SA by Sika Corporation.

2) Fibertite Vaportite.

3) Johns Manville Vapor Barrier SA.

4) Or approved equal.

E. Miscellaneous Flashings: Provide miscellaneous flashings as required by the Contract Documents.

1. Detail Membrane

a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1) Sarnafil Detail Membrane.

2) Fibertite Flashing Membrane.

3) Johns Manville PVC Detail Strip.

4) Or approved equal.

2. T-Joint Covers

a. Manufacturers: Subject to compliance with requirements, provide products by one of the following

1) Sarnafil Sarnacircles.

2) Fibertite T-Joint Covers

3) Johns Manville PVC T-Joint Patch.

4) Or approved equal.

3. Preformed Corners

a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1) Sarnacorners: 60 mil thick prefabricated inside and outside corner injection molded PVC patches; heat-welded to roofing membrane and flashings.

2) Fibertite FTR Premolded Flashings.

3) Johns Manville PVC Universal Corners.

4) Or approved equal.

4. Pipe Seal

a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1) Sarnastack Universal: 60 mil thick prefabricated PVC injection molded stack/pipe flashing boot; size as required to flash penetration; heat-welded to roofing membrane.

2) Fibertite FTR Premolded Flashings.

3) Johns Manville PVC Split Pipe Boot.

4) Or approved equal.

5. Cover Strip

a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1) Sarnafil S327 Coverstrip: 9 in. wide precut flashing made from Sarnafil S327 polyester reinforced membrane. Use as coverstrip over Sarnabars.

2) Fibertite Flashing Membrane.

3) Johns Manville Flashing Membrane.

4) Or approved equal.

6. Primer: As recommended in writing by the manufacturer for the substrates and Project conditions.

F. Insulation and Cover Board Materials

1. Rigid Insulation at Conventional Roof Assembly: Rigid polyisocyanurate insulation boards with integrally laminated heavy, durable, and dimensionally stable coated polymer bonded inorganic all-glass fiber mat facer, square edge, maximum board thickness of 2 in. for flat and tapered installation, providing the total thickness shown on the Drawings.

a. Insulation shall meet ASTM C1289, Type II, Class 2, Grade 3.

b. Minimum compressive strength, ASTM D1621, 20 psi.

c. Maximum water absorption by volume per ASTM C209, < 1.5%.

d. Insulation shall have an LTTR value of 5.7°F ft^2 h/Btu/in. of thickness in accordance with ASTM C1289.

2. Rigid Insulation at PRMA Roof Assembly: Extruded polystyrene foam insulation boards, square edge, maximum board thickness of 2 in., providing the total thickness shown on the Drawings:

a. Insulation shall meet ASTM C578, Type VI or VII.

b. Minimum compressive strength, ASTM D1621, 60 psi.

c. Maximum water absorption by volume per ASTM C272, 0.3%.

d. Insulation shall have an R value of 5.0°F ft2 h/Btu/in. of thickness when tested at 75°F mean temperature in accordance with ASTM C518.

3. Cover Board: Enhanced fiberglass mats front and back that are bonded to a high-density gypsum core:

a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1) DensDeck Prime by Georgia-Pacific; 1/2 in. thick; 900 psi compressive strength.

2) USG Corporation Securock.

3) JM DensDeck Prime Roof Board.

4) Or approved equal.

4. Fasteners: Provide as required by manufacturer's requirements to meet the Code-required wind uplift pressures.

G. Accessories

1. Termination Bar

a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1) Sarnabar-S, 1 in. wide, 14 ga stainless steel bar. Where termination bar is to receive a sealant bead, the termination bar is to have a bent leg to receive sealant. PVC Cord: Sarnacord, 4 mm round PVC cord (red).

2) Fibertite FTR Termination Bar.

3) Johns Manville Termination.

4) Or approved equal.

2. Separator Tape

a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1) Aluminum tape as recommended by the manufacturer.

3. Rooftop Walkway Pads

a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1) Sarnapad by Sarnafil, adhered and heat-welded to the roof membrane as specified by manufacturer.

2) Fibertite FTR Tuff Track Walkway and Protection Pads.

3) Johns Manville PVC Walkpad.

4) Or approved equal.

4. Metal Hose Clamp (Draw Band): Stainless steel worm drive type.

5. Primers, Cleaners, and Sealants: Provide where shown on the Drawings and as required by Manufacturer.

H. Metal Roof Copings

1. Refer to Section 07 62 01 – Facade Sheet Metal Flashings.

I. Drainage Composite (for PRMA roof assemblies)

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Sarnafil Drainage Mat.

b. Paradrain by Siplast.

c. Hydroduct Drainage Composite by GCP Applied Technologies Inc

d. Or approved equal.

J. Filter Fabric (for PRMA roof assemblies)

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Systemfilter by American Hydrotech, Inc.

b. Needle-punched, non-woven, 100% polypropylene fabric allowing high-capacity drainage flow, white color, 140 N-series by TenCate Mirafi.

c. Sopranature Filter Fabric by Soprema.

d. Or approved equal.

K. Root Barrier: High-density polyethylene (HDPE) membrane, min. 30 mil. thickness, with heat welded and taped seams (for PRMA roof assemblies)

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. 30 mil thick polyethyelene Naturetec Root Barrier, by Soprema, with heat-welded seams.

b. Root Stop HD by American Hydrotech, Inc.

c. HDPE Protection/Barrier Courses-40, by Tremco Inc.

d. Naturetec Root Barrier, by Soprema, Inc.

e. Or approved equal.

2.3 OVERBURDEN

A. Refer to Section 07 62 01 – Facade Sheet Metal Flashings..

2.4 ELECTRONIC LEAK DETECTION EQUIPMENT

A. Components specified herein are based on the system by International Leak Detection. Manufacturer's products and specifications are generally referred to for identification; products of other manufacturer meeting the requirements itemized below may be submitted for review.

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. International Leak Detection, Inc. LLC.
2. Detec Systems, Ltd.
3. Infra-red Analyzers, Inc.
4. Or approved equal.

C. Unless approved by the Commissioner, obtain Electronic Leak Detection materials from the same manufacturer.

D. Tape: Small strips of tape or self-adhering membrane compatible with the waterproofing system membrane and Electronic Leak Detection system.

E. Manufacturer's recommended accessories and components to install the Electronic Leak Detection system.

PART III - EXECUTION

3.1 EXECUTION REQUIREMENTS:

A. Refer to DDC General Conditions for execution requirements.

3.2 EXAMINATION:

A. The Contractor is to examine substrate conditions and other conditions under which this work is to be performed and notify the Contractor, in writing, of circumstances detrimental to the proper completion of the work. Do not proceed with work until unsatisfactory conditions are corrected to permit proper installation of the work. Starting of work means acceptance of substrate.

B. Verify that surfaces and site conditions are ready to receive Work. All substrates to receive the roofing membrane and flashings must be smooth, clean, and have no sharp edges, ridges, or points, and shall be free of loose, spalled, or weak material.

C. Verify all site conditions and dimensions by field measurements prior to ordering materials or starting work. Do this in consideration of the special conditions associated with the alteration of existing construction. Notify the Commissioner of any discrepancies between Drawings and field conditions, and of any elements that require restoration. The Commissioner will determine what modifications or additional restorations are necessary.

3.3 DELIVERY, STORAGE, AND HANDLING:

A. Store elastomeric materials, adhesives, solvents, and sealants in their original containers and maintain at a temperature between 60°F and 80°F.

B. Store solvent-bearing solutions, resins, additives, inhibitors, and adhesives in accordance with the MSDS and/or local fire authority. After partial use of materials, replace lids promptly and tightly to prevent contamination. Store rolled goods on ends only. Discard rolls which have been flattened, creased, or otherwise damaged. Place rolls on pallets on clean rigid floors. Unroll sheet membranes and flashings and allow them to flatten out before application.

C. Handle all materials to avoid damage. Handle all materials in such a manner as to preclude damage and contamination with moisture or foreign matter. Keep away from open fire, flame, or any ignition source. Vapors may form explosive mixtures with air. Avoid skin and eye contact with this material. Avoid breathing fumes. Do not eat, drink, or smoke in the application area. Workers shall wear long sleeve shirts, long pants and work boots. Workers shall wear butyl rubber or nitrile gloves when mixing or applying this product. Safety glasses with side shields shall be used for eye protection. Use local exhaust ventilation to maintain worker exposure below TLV as listed on MSDS for respective products. If the airborne concentration poses a health hazard, becomes irritating, or exceeds recommended limits, use a NIOSH approved respirator in accordance with OSHA Respirator Protection requirements. The specific type of respirator will depend on the airborne concentration. A filtering face piece or dust mask is not acceptable for use with this product if TLV filtering levels have been exceeded.

D. Damaged Material: Any materials that are found to be damaged or stored in any manner other than stated above will be rejected, removed, and replaced at the subcontractor's expense.

E. Do not dilute primers, solvents, cements, adhesives, coatings, or sealants. Keep containers closed except when removing materials from them. Do not allow asphalt-based products, petroleum extracts, oil in any form, or other contaminants to contact the membrane materials or their components.

1. Remove plastic sheet wrapping from cover board once it is delivered to the Project site.

3.4 SUBSTRATE PREPARATION:

A. The roof deck construction must be structurally sound to provide support for the new roof system. The Contractor shall load materials on the rooftop so as to eliminate risk of deck overload due to concentrated weight. The Contractor shall ensure that the roof deck is secured to the structural framing according to Code in such a manner as to resist all anticipated wind loads in that location.

B. Verify that the work of adjacent systems meet the following conditions:

1. Roof drains and scuppers have been installed properly.

2. Roof curbs, nailers, equipment supports, vents, and other roof penetrations are properly secured and prepared to receive new roofing materials.

3. All surfaces are smooth and free of dirt, debris, and incompatible materials.

4. All roof surfaces are free of water, ice, and snow.

C. Prepare all substrate surfaces scheduled to receive roofing and flashing in accordance with the roofing system manufacturer's recommendations and requirements and as provided in this Section.

D. Continually remove all dust and debris from surfaces scheduled to receive any sheet membrane by sweeping and blowing with compressed air and/or vacuuming.

3.5 GENERAL WORKMANSHIP FOR ROOFING:

A. Comply with the manufacturer's recommendations or these Specifications, whichever is more stringent.

B. Do not apply any roofing materials until exposed surface of the existing deck is clean, smooth, and dry. Do not work in rain, snow, winds gusting over 30 mph, temperatures below 40°F, or in presence of any water. Comply with applicable recommendations by manufacturers of all materials for workmanship and handling, except as modified in this Section.

C. Only perform as much roofing installation on any day in which the complete roofing system can be installed in that day. Use of the vapor barrier as temporary roofing is not allowed. If any water is allowed to enter under the newly completed roofing, remove and replace the affected area and all materials exposed to water at the Contractor's expense.

D. Provide temporary cutoffs at the end of each day, between the roof and the roof deck, around all exposed edges, and any incomplete flashing areas. Such seals shall prevent moisture penetration into the building, under the existing roof system, or under the new membrane. Remove the cutoffs completely before proceeding with subsequent work.

E. Do not allow wrappers and packaging materials to be included in the roofing system.

F. Components of roofing system may be toxic and flammable. Heed all manufacturer's cautions and warnings in regard to their use. Take proper precautions to avoid fire hazards and exposure of roofing personnel or building occupants to hazardous fumes.

3.6 VAPOR RETARDER INSTALLATION:

A. Provide smooth transitions and eliminate loose materials and sharp protrusions. Clean cover board surface with a broom and compressed air or vacuum. Remove dust and debris.

B. Primer Application: Substrate must be clean, dry, and free of dust, grease, or other contaminants. Apply primer and membrane in accordance with manufacturer's written instructions. Vapor barrier must be installed on the same day as the primer application.

1. Do not install when it is raining, snowing, or on wet/humid surfaces. Install primer at temperatures 40°F and above.

C. Install self-adhering vapor retarder over the primed roof deck, immediately rolling the membrane with 100 lb to 150 lb rollers, in accordance with the manufacturer's installation instructions. Hand rollers are required for terminations on vertical surfaces. Take all necessary precautions to avoid punctures, tears, or fishmouths in the vapor retarder.

D. Apply vapor retarder from low to high points, in a shingle fashion, so that laps shed water. Lap all edges of the vapor retarder 3 in. minimum and all ends 6 in. minimum.

E. Apply manufacturer's recommended trowel grade adhesive to seal around penetrations, T-joints, or step-offs. Use a hand roller or seam roller to mate the entire seam together. Do not apply trowel grade adhesive where it may come in contact with the PVC roofing membrane or flashings.

3.7 INSTALLATION OF INSULATION AND COVER BOARD:

A. Install all insulation to achieve secure attachment to the deck. Do not use pieces of insulation smaller than 18 in. in length or width. Provide insulation and cover board layers in a staggered row pattern, minimum 6 in. stagger between layers and between new insulation and existing insulation; place boards tightly together.

B. Arrange insulation board staggers at the end of each day's work to provide continuity of staggered joints between adjacent work areas.

C. Insulation and cover board shall be neatly but loosely fit together, with no gaps larger than 1/8 in. Fill any gaps larger than 1/8 in. with fiberglass batt insulation.

D. Provide crickets behind all obstructions to flow toward drains.

E. At roof drains, taper insulation to prevent ponding and reduce total insulation thickness per the approved tapered insulation roof plan Shop Drawings for each roof area at the clamping ring. Trim edges and miter corners as necessary to provide smooth surfaces.

F. Mechanical Attachment

1. Mechanically fasten insulation boards to deck at metal deck locations.

2. Mechanically fasten boards to the deck with approved fasteners and plates according to the board manufacturer's and roof manufacturer's recommendations for fastening rates and patterns, and install to resist Code-prescribed wind uplift pressures. Quantity and location of the fasteners and plates shall cause boards to rest evenly on the roof deck/substrate so there are no significant and avoidable air spaces between the boards and substrate.

3. Fasteners must be tight enough so plates do not turn, but not so tight as to deform them.

4. Install fasteners consistently in accordance with fastener manufacturer's recommendations. Fasteners to have minimum penetration into structural deck as recommended by the fastener manufacturer and Sika Corporation.

5. Use fastener tools with a depth locator and torque-limiting attachment as recommended or supplied by fastener manufacturer to ensure proper installation.

G. Fully Adhered Attachment

1. Fully adhere all layers at concrete or composite deck locations.

2. Fully adhere all insulation layers and cover board using the specified adhesives and ribbon spacing to meet project uplift requirements.

3. Place weighted materials (adhesive cans, membrane rolls, etc., weighing minimum 15 lbs) immediately after setting the insulation boards and cover board in the adhesive to help spread adhesive and for

maximum contact. Leave weighted materials in place for 15 min. or until boards are firmly set, but no less than for 5 min.

H. Do not damage insulation or cover board by dropping materials or by placing materials too heavy to be supported by the insulation. Any damaged insulation must be replaced at no additional cost to the City of New York.

I. EFVM Materials Installation

1. Install EFVM materials as required by the manufacturer.

2. Install EFVM connector plates and connector wires in two opposite corners of roof areas according to the manufacturer's written instructions.

3. Install EFVM grounding screen over roofing insulation and over connector plates. Grounding screen to cover entire roof areas. Lap edges of grounding screen 2 in. minimum and tape with duct tape or aluminum tape 5 ft o.c. Terminate grounding screen 1 in. from drain bowl perimeters.

4. Connector plate cable must extend above roofing membrane.

3.8 PVC MEMBRANE INSTALLATION:

A. General

1. Construct PVC membrane and flashing systems in accordance with the manufacturer's current printed specifications, except as modified in this Section. Arrange work so that materials are not exposed to moisture of any kind at any time. Temporarily seal all edges of sheets not completed to the existing roof daily.

2. Workmen and all others who walk on the new membrane shall wear clean, soft-soled shoes so as not to damage materials. Equipment shall have no sharp edges and be clean and free of any asphaltic or coal-tar products.

3. Use the maximum size of all sheet materials to reduce the number of joints in the system. Schedule work to minimize construction traffic over installed materials. Sheets cut along one side shall have the cut edge installed as the underside sheet at all seams.

B. Membrane Placement

1. Place membrane panel, starting at the low point of the roof, unroll, and allow to relax for a minimum of 30 min. before attaching or splicing. Position sheet so each preceding sheet is lapped a minimum of 3 in. and so water runs across or parallel to all seams. Do not lap seams against the flow of water.

2. Position laps so water runs across or parallel to all seams. Do not make seams that "buck" water.

3. Place additional rolls of membrane to provide sufficient overlaps for seaming of membranes; see standard lap splice details for robotic and hand welding.

4. Sheets cut along one side shall have the cut edge installed as the underside sheet at all seams.

C. Seam Construction

1. Using a clean white cotton rag dampened with membrane cleaner as recommended by the Manufacturer, thoroughly clean an area on both sheets at least 6 in. wide. Do not allow dust or debris to contaminate cleaned membrane prior to welding. Membrane left exposed for more than 12 hrs must be re-cleaned prior to welding.

2. Splice the laps with hot-air welding according to the manufacturer's recommendations, using manufacturer-approved electric hot-air welding devices to provide continuous watertight seals. All welds must be constructed by skilled mechanics trained in the welding procedure by the manufacturer.

3. Horizontal Field Splices: All field splices on the horizontal surface (including flashing) shall be completed using an automatic heat welder that has been engineered for hot-air welding of thermoplastic membranes. Seams made with the automatic welder must be a minimum of 3 in. wide. Construct 4 in. wide seams when hand welding.

   a. Adjust air intake, temperature, and speed of the machine to provide proper seam strength.

   b. Provide an ample power supply to all heat-welding equipment. Provide a generator dedicated to the heat-welding equipment.

   c. When weather conditions vary, make adjustments to the welding machine. Conduct test welds on spare material prior to beginning the finished product sheet.

4. Vertical Field Splices: Use handheld welders only on vertical welds or where an automatic welder is not practical or cannot be used. Seams made with handheld welders must be minimum 4 in. wide. Use silicone hand rollers to ensure proper mating of surfaces as heat-welding proceeds.

5. T-Joints (Three-Way Overlaps): Extend head lap under the field seam so T-joint patch only step downs over one thickness of membrane. When welding a T-joint, chamfer top edge of the second membrane layer to create a smooth transition for the top membrane layer to conform to for positive welding. Chamfer the edge of the membrane using a handheld chamfer tool supplied by the manufacturer. Provide T-joint patches at all T-joints.

6. Plan the installation and seam construction to avoid any cut edges with scrim exposed. In the event that a cut edge with scrim cannot be avoided, ensure that the edge is clean and dry; clean with membrane cleaner as recommended by the waterproofing membrane manufacturer to remove any contamination, and seal the cut edge with manufacturer's recommended sealant.

3.9 PVC FLASHING INSTALLATION:

A. Install all flashings concurrently with the roof membrane as the Project progresses. Temporary flashings are not allowed without prior written approval of the Commissioner and the manufacturer. Approval shall only be for specific locations on specific dates. If any water is allowed to enter under the newly completed roofing, remove and replace the affected area at the Contractor's expense. Adhere or mechanically fasten flashing, as required on the Drawings and per the manufacturer's instruction, to compatible, dry, smooth, and solvent-resistant surfaces. Use caution to ensure adhesive fumes are not drawn into the building.

B. Construct the PVC flashing system similar to, and with the same requirements as, the PVC roofing system. Proceed with flashings as the roofing membrane is completed to ensure positive waterproof protection at all projections from the roof.

C. Adhered Membrane Flashings

1. Apply specified adhesive over the properly installed and prepared flashing substrate according to the Manufacturer's instructions. Apply adhesive in smooth, even coats with no gaps, globs or similar inconsistencies. Only an area which can be completely covered in the same day's operations shall be flashed. Press the bonded sheet firmly in place with a hand roller.

2. Do not apply adhesive in seam areas that will be welded. Apply all panels of membrane in the same manner, overlapping the panel edges as required by welding techniques.

3. Consistently adhere all flashing membranes to substrates. Cut and hot-air weld all interior and exterior corners and miters into place. No bitumen shall contact the Sarnafil membrane.

4. Provide additional securement for all adhered flashings that exceed 30 in. in height. Consult Sika Corporation Technical Department for securement methods.

5. Install steel attachment bars and related accessories per the manufacturer's instruction with approved fasteners into the structural deck at the base of parapets, walls, and curbs. Steel attachment bars may be required by the manufacturer at the base of all tapered edge strips and at transitions, peaks, and valleys according to the manufacturer's details. Coordinate all fasteners with the approved Shop Drawings and requirements for Code-prescribed wind uplift pressures.

6. Terminate flashings as shown on the Drawings and per the manufacturers instruction.

7. Flash penetrations with the manufacturer's premolded pipe flashings. Do not cut or patch premolded pipe flashings to assist in their installation. Verify that the premolded flashings will provide the specified flashing height.

8. Construct field-fabricated flashings where manufacturer's premolded pipe flashings are not available in the correct geometry or do not provide specified flashing height. Pitch pockets are not acceptable.

9. Seal top edge of pipe flashing with sealant and stainless steel hose clamp and around penetrations and where shown on the Drawings and per the manufacturers instruction.

10. Install termination bars at top edges of flashing . Position bars per manufacturer's requirements and secure to substrate with specified fasteners at 6 in. o.c. Allow 1/4 in. gap at bar ends for expansion. Seal across the top of the termination bar with a fillet sealant bead.

11. Provide custom fabricated wood blocking and plywood flashing enclosures for multiple pipe and conduit penetrations in close proximity of each other that cannot be flashed with premolded flashings or membrane flashings.

3.10 ROOF DRAINS:

A. Do not flash drains until all grout and setting material around drains is cured and dry as recommended by the membrane manufacturer.

1. Do not allow waterproofing materials, packaging, or other debris to block or clog drains during or after the application of waterproofing materials.

2. Clean and roughen all drain surfaces to receive waterproofing membrane using a grinder to provide a suitable substrate. Remove any debris from grinding.

B. Install tapered edge strips around the drains set in adhesive to create a sump around the drains. Adhere roofing cover board and membrane to extend to drain.

C. Solidly coat drain bowl flange with sealant. Install a 36 in. square piece of PVC flashing over the drain. Use asphalt-resistant membrane where drain components contain any asphalt residue. Fasten clamping ring in a solid bed of sealant on top of the PVC and trim the PVC flush with inside edge of clamping ring. Lap outer edge of flashing sheet onto deck sheet a minimum of 6 in. and heat weld.

D. Position the membrane and cut a hole for the roof drain allowing 1/2 in. to 3/4 in. of membrane inside the clamping ring. Make round holes in the membrane to align with clamping bolts (a paper punch may be used). Do not cut the membrane back to the bolt holes.

E. Install water cut-off mastic on the clamping ring seat flange below the membrane.

F. Install the roof drain clamping ring and all clamping bolts. Tighten the clamping bolts to achieve constant compression.

G. Lay 8 in. wide strip of HDPE protection sheet over the roofing membrane under the perimeter "footprint" of the drain cover so that the protection sheet extends at least 4 in. beyond the flange. Install a heavy application of Sealant at each corner of the drain cover, on the underside of the flange. Set drain cover into position onto the protection sheet and press down on the four corners for complete adhesion.

3.11 MEMBRANE RESTORATIONS:

A. Restore membrane punctures with like material. Patch must extend a minimum of 2 in. beyond the boundary of the affected area in all directions. Round all corners of the patch. A pinhole will require a minimum 4 in. x 4 in. patch.

B. Clean newly installed membrane as described above for standard seaming details.

C. When patching a membrane that has been in place for some time or that has been subjected to dirt or contamination, it is necessary to remove accumulated field dirt. Proper membrane preparation is made by scrubbing the membrane with a scrub brush and warm soapy water, and then rinsing with clear water and drying with clean cotton cloths. For membrane with a significant accumulation of dirt, cleaning with acetone and a clean cotton cloth may be required.

D. Heat-weld the patch as described above for standard seaming details.

3.12 WALKWAY PAD INSTALLATION:

A. Install walkway pads in locations shown on the Drawings. Lay out walkway pads with the smooth surface is face down. Space each pad a minimum of 1 in. and a maximum of 3 in. to allow for drainage. Provide spaces at regular intervals within the range specified above, and at all valleys including edges of crickets.

B. Heat-weld the entire perimeter of the pad continuously watertight to the membrane, following standard procedures for cleaning and heat-welding seams described above.

C. Follow standard procedures for inspecting/testing head-welded seams of walkway pads as described above.

3.13 TEMPORARY CUT OFF:

A. Installer shall ensure that moisture does not damage any completed section of the new waterproofing system. Complete flashings, terminations, and temporary closures as required to provide a watertight condition at the end of each day. All temporary closures shall be made as recommended or required by membrane manufacturer.

3.14 PROTECTION LAYER INSTALLATION AT PRMA ROOF:

A. Install the protection layer to lay flat. Cut to fit all penetrations, curbs, and perimeters. Do not adhere protection layer to waterproofing membrane.

3.15 DRAINAGE LAYER INSTALLATION AT PRMA ROOF:

A. Install drainage layer directly over the waterproofing membrane, below the rigid insulation. Abut longitudinal edges of adjacent sheets and adhere geotextile fabric overlap edge to adjacent drainage layer with approved adhesive.

B. Neatly trim drainage composite to fit closely around all drains. Panels shall lay flat at drain perimeter to ensure that water will flow freely from panels into drain openings. Cut the core around penetrations, and cut an "x" in the filter fabric and tape the fabric to the sides of the penetration.

C. Cover all terminal edges of the drainage panels with an integral fabric flap by tucking the fabric around the edge of the core and adhering the fabric to the bottom of the core.

D. Proceed with installation of insulation, and paving materials promptly; do not leave drainage composite exposed to direct sunlight for more than one week. Provide temporary ballast to prevent drainage board from becoming displaced.

3.16 INSULATION INSTALLATION AT PRMA ROOF:

A. Install insulation in accordance with manufacturer instructions within 48 hrs of water test completion. Insulation shall be installed in a minimum of two layers with the thickest layer on the bottom. Staggered joints in both directions a minimum of 6 in.

B. Cut and fit to within 3/4 in. of all projections, perimeter walls, and penetrations. Insulation is to be loose laid, with tightly butted joints not greater than 1/8 in.

C. After insulation installation is complete and immediately before installation of wearing course, install the root barrier and drainage layer. Monitor surface temperature of the root barrier and drainage layer with infrared thermography during solar exposure to verify the temperature is maintained below maximum service temperature for extruded polystyrene insulation, as recommended by insulation manufacturer.

3.17 FILTER FABRIC INSTALLATION AT PRMA ROOF:

A. Install the filter fabric layer to lay flat. Cut to fit all penetrations, curbs, and perimeters. Do not adhere filter fabric to insulation or other materials.

B. Lap all adjacent sheets a minimum of 6 in.

3.18 EFVM TESTING:

A. Test the entire membrane installation in the current Work area using EFVM testing.

1. Coordinate with adjacent trades and the EFVM manufacturer for performing EFVM testing.

2. Wet the entire membrane test area with water prior to the start of each test and maintain wet for the required duration of testing.

3. If a breach is detected, the Contractor shall patch per the manufacturer's guidelines and as approved by the Commissioner, and retest the roofing membrane. The Contractor is responsible for all costs incurred for patches/reinstallation/retesting of the waterproofing membrane.

B. After the test is successfully completed, review with the Commissioner if they would like the system to remain in place permanently. Provide permanent securement and leads for future if it is determined that the system is to remain in place for future use.

3.19 FIELD QUALITY CONTROL:

A. Inform the Commissioner in writing on a daily basis of any of the following events. State specific locations of each occurrence.

1. Damage by other trades.

2. Debonded areas of membrane.

3. Leakage through the finished roofing membrane or flashings.

B. Provide site access to authorized representative(s) including inspectors, Commissioner, and Manufacturers' for inspection of the waterproofing membrane.

1. Conduct destructive tests of seams in the finished sheet daily at the beginning of the day and every time there is an interruption in the welding process (i.e., power failure, welder shutdown, job conditions change, and after morning or lunch break). Test cuts shall include both seams constructed with the automatic welder and seams constructed by hand. Submit physical samples of all test cuts to the Commissioner, clearly labeled by date, time of day, location on roof and roof level/area, and any unique conditions. Submittal shall include any failed tests and a description of any adjustments made and the results of the follow-up test.

C. Destructive Seam Testing

1. Weld Tests: Cut out and patch seam weld test daily as specified herein and as requested by the Commissioner.

2. Make test cuts 1 in. wide and longer than the width of the seam.

3. Allow Samples to cool for about 30 min., peel the Sample apart and examine the weld. The membrane should delaminate from the reinforcement. Machine welds shall be 1-1/2 in. wide, hand welds 2 in. wide.

4. Patch test-cut areas with membrane overlay with rounded corners and 2 in. hand-welded seam.

D. Probe Testing

1. Test all welds for watertightness and conformity with the specifications by running a metal "pick" aggressively along all joints after the weld has cooled. Have the inspection performed by mechanics who are present during the full roofing system installation and are trained in the procedure by the manufacturer, and again by a manufacturer's technical representative. Reweld any openings or discontinuities on a daily basis. If openings in seams are found in areas that have been exposed to inclement weather since their installation, make a test cut in the membrane to check for moisture in the insulation, replace any damp insulation, and patch the membrane.

E. Adhesion Testing: Perform adhesion tests are specified in this Section.

F. Infared Imaging Testing: Perform testing, including invasive openings for verification, to locate wet insulation per ASTM C1153.

1. Contractor to repair all probes.

3.20 CLEANING AND PROTECTION:

A. Coordinate with other trades to avoid traffic over completed work areas. Arrange work sequence to avoid use of newly constructed roofing for storage, walking, and equipment movement. Move equipment and ground storage areas as work progresses to avoid abuse of the roofing system, as permitted by the City of New York. Notify the Commissioner immediately and in writing if anyone abuses or damages the roofing system or flashing components, and make necessary restoration at no additional cost to the City of New York.

B. Protect surfaces with smooth, 5/8 in., clean plywood runways over a layer of protection layer, as a minimum, where access is absolutely required, and ensure full protection of new roofing surfaces against mechanical damage.

C. Against Loads: Protect work of this Section against concentrated loads and any other loads or equipment that would damage the materials or work.

D. Against Traffic: Do not permit traffic on horizontally installed work of this Section, except for workmen doing the work, during and after the installation.

E. Take and maintain necessary preventative measures to protect work of this Section from damage until Project is accepted.

F. Upon completion of the roofing system and flashings (including all associated Work), institute appropriate procedures for surveillance and protection of roofing during remainder of construction period. Protect all areas where membrane has been installed.

G. Promptly remove primer or membrane system from adjacent surfaces and leave Work area in broom clean condition.

H. Promptly remove from the site all materials or incomplete roofing exposed to moisture and/or any work rejected by the Commissioner.

I. Workmen and all others that walk on the membrane shall wear clean soft-soled shoes so as not to damage materials. Equipment shall have no sharp edges and shall be clean and free of any materials that are harmful to the waterproofing materials.

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SECTION 07 21 00
Thermal Insulation

PART I - GENERAL

1.1 RELATED DOCUMENTS

A. The following documents apply to all required work for the Project: (1) the Contract Drawings, (2) the Specifications, (3) the General Conditions, (4) the Addendum and (5) the Contract (City of New York Standard Construction Contract).

B. LEED / Environmentally Preferable Purchase (EPP) General Requirements:

1. Refer to DDC General Conditions and the Addendum to the General Conditions

2. LEED requirements apply to all Phase II work with the exception of the Existing Building scope. EPP requirements apply to the project's Existing Building scope only.

1.2 SUMMARY

A. Section includes:

1. Foundation and underslab insulation.

2. Exterior wall semi-rigid insulation.

3. Miscellaneous blanket insulation.

4. Closed cell spray foam insulation.

5. Attachment devices.

B. Related Sections

1. Thermoplastic Membrane Roofing - Section 07 20 00.

2. Firestops and Smokeseals - Section 07 84 13.

3. Glazed Storefronts Curtain Wall System - Section 08 40 01.

4. Gypsum Drywall - Section 09 29 00, for acoustical insulation.

5. Earthwork - Section 31 00 00.

1.3 SUBMITTAL PROCEDURES

A. Refer to DDC General Conditions Section 01 33 00 "Submittal Procedures".

1.4 SUBMITTALS

A. Submit product data for each type of product indicated.

B. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for insulation products.

1.5 QUALITY ASSURANCE

A. Refer to DDC General Conditions Section 01 40 00 "Quality Requirements".

B. Surface-Burning Characteristics: As determined by testing identical products according to ASTM E 84 by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

C. Vertical and Lateral Fire Propagation Test Characteristics: The exterior wall assembly is required to comply with NFPA 285 "Standard Method of Test for the Evaluation of Flammability Characteristics of Exterior Nonload-bearing Wall Assemblies Containing Combustible Components." The base wall, stud cavity insulation, wall sheathing, air barrier, continuous wall rigid insulation and exterior cladding are components that are required to be to be evaluated as part of this specific assembly test.

1.6 DELIVERY, STORAGE AND HANDLING

A. Store materials under cover in a dry and clean location, off the ground. Remove materials which are damaged or otherwise not suitable for installation and replace with acceptable materials.

B. Take every precaution to prevent the insulation from becoming wet, cover with tarps or other weather/watertight sheet goods.

PART II - PRODUCTS

2.1 FOUNDATION WALL AND UNDERSLAB INSULATION

A. Provide extruded polystyrene board insulation conforming to ASTM C 578, Type IV, with a maximum flame spread and smoke developed indices of 75 and 450 respectively. Insulation shall have an aged R value of not less than 5/inch; shall be 2" thick unless otherwise noted on the drawings.

1. Basis of Design: Subject to compliance with requirements, provide Dow Chemical Co.; Styrofoam or comparable product by one of the following:
2.
   a. Owens Corning
   b. PACTIV Building Products
   c. Or approved equal

2.2 SEMI-RIGID INSULATION

A. Provide mineral wool fiberboard insulation conforming to ASTM C 612, Type IVB with a maximum flame spread and smoke developed indices of 0.

1. Boards shall be 16" wide x 96" long; boards shall be 6" thick unless otherwise noted on the drawings.
2. Insulation shall have an aged R value of not less than 4.3/inch.

3. Basis of Design: Subject to compliance with requirements, provide Roxul; CavityRock DD or comparable product by one of the following:
   a. Thermafiber
   b. Auralex
   c. Or approved equal

2.3 MINERAL-WOOL BLANKET INSULATION

A. Basis of Design Manufacturers: Subject to compliance with requirements, provide Fibrex Insulations Inc. or comparable product by one of the following:

1. Owens Corning.
2. Roxul Inc.
3. Thermafiber.
4. Or approved equal

B. Recycled Content: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 70 percent.

C. Unfaced, Mineral-Wool Blanket Insulation: ASTM C 665, Type I (blankets without membrane facing); consisting of fibers; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively, per ASTM E 84; passing ASTM E 136 for combustion characteristics.

1. Fire Propagation Characteristics: Passes NFPA 285 testing as part of an approved assembly.

2.4 SPRAY INSULATION

A. Closed Cell Spray Foam Insulation

1. Basis of Design: Subject to compliance with requirements, provide Henry Permax RT 2045-2.0 or comparable product by one of the following:

   a. Dow Chemical Co. Styrofoam Spray Polyurethane Foam
   b. Demilec LLC Heatlok SOY 200
   c. BASF Corp. Walltite
   d. NCFI InsulStar
   e. Or approved equal

2. Material

   a. Insulation: ASTM C 1029, Type II polyurethane with zero ODP.
   b. Density (ASTM D 1622): 2.1 lbs/cu. ft.

3. Accessories

   a. Primer: As required by insulation manufacturer.
   b. Overcoat: As required by 2014 New York City Building Code and manufacturer.

2.5 ACCESSORIES

A. Clips for Securing Insulation to Encountered Surfaces: Spindle anchor and washer type consisting of perforated metal plates with spindle welded to center and snap on washers. Spindle and washers shall receive a corrosion-resistant electro-zinc plating. Adhesives for securing clips in place shall be recommended by the approved clip manufacturer.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Miracle Adhesives Corp.
   b. Stic-Klip Mfg. Co., Inc.
   c. Midwest Fasteners
   d. Or approved equal

B. Adhesive for Bonding Insulation: The type recommended by the insulation manufacturer, and complying with fire-resistance requirements.

1. Contractor shall ensure that all submitted products that will interface are both chemically and adhesion compatible.

C. Protection Board: Premolded, semi-rigid asphalt/fiber composition board, 1/4" thick, formed under heat and pressure, standard sizes.

PART III - EXECUTION

3.1 EXECUTION REQUIREMENTS

A. Refer to DDC General Conditions for execution requirements.

3.2 INSTALLATION, GENERAL

A. Clean substrates of substances that are harmful to insulation including removing projections capable of puncturing vapor retarders, or that interfere with insulation attachment.

B. Install insulation that is undamaged, dry, and unsoiled and that has not been left exposed to ice, rain, or snow at any time. Maintain dryness by providing temporary protection (tarp, etc.) over insulation and other materials that are intended to be covered by the building envelope, but must remain open for a period of time during construction

C. Extend insulation to envelop entire area to be insulated. Cut and fit tightly around obstructions and fill voids with insulation. Remove projections that interfere with placement.

D. Provide sizes to fit applications indicated and selected from manufacturer's standard thicknesses, widths, and lengths. Apply single layer of insulation units to produce thickness indicated unless multiple layers are otherwise shown or required to make up total thickness.

3.3 INSTALLATION OF BELOW-GRADE INSULATION

A. On vertical surfaces, set insulation units using manufacturer's recommended adhesive according to manufacturer's written instructions.

1. If not otherwise indicated, extend insulation a minimum of 48" below exterior grade line.

B. On horizontal surfaces, loosely lay insulation units according to manufacturer's written instructions. Stagger end joints and tightly abut insulation units.

1. If not otherwise indicated, extend insulation a minimum of 48" in from exterior walls.

3.4 INSTALLATION OF BLANKET INSULATION FOR FRAMED CONSTRUCTION

A. Apply insulation units to substrates by method indicated, complying with manufacturer's written instructions. If no specific method is indicated, bond units to substrate with adhesive or use mechanical anchorage to provide permanent placement and support of units.

B. Blanket Insulation: Install in cavities formed by framing members according to the following requirements:

1. Use insulation widths and lengths that fill the cavities formed by framing members. If more than one length is required to fill the cavities, provide lengths that will produce a snug fit between ends.

2. Place insulation in cavities formed by framing members to produce a friction fit between edges of insulation and adjoining framing members.

3. Maintain 3-inch clearance of insulation around recessed lighting fixtures not rated for or protected from contact with insulation.

4. For metal-framed wall cavities where cavity heights exceed 96", support unfaced blankets mechanically and support faced blankets by taping flanges of insulation to flanges of metal studs.

3.5 INSTALLATION OF BOARD INSULATION FOR CONCRETE SUBSTRATES

A. Install board insulation on concrete substrates by adhesively attached, spindle-type insulation anchors as follows:

1. Fasten insulation anchors to concrete substrates with insulation anchor adhesive according to anchor manufacturer's written instructions. Space anchors according to insulation manufacturer's written instructions for insulation type, thickness, and application indicated.

2. Apply insulation standoffs to each spindle to create cavity width indicated between concrete substrate and insulation.

3. After adhesive has dried, install board insulation by pressing insulation into position over spindles and securing it tightly in place with insulation-retaining washers, taking care not to compress insulation below indicated thickness.

4. Where insulation will not be covered by other building materials, apply capped washers to tips of spindles.

3.6 INSTALLATION OF SPRAY FOAM INSULATION

A. Apply self-supported, spray-applied insulation according to manufacturer's written instructions. Do not apply insulation until installation of pipes, ducts, conduits, wiring, and electrical outlets in walls is

completed and windows, electrical boxes, and other items not indicated to receive insulation are masked. After insulation is applied, make it flush with face of studs by using method recommended by insulation manufacturer.

END OF SECTION 07 21 00

SECTION 07 21 29
Spray-Applied Thermal Insulation

PART I - GENERAL

1.1 RELATED DOCUMENTS

A. The following documents apply to all required work for the Project: (1) the Contract Drawings, (2) the Specifications, (3) the General Conditions, (4) the Addendum and (5) the Contract (City of New York Standard Construction Contract).

B. LEED General Requirements:

1. Refer to DDC General Conditions

a. Section 01 33 00 "Submittal Procedures"
b. Section 01 81 13.04 "Sustainable Design Requirements for LEED v4 Buildings"
c. Section 01 81 13.13 "Volatile Organic Compound Limits for Adhesives, Sealants, Paints and Coatings for LEED Buildings"
d. Section 01 81 19 "Indoor Air Quality Requirements for LEED Buildings"

1.2 SUMMARY

A. Section includes spray-applied glass fiber insulation.

B. Related Sections

1. Thermal Insulation - Section 07 21 00, for closed cell spray foam insulation.

2. Firestops and Smokeseals - Section 07 84 13.

3. Gypsum Drywall - Section 09 29 00, for acoustical insulation.

1.3 SUBMITTAL PROCEDURES

A. Refer to DDC General Conditions Section 01 33 00 "Submittal Procedures".

1.4 SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: Include plans or schedules, or both, indicating the following:

1. Extent of thickness, color, and texture.

2. Treatment of spray-applied thermal insulation after application.

C. Samples: For each exposed product of each color and texture specified, in manufacturer's standard dimensions.

D. Product Test Reports: For each product, for tests performed by a qualified testing agency.

1.5 QUALITY ASSURANCE

A. Refer to DDC General Conditions Section 01 40 00 "Quality Requirements".

B. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, to set quality standards for materials and execution, to set quality standards for fabrication and installation and for preconstruction testing.

1. Build mockup of typical exposed thermal insulation as indicated on Drawings.

2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless the Commissioner specifically approves such deviations in writing.

C. Surface-Burning Characteristics: As determined by testing identical products according to ASTM E 84 by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

D. Vertical and Lateral Fire Propagation Test Characteristics: The exterior wall assembly is required to comply with NFPA 285 "Standard Method of Test for the Evaluation of Flammability Characteristics of Exterior Nonload-bearing Wall Assemblies Containing Combustible Components." The base wall, stud cavity insulation, wall sheathing, air barrier, continuous wall rigid insulation and exterior cladding are components that are required to be to be evaluated as part of this specific assembly test.

PART II - PRODUCTS

2.1 SPRAY-APPLIED GLASS FIBER INSULATION

A. Self-Supported, Spray-Applied Glass Fiber Insulation: Type 902 bio-soluble white fiberglass conforming to CAN/ULC S102-10 and ASTM E136 and sprayed using manufacturer's liquid water-based bonding adhesive. Does not contain asbestos, crystalline silica, or combustible fibers.

1. Basis-of-Design Product: Subject to compliance with requirements, provide Monoglass Inc.; Sonoglass Spray-On Insulation or comparable product by one of the following:

2.

a. K-13 International Cellulose
b. Thermacoustic
c. Or approved equal

3. Properties:

a. Fire Resistance: Maximum flame-spread and smoke-developed indexes of zero and zero, respectively, in accordance with ASTM E84. Noncombustible in accordance with ASTM E136.
b. Thermal Conductivity: 4.00/inch R-value in accordance with ASTM C518.
c. Noise Reduction Coefficient (NRC): 0.95 at 2 inches in accordance with ASTM C423 and ISO 354.
d. Bond Strength: Minimum 43-lbf/sq. ft. cohesive and adhesive strength based on field testing in accordance with ASTM E736.
e. Dry Density: 2.2 lb/cu. ft. in accordance with ASTM D1622/D1622M.
f. Air Erosion: Maximum weight loss of 0.0 oz./sq. ft. in 24 hours in accordance with ASTM E859.

g. Fungus and Bacterial Resistance: No growth in accordance with MIL STD810F.

2.2 ACCESSORIES

A. Substrate Primers: For spray-applied insulation, use manufacturer-approved, spray-applied, stain-blocking primers.

B. Spray-Applied Insulation Adhesive: Manufacturer's standard water-based, spray-applied adhesive for mixing with fibers at point of discharge during spray application of thermal insulation and for final topcoat of sprayed thermal insulation.

C. Spray-Applied Insulation Paint Coating: See Section 099000 "Painting and Finishing."

D. Spray-Applied Insulation Sealer: Spray-applied, water-soluble, liquid-copoly emulsion.
1. Basis-of-Design Product: Subject to compliance with requirements, provide Monoglass Inc.; InsulSeal or comparable product by one of the following:

   a. K-13 International Cellulose
   b. Thermacoustic
   c. Or approved equal

2. Tint Color: As selected by Commissioner.

PART III - EXECUTION

3.1 EXECUTION REQUIREMENTS

A. Refer to DDC General Conditions for execution requirements.

3.2 PREPARATION

A. Comply with manufacturer's written instructions applicable to substrate conditions.

B. Clean substrates of substances that are harmful to insulation, including removing projections capable of puncturing insulation or vapor retarders, or that interfere with insulation attachment or impair adhesive bonding. Verify surface bonding and compatibility.

C. Coordinate application with Work of other trades, including ductwork, piping, and equipment.

3.3 APPLICATION

A. Mix and apply thermal insulation in compliance with insulation manufacturer's written instructions.
B. Extend insulation to envelop entire area to be insulated as indicated on Drawings.
C. Apply insulation as required to achieve R-value.
D. Board-tamp sprayed insulation surfaces and spray apply manufacturer's pre-tinted adhesive to seal tamped insulation surface in accordance with manufacturer's written instructions.
E. Paint-coated, tamped insulation surfaces in accordance with Section 099000 "Painting and Finishing."

END OF SECTION 07 21 29

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SECTION 07 27 01
Weather Resistive Barriers

PART I – GENERAL

1.1 RELATED DOCUMENTS:

A. The following documents apply to all required work for the Project: (1) the Contract Drawings, (2) the Specifications, (3) the General Conditions, (4) the Addendum, and (5) the Contract (City of New York Standard Construction Contract).

B. LEED / Environmentally Preferable Purchase (EPP) General Requirements

1. Refer to DDC General Conditions and the Addendum to the General Conditions.

2. LEED requirements apply to all Phase II work with the exception of the Existing Building scope. EPP requirements apply to the Project's Existing Building scope only.

1.2 DEFINITIONS:

A. Referenced System: Building enclosure system as specified by the Building Enclosure System Matrix.

B. Impermeable: A material with a water vapor transmission rate of less than or equal to 0.1 US perms.

C. Semi-Permeable: A material with a water vapor transmission rate of more than 0.1 US perm but less than or equal to 10 US perm.

D. Permeable: A material with a water vapor transmission rate of more than 10 US perm.

1.3 SUMMARY:

A. This Section includes the weather resistive barrier (WRB) components for the associated building enclosure systems described in the Building Enclosure System Matrix.

B. For all systems described, supply and install the following components and their subcomponents of the work required to provide a complete system, including but not limited to the following:

1. Install new WRB including the following components which comprise the Waterproofing System:

a. Self-adhering rubberized asphalt sheet membrane air, vapor, and weather barrier.

b. Self-adhering sheet membrane that serves as an air and weather barrier but is vapor permeable.

c. Sealants, liquid membrane, and accessories at all penetrations, walls, wall openings, flashing terminations, and other locations as shown on the Drawings.

d. Membrane pan flashings and window and door openings where shown on the Drawings.

e. Membrane flashing, sealants, and separators as shown on the Drawings to construct expansion joints in the weatherproofing systems.

C. This Section incorporates the use of Sealants. Requirements specified in this Section are in addition to those in the following Section:

1. Section 07 92 01 – Exterior Joint Sealants.

D. The following Sections describe systems and materials that incorporate Weather Resistive Barriers, and will require coordinated interfaces:

1. Section 07 00 01 – Rainscreen System.

2. Section 07 20 00 – Thermoplastic Membrane Roofing.

3. Section 07 62 01 – Facade Sheet Metal Flashings.

4. Section 07 95 00 – Expansion Control.

5. Section 08 40 01 – Glazed Storefronts and Curtain Wall System.

E. Reference Documents

1. Building Enclosure System Matrix: Refer to Drawing EN1-003.

1.4 REFERENCE STANDARDS AND REGULATIONS:

A. Refer to DDC General Conditions.

B. The Contractor's Engineering, materials, and workmanship shall comply with 2014 New York City Building Code. Where the 2014 New York City Building Code recommendations or requirements are to a lower standard than required by this Contract Document, the Contract Documents shall take precedence.

C. The Contractor's Engineering, materials, and workmanship shall comply with 2014 New York City Fire Code.

D. Comply with applicable provisions and recommendations of the following standards. Where standards conflict with each other or conflict with the provisions of these Specifications, the more stringent shall apply. Unless otherwise noted, the latest editions of the standards shall apply:

1. ASTM International (ASTM)

a. ASTM B209 – Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.

b. ASTM B221 – Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.

c. ASTM C1513 – Standard Specification for Steel Tapping Screws for Cold-Formed Steel Framing Connections.

d. ASTM D412 – Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers – Tension.

e. ASTM D570 – Standard Test Method for Water Absorption of Plastics.

f. ASTM D4258 – Standard Practice for Surface Cleaning Concrete for Coating.

g. ASTM D4263 – Standard Test Method for Indicating Moisture in Concrete by the Plastic Sheet Method.

h. ASTM D6135 – Standard Practice for Application of Self-Adhering Modified Bituminous Waterproofing.

i. ASTM E96 – Standard Test Methods for Water Vapor Transmission of Materials.

j. ASTM E154 – Standard Test Methods for Water Vapor Retarders Used in Contact with Earth under Concrete Slabs, on Walls, or as Ground Cover.

k. ASTM E283 – Standard Test Method for Determining Rate of Air Leakage through Exterior Windows, Curtain Walls, and Doors under Specified Pressure Differences Across the Specimen.

l. ASTM E488 – Standard Test Methods for Strengths of Anchors in Concrete Elements.

m. ASTM E754 – Standard Test Method for Pullout Resistance of Ties and Anchors Embedded in Masonry Mortar Joints.

n. ASTM E783 – Standard Test Method for Field Measurement of Air Leakage through Installed Exterior Windows and Doors.

o. ASTM E1186 – Standard Practices for Air Leakage Site Detection in Building Envelopes and Air Barrier Systems.

p. ASTM E2178 – Standard Test Method for Air Permeance of Building Materials.

q. ASTM E2357 – Standard Test Method for Determining Air Leakage of Air Barrier Assemblies.

2. Society for Protective Coatings (SSPC)

a. SSPC-SP3 – Power Tool Cleaning.

1.5 PERFORMANCE REQUIREMENTS:

A. General Prescriptive Requirements

1. Provide WRB where indicated and under the following conditions:

a. At opaque separations of outdoor environment from the indoor environment of the building.

2. Site-applied Sealant is not acceptable as part of the primary Waterproofing System unless shown on the Architectural Drawings or noted within this Section.

3. All horizontal flashings, or any surface intended to drain moisture, shall be sloped to the exterior 1/8 in. per foot minimum, and 1/4 in. per foot where space allows.

B. General Performance

1. Install WRB according to the intended use, appropriate standards, as specified herein, and per the manufacturer's recommendations.

2. A qualified Contractor shall install the specified Waterproofing System. The system shall:

   a. Include suitable allowances for the specified construction tolerances.

   b. Withstand the specified deleterious and degrading effects of radiation from the sun, weathering, atmospheric pollution, vermin, fungi and other growths for the required service life without maintenance in excess of routine cleaning and minor repairs.

   c. Be compatible with all materials with which it comes in contact.

   d. Not stain adjacent surfaces.

C. Durability Performance

1. Protect WRB from radiation from the sun and exposure to inclement weather conditions both in-progress and in the completed construction. Cover and protect all surfaces to prevent damage to the membrane until the final Flashing or Panel components are installed.

2. Provide high-temperature resistant WRB membranes where installed directly beneath sheet metal flashings exposed to the sun.

3. Failure includes inability of the WRB to meet the performance requirements set forth in this and all Referenced Systems, in addition to the following:

   a. Ingress of air into the interior building environment, or exfiltration of interior air, through an air barrier beyond that specified for the Referenced System.

   b. Ingress of water vapor into the interior building environment through a vapor retarder beyond that specified for the permeability of that material.

   c. Degradation of WRB from radiation exposure from the sun.

   d. Melting of WRB from exposure to high temperatures.

D. Structural Performance

1. Engineer Waterproofing System to resist the maximum design loads of the associated system.

2. Securely attach all WRB to the structure.

3. Engineer Waterproofing System to accommodate the structural, thermal, and moisture movements developed by the associated system .

4. Fire Performance

   a. The WRB shall:

      1) Have a resistance to combustion and fire spread appropriate to each part and assembly.

a) Ensure assembly compliance with NFPA requirements, and other applicable provisions, when installed in the specified wall assemblies.

2) Not give off toxic fumes in excess of NFPA standards and code requirements.

5. Weatherproofing Performance

a. WRB shall perform as a continuous vapor-impermeable or vapor-permeable air barrier, as indicated, and as a liquid-water drainage plane flashed to discharge condensation or water to the exterior. Air barrier assemblies shall accommodate substrate movement and maintain continuity at substrate expansion and control joints, construction material changes, penetrations, tie-ins to installed waterproofing, and transitions at perimeter conditions without deterioration and air leakage exceeding specified limits.

1) Coordinate sheet metal flashings to protect the building, membrane terminations and transitions, and other conditions as shown on the Drawings against water infiltration.

2) Waterproofing System installations shall not rely on sealants or gaskets for primary waterproofing performance. No exposed sealant products are permitted except where shown on the Drawings.

6. Volatile Organic Content (VOC) Performance

a. Provide low-VOC products where required by the City of New York to reduce odor and as required to comply with the VOC content limits determined by the City of New York.

1.6 SUBMITTAL PROCEDURES:

A. Refer to DDC General Conditions Section 01 33 00 – Submittal Procedures.

1.7 SUBMITTALS:

A. Shop Drawings.

B. Product data.

C. Samples

1. Provide Samples for all products used in the Referenced System. Provide minimum of one 6 in. x 6 in. Sample for all WRBs.

2. All other Samples shall be 6 in. long or as specified.

D. Quality Control Plan

1. Provide as required and specified in the DDC General Conditions

2. Work Sequence Plan: Provide a comprehensive work sequence plan showing areas where work will be performed by trades involved in each area and time required to complete each area, including plans to avoid exposure of the WRB for longer than the WRB manufacturer's specified limit. Do not commence work until receiving Commissioner's written approval of the work plan. Indicate water

testing of exterior cladding or components in the sequence plan. The plan shall include the following as a minimum:

a. Notify the Commissioner in writing at least 72 hrs prior to the initial installation of the waterproofing membrane.

b. Inspect conditions and materials to ensure conformity to the Contract requirements.

c. Inspect substrate conditions and coordinate with Main / General Contractor to ensure proper substrate preparation in conformance to the manufacturer's requirements and Contract requirements.

d. Inspect work in progress to ensure that the work is in compliance with approved procedures.

e. Inspect all completed and any corrected work for compliance with the Contract Documents and the membrane manufacturer's recommendations.

3. Results of moisture content tests on the substrates to confirm that the concrete moisture content is in accordance with the waterproofing manufacturer's requirements. Tests shall be conducted by a qualified testing agency and, at minimum, comply with the Waterproofing System manufacturer's recommendations for testing.

E. Product Test Reports

1. Indicating compliance with performance requirements as required and specified herein.

F. Quality Control Reports

1. Manufacturer site visit reports.

2. Field reports by Contractor and/or other third-party inspectors.

3. Protection Plan: Written procedures and plans for providing temporary protection of areas that will be exposed to weather, traffic, etc., prior to the installation of the complete Waterproofing System.

4. Results of adhesion tests on the concrete substrate to confirm that the WRB is adhered in accordance with the manufacturer's requirements. Tests shall be conducted by a qualified Independent Testing Agency and, at minimum, shall comply with the Waterproofing System manufacturer's recommendations for testing.

G. Manufacturer's Certification: Written certification (in time to prevent delay of the installation of the Referenced System) from the WRB material manufacturer that the materials supplied to the Contractor for this Project comply with all requirements of the referenced standards, and that all materials are suitable for the uses specified herein.

H. Maintenance Data: For WRB to include in maintenance manuals.

I. Mockups: Provide mockups of all typical and atypical details, including window perimeter flashing, relieving angles, base of wall, parapet transitions, building corners, expansion joints, integration with other building enclosure systems, and seals at masonry ties. Mockups may be installed as part of a complete assembly for the Referenced System; allow Commissioner and/or other parties to review installation of the

underlying waterproofing components prior to covering with the proposed cladding or other building enclosure components.

1.8 QUALITY ASSURANCE:

A. Refer to DDC General Conditions Section 01 40 00 – Quality Requirements.

B. Installer Qualifications: The contractor or subcontractor must be licensed or approved by the manufacturer.

C. Field Inspection Services: Arrange with the manufacturer to have the services of a competent manufacturer's field representative at the Project site. The manufacturer's field representative shall review the substrate conditions, instruct work crews in the proper application procedures, and provide written recommendations to the Commissioner regarding special conditions related to the work. At a minimum, the manufacturer's technical representative shall provide the following inspections of the membrane:

1. Project start inspection at the beginning of each phase of the Project to review special detailing conditions and substrate preparation.

2. Periodic in-progress inspections throughout the Project to evaluate WRB application.

3. Final punch-list inspection at the completion of each phase of the Project prior to installation of surfacing or overburden materials.

4. Warranty inspection confirming completion of all punch-list items, surfacing, and cladding application.

5. The manufacturer's field representative shall provide the Contractor, and Commissioner with written reports outlining observations and required corrections from each site visit.

D. Single Source: Obtain materials through one source from a single manufacturer for the Waterproofing System. Products from alternate manufacturers shall be approved in writing by the primary manufacturer.

E. Moisture Content: Evaluate moisture content of cementitious substrate materials. Applicator shall determine substrate moisture content throughout the work and record with daily inspection reports or other form of reporting acceptable to the City of New York and membrane manufacturer. Concrete substrates shall have a maximum moisture content of 4% by weight in the upper 3/4 in. of the concrete substrate or otherwise as required by the manufacturer.

F. Conduct adhesion tests of the specified membrane to all substrate(s) at the beginning of the membrane installation and at a rate of one test per 2,000 sq ft. Submit test results to the Commissioner and the WRB manufacturer, and notify both parties immediately of any test result that fails to meet the manufacturer's specified values. Do not proceed with Waterproofing System until all deficiencies have been corrected. Perform the following tests:

1. Tab Pull Test: Cut the membrane to form a 2 in. wide and 4 in. long tab, peel the membrane with a duckbill clamp or similar tool and a force gauge, and qualitatively evaluate the membrane adhesion, assessing if it is aggressively bonded to the substrate.

2. Cross Cut Test: Cut the membrane two times in the shape of an "X." Each cut shall be 12 in. long. Peel the membrane with a duckbill clamp or similar tool and a force gauge, and qualitatively evaluate the membrane adhesion, assessing if it is aggressively bonded to the substrate.

a. Adequate surface preparation will be indicated by tensile bond strength of WRB to substrate, greater than or equal to the manufacturer's listed adhesion strength.

b. In the event the bond strengths are less than that required by the manufacturer, additional substrate preparation may be required. Repeat testing to verify suitability of substrate preparation.

3. Adequate adhesion shall be demonstrated if the membrane fails cohesively or tears the facer off sheathing.

a. The Contractor is responsible for repairing any areas of the WRB where tests are conducted to provide continuous full-thickness coverage of the WRB. Seal all membrane patches that contain reverse laps along the edges of the patch with a compatible liquid membrane seal.

b. The Commissioner shall provide final approval whether acceptable adhesion strength has been achieved.

G. Pre-Installation Conference

1. Provide as required and specified in the DDC General Conditions.

2. Include in conference, a review of membrane adhesion testing procedures and requirements.

1.9 PROJECT CONDITIONS:

A. Do not apply the WRB during or with the threat of inclement weather. Proceed with installation only when existing and forecasted weather conditions permit Waterproofing Systems to be installed according to manufacturer's written instructions and warranty requirements:

1. Do not install if wind is gusting more than 15 mph, or interferes with proper installation.

2. Application of Waterproofing System may proceed while air temperature is between 40°F and 85°F, providing the substrate is a minimum of 5°F above the dewpoint.

B. Do not expose materials vulnerable to water or sun damage in quantities greater than can be weatherproofed the same day.

C. Where required by the Commissioner, Contractor shall implement odor control and elimination measures prior to and during application of the waterproofing materials. Implement odor control measures at no additional cost to the City of New York.

D. Ensure that substrate materials are dry and free of contaminants. Do not commence with application unless substrate conditions are suitable. Contractor shall demonstrate that substrate conditions are suitable for the application of the materials.

E. The Contractor shall include with its proposal odor control and elimination measures as relevant to the Project and specific areas where work takes place.

1. If required by the Commissioner, Contractor shall implement odor control and elimination measures prior to and during the application of the waterproofing materials. Control/elimination measures shall

be field tested at off-hours and typically consists of one (1) or a combination of the following measures:

a. Seal air intakes with activated carbon filters. Install filters in accordance with requirements and recommendations of the filter manufacturer. Seal filters at joints and against building exterior walls to prevent leakage of unfiltered air.

b. Seal doorways, windows, and skylights with duct tape and polyethylene sheeting to prevent leakage of air into the building.

c. Erect and use moveable enclosure(s) sized to accommodate work area(s) and stationary enclosure for resin mixing station. Enclosure shall be field constructed or pre-manufactured of fire-retardant materials in compliance with 2014 New York City Building Code and 2016 New York City Energy Conservation Code. Provide equipment enclosure(s) with mechanical air intake/exhaust openings and Odor Control Air Cleaners, as required to clean enclosed air volume and to prevent odor migration outside the enclosure. Seal exhaust opening with activated carbon filter.

1.10 COORDINATION AND SEQUENCING:

A. Fully coordinate construction and installation sequences with adjacent trades.

B. Provide as specified in the DDC General Conditions.

1.11 WARRANTY:

A. Unless stated otherwise in these Specifications, Guarantee shall state that the Waterproofing System free from defects in materials and workmanship and weathertight for a period of 2 yrs from the date of Substantial Completion. Contractor shall agree to promptly repair or replace defective materials and workmanship to "like new condition," including such exploratory work, required to determine the cause, during the Guarantee period, at no additional cost to the City of New York.

B. Manufacturer's Warranty: Provide 5-yr manufacturer's membrane warranty under provisions of this Section from date of Substantial Completion. This waterproofing warranty includes providing replacement material at no cost to the City of New York to replace defective materials within the warranty period.

C. The Contractor shall be responsible for repairing damage to the building and furnishings caused by defective materials or workmanship or damage as part of repairs to the Waterproofing System.

PART II – PRODUCTS

2.1 WEATHER-RESISTIVE BARRIER:

A. Manufacturers: Subject to compliance with requirements documented herein provide products by one of the following:

1. GCP Applied Technologies.

2. Henry Company.

3. Carlisle.

4. Or approved equal.

B. Products: From an approved manufacturer including all accessories which may include: flashing materials, primers, cleaners, sealants, and termination materials, for a complete Waterproofing System and application including, but not limited to, the following:

1. Weather-Resistive Barrier

   a. GCP Applied Technologies Perm-A-Barrier Wall Membrane.

   b. Henry Company Blueskin SA.

   c. Carlisle CCW-705.

   d. Or approved equal.

2. Permeable Weather-Resistive Barrier

   a. GCP Technologies Perm-A-Barrier VPS.

   b. Henry Company Blueskin VP160.

   c. Carlisle Fire Resist 705VP.

   d. Or approved equal.

3. Weather-Resistive Barrier Flashing for Membrane Transitions

   a. GCP Applied Technologies Perm-A-Barrier Wall Flashing, for membrane transitions.

   b. Henry Company Blueskin TWF.

   c. Carlisle CCW-705 Air and Vapor Barrier Strips.

   d. Or approved equal.

4. High-Temperature Weather-Resistive Barrier

   a. Provide membrane transitions if incompatible with adjacent substrates and products and directly behind exterior-exposed sheet metal.

      1) GCP Applied Technologies Ice and Water Shield HT.

      2) Henry Company Blueskin PE200 HT.

      3) Carlisle CCW-705 HT.

      4) Or approved equal.

   b. Provide high-temperature membrane flashing transitions to materials compatible with butyl-based membrane and incompatible with asphalt-based membranes.

5. Aluminum-Faced Weather-Resistive Barrier

a. Perm-A-Barrier Aluminum Wall Membrane.

b. Henry Company Metal Clad.

c. Carlisle Fire Resist 705FR-A.

d. Or approved equal.

6. Weather-Resistive Barrier Primer: As recommended by manufacturer for job specific substrates and environmental conditions at time of installation, submit for approval. All WRB membrane installation to receive primer unless the manufacturer states in writing that primer will adversely affect the WRB's adhesion or long-term performance.

7. Sealant for Sealing Penetrations, Terminations, Patches, Etc.

a. GCP Applied Technologies Bituthene Liquid Membrane, Two-Component, Asphalt-Modified Urethane.

b. Henry Company HE925 BES Sealant.

c. Dow Corning 758.

d. Or approved equal.

8. Rubberized Asphalt Mastic for Temporary Membrane Terminal Seals: Bituthene Mastic.

9. Separation Sheet: Aluminum Tape, to separate dissimilar membrane materials. Locations and detailing for all transitions to be reviewed by Commissioner.

10. Transition Flashing: Provide where required to provide weather barrier continuity to fenestration and other cladding systems or components:

a. Pre-formed silicone sheet membrane; provide compatible sealant for adhesion as required by membrane manufacturer.

11. Sealants: Refer to requirements in Section 07 92 01 – Exterior Joint Sealants.

2.2 VAPOR PERMEABLE AIR BARRIER:

A. Products are subject to compliance with requirements documented herein. Manufacturers offering products that may be incorporated into the waterproofing system include the following:

1. VaproShield.

2. Cosella Dorken Delta.

3. Carlisle.

4. Or approved equal.

B. Vapor Permeable Air Barrier: Mechanically attached water-resistive, vapor permeable air barrier sheet that meets the requirements of ASTM E1677 and ICC-ES AC38.

1. Vaproshield RevealShield.
2. Cosella Dorken Fassade S.
3. Carlisle CCW 705 RS.
4. Or approved equal.

C. Air Barrier Flashing: Mechanically attached, black UV stable transition and flashing membrane 6-1/2 in. or 11-3/4 in. wide.

1. Vaproshield RevealFlashing.
2. Cosella Dorken Fassade S.
3. Carlisle BRT-801 Flashing Tape.
4. Or approved equal.

D. Air Barrier Batten: Black vinyl extrusion with pre-formed fastener and moisture drainage channels configured to create a ventilated airspace between wall cladding and air barrier.

E. Fasteners for Air Barrier: Fasteners as required by manufacturer.

F. Bugle headed screws, #6, #7, or #8 as required for air barrier. Screws to be stainless steel.

G. Flashing and Penetration Tapes: UV-resistant black, 35 mil thick, 4 in. wide penetration seam tape.

1. Vaproshield VaproTape.
2. Cosella Dorken Delta Fassade Flashing.
3. Carlisle BRT-801 Flashing Tape.
4. Or approved equal.

H. Refer to requirements in Section 07 92 01 – Exterior Joint Sealants for Sealants.

2.3 ACCESSORIES:

A. Termination Bar: 1/8 in. x 1 in., prepunched aluminum conforming to ASTM B209/B221 or stainless steel bar conforming to ASTM A240/240M.

B. Fasteners for Termination Bars and Flashing Integration: Noncorrosive fasteners as recommended by system Manufacturer for applications involved.

1. Fasteners shall maintain recommended edge distances and spacing so as not to adversely affect or damage the substrate. Fastener design shall also consider condition, thickness, and material properties of substrate.
2. All exterior fasteners or fasteners in wet areas shall be of a suitable grade of stainless steel. Weather coatings for corrosion resistance may only be used with the Commissioner's approval.

3. All exterior fasteners that penetrate a self-sealing weatherproofing system shall be selected and coordinated with the weatherproofing system manufacturer to ensure self-sealing occurs. Fastener connections penetrating the weatherproofing system shall also be set in sealant.

4. Fasteners Used in Cast-in-Place Concrete and Concrete Masonry Unit (CMU) Backup Construction

   a. Fastener selection and sizing shall be based on applicable ICC-ES Evaluation Reports.

   b. Fastener selection and sizing shall be based on testing according to ASTM E488 and ASTM E754 (for CMU construction) with the same backup wall construction used on the Project.

5. When utilizing a fastener not included in any of the above references, available standards, or design guides, use a minimum factor of safety of 4 for permissible load Engineering of anchoring assemblies.

6. Fasteners Used in Cold-Formed Steel Framing Backup Construction

   a. Fastener selection and sizing shall be in accordance with the AISI Cold-Formed Steel Design Manual and ASTM C1513.

7. Contractor shall provide for Commissioner's review, documentation demonstrating that the use of all fasteners installed has been reviewed and approved by the fastener manufacturer and shall, prior to installation, submit manufacturer's written certification that details proposed by the Contractor are appropriate for their intended use.

C. Solvent-Based Cleaner for Tools and Membrane Tie-Ins: As required by the membrane manufacturer.

PART III – EXECUTION

3.1 EXECUTION REQUIREMENTS:

A. Refer to DDC General Conditions for execution requirements.

3.2 EXAMINATION:

A. The Contractor is to examine substrate conditions and other conditions under which this work is to be performed and notify the Commissioner, in writing, of circumstances detrimental to the proper completion of the work. Do not proceed with work until unsatisfactory conditions are corrected to permit proper installation of the work. Starting of work means acceptance of Project and substrate conditions.

B. Verify that surfaces and site conditions are ready to receive Waterproofing System. All substrates to receive the waterproofing membrane must be smooth, clean, and have no sharp edges, ridges, or points, and shall be free of loose, spalled, or weak material.

3.3 DELIVERY, STORAGE, AND HANDLING:

A. Store elastomeric materials, adhesives, solvents, and sealants in their original containers and maintain at a temperature between 60°F and 80°F or as required by the manufacturer.

B. Store solvent-bearing solutions, resins, additives, inhibitors, and adhesives in accordance with the SDS and the 2014 New York City Fire Code . After partial use of materials, replace lids promptly and tightly to prevent contamination. Store rolled goods on ends only and protect against ultraviolet (UV) exposure. Discard rolls which have been flattened, creased, or otherwise damaged. Place rolls on pallets on clean rigid floors. Unroll felts and allow them to flatten out before application.

C. Handle all materials to avoid damage. Handle all materials in such a manner as to preclude damage and contamination with moisture or foreign matter. Keep away from open fire, flame, or any ignition source. Vapors may form explosive mixtures with air. Avoid skin and eye contact with this material. Avoid breathing fumes. Do not eat, drink, or smoke in the application area. Workers shall wear long sleeve shirts, long pants and work boots. Workers shall wear butyl rubber or nitrile gloves when mixing or applying this product. Use safety glasses with side shields for eye protection. Use local exhaust ventilation to maintain worker exposure below TLV as listed on SDS for respective products. If the airborne concentration poses a health hazard, becomes irritating, or exceeds recommended limits, use a NIOSH approved respirator in accordance with OSHA Respirator Protection requirements. The specific type of respirator will depend on the airborne concentration. A filtering face piece or dust mask is not acceptable for use with this product if TLV filtering levels have been exceeded.

D. Damaged Material: Any materials found damaged or stored in any manner other than stated above will be rejected, removed, and replaced at the Contractor's expense.

E. Do not dilute primers, solvents, cements, adhesives, coatings, or sealants. Keep containers closed except when removing materials from them. Do not allow petroleum extracts or oil in any form to contact the membrane materials or their components.

3.4 SUBSTRATE PREPARATION:

A. Prepare all substrate surfaces scheduled to receive waterproofing and flashing in accordance with the Waterproofing System manufacturer's recommendations and requirements and as provided in this Section.

B. Continually remove all dust and debris from all concrete surfaces by sweeping and blowing with compressed air and/or vacuuming.

C. Concrete

1. New and existing concrete shall be free of oil, grease, curing compounds, loose particles, moss, algae growth, laitance, friable matter, dirt, bituminous products, and previous waterproofing materials.

2. The substrate shall be sound and all spalls, voids, and blow holes on vertical or horizontal surfaces must be repaired prior to placement of the primer coat. Ensure all uneven areas are leveled using cementitious or other suitable materials . Repair in accordance with the Commissioner's requirements and as approved by the membrane manufacturer.

3. Concrete surfaces with a steel float finish must be sandblasted or equivalent prior to the application of the Waterproofing System. The amplitude of any voids, cleaning, or scarification procedures must not exceed 1/4 in.

4. Mark deficiencies in the concrete substrates that adversely affect waterproofing installation for correction by the Contractor. Notify the Commissioner in writing of the deficiencies. Cracks in the

concrete not considered a defect or detrimental to the structure shall be addressed during the waterproofing installation as directed in this Section.

5. Extent and location of thin surface patching requires approval of the Commissioner and membrane manufacturer prior to the application of any system component.

6. Repair all concrete substrate cracks in accordance with the waterproofing manufacturer's instructions prior to the installation of the waterproofing membrane.

7. For concrete materials with a compressive strength of less than 3,500 psi, contact waterproofing manufacturer's technical department for substrate preparation requirements.

D. Steel Metal

1. Clean and prepare metal surfaces to near white metal in accordance with SSPC-SP3 (power tool clean) or as required by membrane manufacturer. Extend preparation a minimum of 3 in. beyond the termination of the membrane flashing materials. Notch steel surfaces to provide a rust-stop.

2. In addition to cleaning, abrade all metal surfaces to provide a rough open surface. A wire brush finish is not acceptable.

3. Wipe prepared metal surface with Methyl Ethyl Ketone (MEK) or other acceptable solvent cleaner prior to application of primer.

E. Wood/Plywood

1. Plywood shall be identified with American Plywood Association (APA) grade trademarks and shall meet the requirements of product standard PS1.

F. Masonry

1. All masonry joints to be filled and tooled flush to provide an even substrate.

G. Other Flashing Surfaces

1. Remove all contaminants as required by membrane manufacturer. Perform surface preparation by means approved by the Commissioner.

3.5 GENERAL WORKMANSHIP FOR WATERPROOFING:

A. Stir all liquid components before each use to thoroughly combine components as recommended by the manufacturer.

1. Apply liquids in a smooth, even coating without globs.

2. Use pump cans to dispense cleaning fluids.

3.6 SHEET MEMBRANE AND FLASHING INSTALLATION:

A. Prime all surfaces to receive waterproofing membrane. Allow primer to dry until it is slightly tacky.

B. Apply waterproofing membrane in compliance with manufacturer's printed instructions, unless modified by this Section. Do not lap membrane directly onto thermoplastic roofing membrane or other non-compatible material; separate two membranes with a strip of stainless steel sheet metal where required.

1. Begin application of sheets at bottom of wall and work up the surface; install the waterproofing membrane horizontally over the backup. Install successive courses in shingle fashion, lapping the upper course over the lower course 4 in. minimum. Reverse laps are not permitted unless approved by the Commissioner at each specific location. Lap vertical joints at end laps 6 in. minimum and stagger end laps 24 in. minimum.

2. Roll out sheets on primed surfaces and align. Reroll one-half of the sheet in its long direction and cut through release paper, taking care not to cut the membrane.

3. Roll the membrane onto primed surfaces, pulling release paper in front of the roll such that once release paper is removed, membrane is immediately set onto the surface. Place sheets without fishmouths or wrinkles. Do not stretch the membrane.

4. If fishmouths and wrinkles appear, cut out and flatten the affected area and cover with membrane extending at least 6 in. beyond the cut on all sides. Examine all seams in membrane thoroughly for fishmouths and wrinkles, and repair as above. Seal all edges of membrane patches with liquid membrane.

5. Immediately after applying the membrane sheet, hand press into contact with the surface, and roll the entire membrane towards lap seams with a handheld neoprene roller. Remove air pockets and patch as required by manufacturer Create a uniform and complete bond.

6. Seal all exposed perimeter edges at temporary tie-ins with specified mastic each day and remove mastic before applying additional membrane. Do not apply membrane over any mastic sealing materials.

7. Re-prime areas that become dirty and debris covered during the course of the work, or if primed area is exposed for more than seven days prior to installing membrane.

8. Where liquid membrane is used to seal a membrane edge, the liquid membrane must fully cover the edge such that the edge is not visible through the liquid membrane.

9. Only where the Commissioner has specifically approved a reverse lap in the membrane, install a continuous termination bar across the top edge of the reverse lapped membrane. Fully seal the termination bar with liquid membrane tooled to a fillet profile.

C. Provide liquid membrane cants where substrate changes direction (e.g., inside corners).

D. Mix liquid membrane from the manufacturer's standard size packages only. "Batch mixing" of small quantities of liquid membrane is not allowed.

E. Connect and seal exterior wall membrane air barrier continuously to roofing-membrane air barrier, concrete below-grade structures, floor-to-floor construction, exterior glazing and window systems, glazed curtain-wall systems, storefront systems, exterior louvers, exterior door framing, and other construction used in exterior wall openings, using accessory materials, as shown on the Drawings.

F. Wall Openings: Prime concealed, perimeter frame surfaces of windows, curtain walls, storefronts, and doors. Apply membrane transition strip as shown on the Drawings so that a minimum of 3 in. of coverage is achieved over each substrate; provide maximum coverage possible for fenestration system surfaces less than 3 in.

G. Do not cover membrane waterproofing and flashings until they have been tested and inspected by the third party testing agency.

H. Correct deficiencies in or remove sheet membrane and flashings that does not comply with requirements; repair substrates and reapply air barrier components.

3.7 FIELD QUALITY CONTROL:

A. Inform the Commissioner in writing on a daily basis of any of the following events. State specific locations of each occurrence.

1. Damage by other trades.
2. Debonded areas of membrane.
3. Fishmouths or other deficiencies in the membrane.
4. Leakage through the finished waterproofing membrane.

B. Provide site access to the authorized representative(s) including inspectors, Commissioner, and manufacturers' for inspection of the waterproofing membrane.

C. Inspections: Arrange for the manufacturer's representative and Commissioner to inspect the substrate prior to installation and to review the completed work, during all phases of installation, and as required to assure conformance with Manufacturer's specifications and the Contract Documents. Manufacturer to perform adhesion tests and provide results in a field report with recommendations to repair areas that fail adhesion test. Sheet membrane materials, accessories, and installation are subject to inspection for compliance with requirements. Inspections will include the following:

1. Continuity of air barrier system has been achieved throughout the building envelope with no gaps or holes.
2. Continuous structural support of air barrier system has been provided.
3. Masonry and concrete surfaces are smooth, clean, and free of cavities, protrusions, and mortar droppings.
4. Site conditions for application temperature and dryness of substrates have been maintained.
5. Maximum exposure time of materials to UV deterioration has not been exceeded.
6. Surfaces have been primed, if applicable.
7. Laps in sheet materials comply with the minimum requirements and have been shingled in the correct direction (or mastic applied on exposed edges), with no fishmouths.
8. Termination mastic has been applied on cut edges.

9. Sheet membrane has been firmly adhered to substrate.

10. Compatible materials have been used.

11. Transitions at changes in direction and structural support at gaps have been provided.

12. Connections between assemblies (membrane and sealants) comply with requirements for cleanliness, surface preparation and priming, structural support, integrity, and continuity of seal.

13. All penetrations have been sealed.

D. Provide the Commissioner with the manufacturer's field report (prior to installation of the insulation and cladding) stating that the waterproofing has been inspected and is acceptable. Do not cover the membrane until the manufacturer inspects and accepts, in writing, the sheet membrane installation, and states it is fully eligible for the manufacturer's warranty, without exceptions, unless agreed to in writing by the City of New York.

3.8 CLEANING AND PROTECTION:

A. Refer to requirements in the DDC General Conditions.

B. Coordinate with other trades to avoid traffic over completed work areas. Arrange work sequence to avoid use of newly constructed waterproofing and flashing for storage, walking, and equipment movement. Move equipment and ground storage areas as work progresses to avoid abuse of waterproofing, as permitted by the City of New York. Notify the Commissioner immediately and in writing if anyone abuses or damages waterproofing or flashing components, and make necessary restoration with no additional cost to the City of New York.

C. Against Loads: Protect work of this Section against concentrated loads and any other loads or equipment that would damage the materials or work.

D. Against Traffic: Do not permit traffic on horizontally installed work of this Section, except for workmen doing the work, during and after the installation.

E. Take and maintain necessary preventative measures to protect work of this Section from damage until Project has reached substantial completion.

F. Upon completion of waterproofing and flashings (including all associated components), institute appropriate procedures for surveillance and protection of waterproofing during remainder of construction period. Protect all areas where membrane has been installed.

G. Promptly remove primer or membrane system from adjacent surfaces and leave Waterproofing System area in broom clean condition.

H. Promptly remove from the site all materials or incomplete waterproofing exposed to moisture and/or any work rejected by the Commissioner.

END OF SECTION 07 27 00

SECTION 07 42 14
Metal Panels

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

A. The following documents apply to all required work for the Project: (1) the Contract Drawings, (2) the Specifications, (3) the General Conditions, (4) the Addendum, and (5) the Contract (City of New York Standard Construction Contract).

B. LEED General Requirements

1. Refer to DDC General Conditions.

a. Section 01 33 00 – Submittal Procedures.

b. Section 01 74 19 – Construction Waste Management and Disposal.

c. Section 01 81 13.01 – Sustainable Design Requirements for LEED v4 Buildings.

d. Section 01 81 19 – Indoor Air Quality Requirements for LEED Buildings.

1.2 SUMMARY:

A. This Section includes the Metal Panel components for the associated building enclosure systems described in the Building Enclosure System Matrix. For a description of where Panels are required as well as additional requirements, refer to the Related Sections.

1. For all Panels described, supply and install all components and their subcomponents of the work required to provide a complete system, including but not limited to the following:

a. Panels.

b. Finishes, coatings, and surface treatments.

B. This Section incorporates the use of Sealants. Requirements specified in this Section are in addition to those in the following Section:

1. Section 07 92 01 – Exterior Joint Sealants.

C. The following Sections describe systems that incorporate Metal Panels, and will require coordinated interfaces:

1. Section 05 40 00 – Cold Formed Metal Framing.

2. Section 05 50 00 – Miscellaneous Metals.

3. Section 07 00 01 – Rainscreen System.

4. Section 07 95 00 – Expansion Control.

5. Section 08 40 01 – Glazed Storefronts and Curtain Wall System.

D. Reference Documents

1. Building Enclosure System Matrix: Refer to Drawing EN1-003.

2. Samples Matrix: Refer to Drawing EN1-003.

1.3 DEFINITIONS:

A. Referenced System: Building enclosure system as specified by the Building Enclosure System Matrix.

B. Metal Panel Assembly: Metal Panels, attachment system components, miscellaneous metal framing, and accessories necessary for a complete Metal Panel cladding system.

1.4 REFERENCE STANDARDS AND REGULATIONS:

A. Refer to DDC General Conditions.

B. The Contractor's Engineering, materials, and workmanship shall comply with 2014 New York City Building Code. Where their recommendations or requirements are to a lower standard than required by this Contract Document, the Contract Documents shall take precedence.

C. Comply with applicable provisions and recommendations of the standards listed below. Where standards conflict or conflict with the provisions of these Specifications, the more stringent shall apply. Unless otherwise noted the latest editions of the standards shall apply:

1. American Architectural Manufacturers Association (AAMA)

a. AAMA 611 – Voluntary Specification for Anodized Architectural Aluminum.

b. AAMA 620 – Voluntary Specifications for High Performance Organic Coatings on Coil Coated Architectural Aluminum Substrates.

c. AAMA 621 – Voluntary Specifications for High Performance Organic Coatings on Coil Coated Architectural Hot Dipped Galvanized (HDG) and Zinc-Aluminum Coated Steel Substrates.

d. AAMA 2605 – Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels.

2. Aluminum Association (AA)

a. AA Aluminum Standards and Data.

b. AA ADM-1 Aluminum Design Manual.

3. ASTM International (ASTM)

a. ASTM B209/B209M – Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.

b. ASTM B221/B221M – Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.

c. ASTM B308/B308M – Standard Specification for Aluminum-Alloy 6061-T6 Standard Structural Profiles.

d. ASTM B429/B429M – Standard Specification for Aluminum-Alloy Extruded Structural Pipe and Tube.

e. ASTM B449 – Standard Specification for Chromates on Aluminum.

f. ASTM D523 – Standard Test Method for Specular Gloss.

g. ASTM D1400 – Standard Test Method for Nondestructive Measurement of Dry Film Thickness of Nonconductive Coatings Applied to a Nonferrous Metal Base.

h. ASTM D1781 – Standard Test Method for Climbing Drum Peel for Adhesives.

i. ASTM D2244 – Standard Practice for Calculation of Color Tolerances and Color Differences from Instrumentally Measured Color Coordinates.

j. ASTM D3363 – Standard Test Method for Film Hardness by Pencil Test.

k. ASTM D4214 – Standard Test Methods for Evaluating the Degree of Chalking of Exterior Paint Films.

l. ASTM E84 – Standard Test Method for Surface Burning Characteristics of Building Materials.

m. ASTM E119 – Standard Test Methods for Fire Tests of Building Construction and Materials.

n. ASTM E329 – Standard Specification for Agencies Engaged in Construction Inspection, Testing, or Special Inspection.

4. National Association of Architectural Metal Manufacturers / National Ornamental & Miscellaneous Metals Association (NAAMM/NOMMA)

   a. NAAMM/NOMMA 500-06 – Metal Finishes Manual for Architectural and Metal Products.

5. National Fire Protection Association (NFPA)

   a. NFPA 259 – Standard Test Method for Potential Heat of Building Materials.

   b. NFPA 268 – Standard Test Method for Determining Ignitability of Exterior Wall Assemblies Using a Radiant Heat Energy Source.

   c. NFPA 285 – Standard Fire Test Method for Evaluation of Fire Propagation Characteristics of Exterior Non-Load-Bearing Wall Assemblies Containing Combustible Components.

6. Sheet Metal and Air Conditioning Contractors' National Association (SMACNA)

   a. SMACNA Architectural Sheet Metal Manual.

1.5 PERFORMANCE REQUIREMENTS:

A. General Prescriptive Requirements

1. Metal Panel Assembly shall meet the performance requirements specified for the Referenced System.
   a. Provide Panels where indicated in the Drawings.
   b. Panels shall not have any visible fasteners, telegraphing, or fastening on the Panel faces or any other compromise of a neat and flat appearance.

B. General Performance

1. Comply with performance requirements specified, and as validated by Pre-Construction Mockup testing as described in Section 01 43 39 – Facade Mockup Testing and Samples.
2. Engineer Panels, including comprehensive engineering according to the intended use, appropriate standards, and per the manufacturer's recommendations.
3. All Panels used shall be Engineered by a qualified Professional Engineer licensed in the State of New York.
4. Failure includes inability of the Panels to meet the performance requirements set forth in this and as required for adjacent systems including:
   a. Structural failure including, rupturing, cracking, buckling, or puncturing.
   b. Deterioration of metals and other materials beyond normal weathering.
   c. Structural failure of components resulting from forces within specified limits.
   d. Thermal stresses transferring to/from the Panels to the building structure.
   e. Excessive deflections.
   f. Excessive oil canning.
   g. Noise or vibration created by wind, and thermal and structural movements.
   h. Loosening or weakening of fasteners, attachments, and other components.
   i. Failure of touch-up finish to match factory finish.
   j. Staining of adjacent components or wetting of interior building components.
   k. Discoloration, fading, chalking, excessive non-uniformity, pitting, cracking, peeling, corrosion, or crazing of finish.
      1) Color fading more than 5 Hunter units when tested according to ASTM D2244.
      2) Chalking in excess of a No. 8 rating when tested according to ASTM D4214.
      3) Cracking, checking, peeling, or failure of paint to adhere to bare metal.

1. Failure to fulfill other specified performance requirements.

C. Durability Performance

1. Panels shall withstand the specified deleterious and degrading effects defined by the Referenced System.

2. Materials used in the Panels shall resist attack or infestation by plants, micro-organisms, fungi, insects, or other vermin.

3. Bond Integrity

a. When tested for bond integrity, in accordance with ASTM D1781 (simulating resistance to panel delamination), no adhesive failure of the bond a) between the core and the skin or b) cohesive failure of the core itself below the following values:

1) Peel Strength: 22.5 in lbs per inch as manufactured.

2) Peel Strength: 22.5 in lbs per inch after twenty-one (21) days soaking in water at 70°F.

D. Structural Performance

1. Metal Panel assembly shall transmit and resist loads and its combinations as defined by the Referenced System, to the supporting framing of that system.

E. Movement Performance

1. Panels shall accommodate the movements specified and developed by the Referenced System without any reduction in the performance below the minimum levels required herein.

a. Maximum Center of Panel Deflection: Span/90.

F. Fire Performance

1. Panels shall meet the performance requirements specified for the Referenced System.

G. Lightning Protection Performance

1. Panels shall meet the performance requirements specified for the Referenced System.

1.6 SUBMITTAL PROCEDURES:

A. Refer to DDC General Conditions Section 01 33 00 – Submittal Procedures.

1.7 SUBMITTALS:

A. Shop Drawings.

B. Calculations

1. Provide structural calculations.

C. Testing reports.

D. Product data.

E. LEED Submittals.

F. Samples

1. Provide Samples as indicated in the Samples Matrix for the Referenced System.

G. Quality Control Plan

1. For Metal Panel products, submit manufacturer's guidelines highlighting the verification of acceptable manufacturing tolerances and defects.

2. Provide certification from Metal Panel producer/fabricator that the Metal Panel producer/fabricator has reviewed the details and thicknesses and finds same suitable for the purpose intended in accordance with its published literature and in accordance with these Specifications. This includes, but is not limited to, a written analysis of stress due to wind load, environmental conditions, and thermal factors anticipated at the completed Project.

H. Product Test Reports

1. Provide confirmation from Metal Panel producer/fabricator and where applicable from gasket and sealant manufacturer that gaskets and sealants that contact Metal Panels are chemically and otherwise compatible.

I. Quality control reports.

J. Provide closeout submittals as specified.

1.8 QUALITY ASSURANCE:

A. Refer to DDC General Conditions Section 01 40 00 – Quality Requirements.

B. Testing Agency Qualifications: Qualified according to ASTM E329 for testing indicated.

C. Source Limitations

1. Obtain each type of Panel type from single source from single manufacturer.

1.9 WARRANTY:

A. Refer below and to the requirements for Referenced System.

B. Unless stated otherwise in these Specifications, Warranty shall state that the Panels are, free from defects in materials and workmanship for a period of 2 yrs from the date of substantial completion. Contractor shall agree to promptly repair or replace defective materials and workmanship to "like new condition," including such exploratory work, required to determine the cause, during the Warranty period, at no additional cost to the City of New York.

C. In addition to Contractor's Guarantee, the paint finish manufacturer shall guarantee the finish for a period of 20 yrs from the date of Substantial Completion.

D. The Contractor shall be responsible for repairing damage to the building and furnishings occasioned by defective materials or workmanship or damage as part of repairs to the Panels.

1.10 PROJECT CONDITIONS

A. Adjacent Trade Shop Drawing Review and Field Measurements: Verify actual locations of structural supports for Contract Work by review of supporting structure Shop Drawings or field measurements before fabrication and indicate measurements on Shop Drawings.

PART 2 - PRODUCTS

2.1 MATERIALS:

A. Aluminum Components

1. Manufacturer's recommended alloy and temper, meeting the requirements and standards listed herein for type of use and finish in accordance with:

a. Sheet and Plate: ASTM B209.

2.2 METAL PANELS:

A. Formed Metal Panels

1. Factory-formed Panels fabricated from single sheets of metal formed into profile for installation method indicated. Include required attachment system components, Panel stiffeners, and accessories.

2. Products: Subject to compliance with requirements, available products that may be incorporated into the Panels include, but are not limited to, the following:

a. Corrugated Metal panel (MP-01, MP-01A, MP-02, and MP-02A)

1) Morin Corporation, a Kingspan Company; Integrity S-16.

2) ATAS International, Inc.; CorraLock.

3) Berridge Manufacturing Co.; H-16.

4) Or approved equal.

b. Ribbed Metal Panel Rainscreen (MP-03)

1) QC Facades; Quadroline.

2) ATAS International, Inc.; Metafor.

3) Metal Sales Mfr Corp; Empire Series.

4) Or approved equal.

c. Exterior Corrugated Metal Panel (MP-04)

1) Morin Corporation, a Kingspan Company; Exposed MR-36 solid.

2) ATAS International, Inc.

3) Berridge Manufacturing Co.; H-16.

4) Or approved equal.

B. Metal-Faced Composite Panels

1. Factory formed and assembled, metal-faced composite Panels fabricated from two metal facings bonded, using no glues or adhesives, to solid, extruded thermoplastic core; formed into profile for installation method indicated. The core material shall be free of voids and/or air spaces and not contain foamed insulation material. Product laminated sheet by sheet in a batch process; use of glues or adhesives between materials is not acceptable.

2. Products: Subject to compliance with requirements, available products that may be incorporated into the work include, but are not limited to, the following:

a. Flat Composite Metal Panel (MP-06, MP-07, and MP-08)

1) ALPOLIC, Division of Mitsubishi Chemical America, Inc.; ALPOLIC/fr,.

2) Alcan Composites USA Inc.; Alucobond Plus.

3) Alcoa Inc.; Reynobond FR.

4) Or approved equal.

3. Face Sheet Material

a. Aluminum, minimum 0.020 in. thick.

4. Panel Thickness: As required to meet the performance requirements.

2.3 FINISHES:

A. General

1. Comply with requirements in Referenced System.

2. Finish: Refer to Building Enclosure System Matrix.

3. Comply with NAAMM/NOMMA 500-06 – Metal Finishes Manual for Architectural and Metal Products for recommendations for applying and designating finishes.

4. Noticeable variations in same piece are not acceptable. Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

5. Choose finishes so touch-up finishes match factory finish.

6. Discoloration, fading, chalking, excessive non-uniformity, pitting, cracking, peeling, corrosion, or crazing of finish is not allowed.

7. The terms below used in conjunction with finish Guarantee are defined as follows:

   a. "Excessive Fading": Means a change in appearance that is perceptible and objectionable as determined by the Commissioner when viewed visually in comparison with the original color range standards.

   b. "Excessive Non-Uniformity": Means non-uniform fading during the Guarantee period to the extent that adjacent parts have a color difference greater than the original acceptable color range.

   c. "Will Not Pit or Otherwise Corrode": Means no pitting or other type of corrosion of finish discernible from a distance of 10 ft, resulting from the natural elements in the atmosphere at the Project site.

PART 3 - EXECUTION

3.1 EXECUTION:

A. Refer to DDC General Conditions for execution requirements.

3.2 EXAMINATION:

A. Examine roughing-in for components and systems penetrating Panels to verify actual locations of penetrations relative to seam locations of Panels before Panel installation.

3.3 DELIVERY, STORAGE, AND HANDLING:

A. Deliver components, sheets, Panels, and other manufactured items to prevent damage or deformation. Package Panels for protection during transportation and handling.

B. Unload, store, and erect Panels in a manner to prevent bending, warping, twisting, and surface damage.

C. Store Panels vertically, covered with suitable weathertight and ventilated covering. Store Panels to ensure dryness, with positive slope for drainage of water.

D. Do not store Panels in contact with other materials that might cause staining, denting, or other surface damage. Do not allow storage space to exceed 120°F.

E. Complete installation and concealment of plastic materials as rapidly as possible in each area of construction.

F. Retain strippable protective covering on Panel for period of Panel installation.

3.4 FABRICATION:

A. General

   1. Refer to requirements of the Referenced System.

2. Fabricate and finish Metal Panel assembly and accessories at the factory to greatest extent possible, by manufacturer's standard procedures and processes, as necessary to fulfill indicated performance requirements.

3. Follow manufacturer's recommendations for Panel fabrication.

B. Tooling

1. Tooling shall not contain elements made of materials that may react with the Panel materials.

C. Assembly

1. Fabricate components that, when assembled, have the following characteristics:

a. Grind, cut, and shape metals using tools which will not contaminate them with particles which could stain or corrode them.

b. Accurately formed joints without lipping or offsets in visible surfaces unless Engineered otherwise. Rigidly secure other joints to prevent all but engineered movement, unless shown otherwise.

c. Profiles are sharp, straight, and free of defects or deformations.

d. Accurately fitted joints with ends coped or mitered.

e. Means to drain water passing joints.

f. Fasteners, anchors, and connection devices that are concealed from view to greatest extent possible.

D. Cutting, Drilling, and Milling

1. Minimize use of arc cutting and acetylene gas cutting as much as feasible. If required, Contractor shall submit procedures to demonstrate material hardness remain within the required limits.

E. Pressing and Folding

1. Perform pressing and folding of Metal Panels according to manufacturers' recommendations.

F. Fabrication Tolerances

1. Dimensional Tolerances for Metal Panels

a. Length and Width: ± 0.032 in. up to 48 in.; ± 0.064 in. more than 48 in.

b. Diagonal: ± 0.1875 in.

c. Panel Bow: Not more than 0.2% of Panel width or length up to 0.0625 in. maximum.

d. Thickness: ± 0.008 in.

e. Squareness: 0.125 in. maximum difference between diagonal measurements.

f. Camber: 0.032 in.

G. After fabrication, clearly mark components to identify their locations in Project according to Shop Drawings.

3.5 INSTALLATION:

A. Provide complete installation.

B. Comply with manufacturer's recommended installation guidelines.

C. Do not install damaged components.

D. Rigidly secure non-moving joints. Install anchors with separators and isolators to prevent metal corrosion and electrolytic deterioration.

3.6 ERECTION TOLERANCES:

A. Install Panels to comply with the following maximum tolerances specified in the referenced system.

END OF SECTION 07 42 14

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SECTION 07 46 46
Fiber-Cement Panels

PART I - GENERAL

1.1 RELATED DOCUMENTS

A. The following documents apply to all required work for the Project: (1) the Contract Drawings, (2) the Specifications, (3) the General Conditions, (4) the Addendum and (5) the Contract (City of New York Standard Construction Contract).

B. LEED General Requirements:

1. Refer to DDC General Conditions

a. Section 01 33 00 "Submittal Procedures"
b. Section 01 81 13.04 "Sustainable Design Requirements for LEED v4 Buildings"
c. Section 01 81 19 "Indoor Air Quality Requirements for LEED Buildings"

1.2 SUMMARY

A. Section includes:

1. Fiber-cement wall panels and trim; rainscreen panel system.
2. Trim and accessories required for complete installation.
3. Sealant in conjunction with fiber-cement wall panel work.

B. Related Sections

1. Cold-Formed Metal Framing - Section 05 40 00.
2. Rainscreen System - Section 07 00 01.
3. Weather Resistive Barriers - Section 07 27 01.
4. Sheet Metal Flashings - Section 07 62 01.
5. Exterior Joint Sealants - Section 07 92 01.

1.3 QUALITY ASSURANCE

A. Refer to DDC General Conditions Section 01 40 00 "Quality Requirements".

B. Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this Section.

C. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for fabrication and installation.

1. Build mockups for siding including accessories.

   a. Size: See Drawings.
   b. Show exposure, shadow detail with trim piece, and corner lapping.

2. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.4 PERFORMANCE CRITERIA

A. Comply with 2014 New York City Building Code.

B. Wind Load: The fiber cement panel systems including all rivet layouts, clips, rails and girts shall be installed to meet the positive and negative wind load requirements as set forth in the 2014 New York City Building Code, structural exterior cladding pressures, and ASCE/ SEI 7, whichever is the greatest.

1.5 SUBMITTAL PROCEDURES

A. Refer to DDC General Conditions Section 01 33 00 "Submittal Procedures".

1.6 SUBMITTALS

A. Manufacturer's Data: Submit standard detail drawings and installation instructions for fiber cement siding. Include manufacturer's certification or other data substantiating that the materials and finishes comply with the requirements. Indicate by copy of transmittal that the Installer has received a copy of the installation instructions.

B. Samples: Submit twelve (12) inch long by full width samples of each type of fiber cement cladding, complete with factory-applied finish.

C. Shop Drawings: Submit shop drawings showing the fiber cement cladding, and the details of forming, jointing (gaskets), internal supports, anchorages, trim, flashing, and accessories. Show details of weatherproofing at edges, terminations, and penetrations of the fiber cement cladding work. Show small scale layout and elevations of entire work.

D. Engineering Data: Submit engineering and test data and tables showing performance characteristics of the panels for loads and deflections.

E. Submit signed and sealed calculations and shop drawings by a Professional Engineer licensed in the State of New York.

1.7 WARRANTY

A. Provide manufacturer's standard 30-year warranty for cementitious siding.

PART II - PRODUCTS

2.1 MANUFACTURERS

A. Fiber-Cement Panels

1. Panel Thickness: As indicated on the drawings.
2. Color: See Finish Schedule.
3. Panel Size: As indicated on the drawings.
4. Basis of Design: Subject to compliance with requirements, provide Cembrit; Cembrit Solid or comparable product by one of the following:
   1). Swisspearl
   2). Nichicha
   3). Or approved equal

B. Fasteners: Stainless steel as shown on drawings.

C. Soffit Vents: Provide continuous, mill finished aluminum, hat-shaped vents, with stamped louvers; 2" wide and not less than 96" long.

2.2 MATERIALS

A. Panel Material (Description): High-strength fiber-cement panel featuring polypropylene reinforcement strips inserted into the matrix for maximum strength.

1. Matrix manufactured using Portland cement and water and further reinforced with cellulose and textile fibers.
2. Panel Profile: As indicated on Drawings.
3. Finish: See Finish Schedule.

B. Panel Physical Dimensions and Characteristics:

1. Thickness: 12 mm.
2. Panel Lengths: As determined by manufacturer for structural integrity, desired aesthetic qualities, and most efficient application.
3. Panel Size: As indicated on Drawings.

C. 2-piece extruded aluminum anchor clips attached over thermal isolator pads.

D. Purlins and Girts: Formed from extuded aluminum, painted black, and engineered by panel manufacturer to meet required structural criteria and shapes as shown on drawings.

E. Trim Material: Furnish necessary trim in conjunction with the cement panel wall system, including feature strips, top, bottom, corner, end units, etc. All exposed members finished to match panels..

F. Sealant: One part polysulfide or polyurethane conforming to Fed. Spec. TT-S-00230-C, approved by panel manufacturer.

G. Fasteners: Fasteners shall be stainless steel, in conjunction with EPDM washers. All fasteners shall be concealed. Fastening/clip system to be manfacturer's standard concealed fastening system.

H. Contractor to provide all necessary angles, Unistrut, compression structure, attachments, etc., for the panels.

I. Contractor to provide accessible mounting system for panels as noted on drawings.

J. Rainscreen Systems: See Section 07 00 01, Rainscreen System.

2.3 ACCESSORIES

A. Flashing: Provide stainless steel flashing where indicated complying with Section 07 62 01, Sheet Metal Flashings.

B. Fasteners: Stainless steel (Type 304) self-tapping screws, bolts, nuts, self-locking rivets and bolts, end-welded studs, and other suitable fasteners, designed to withstand design loads. Provide exposed fasteners with neoprene gaskets and heads matching color of wall panels by means of plastic caps or factory-applied coating.

1. Blind Fasteners for Wall Panels: High-strength stainless steel rivets, with powder coated head, neoprene gaskets, and self-adhesive foam tape.

C. Sub-Framing: Formed from extruded aluminum in shapes and profiles as required and indicated, and engineered to meet required structural criteria and performance as indicated.

1. All framing behind open joints shall be painted black.

2. All clip devices used to secure sub-frame to metal studs shall be of Type 304 stainless steel.

D. Trim Material: Furnish necessary trim in conjunction with the cement panel wall system, including feature strips, top, bottom, corners, end units, insect screens, etc. All exposed members finished to match panels.

1. Provide painted 3/16" aluminum angle trim at cement board edges to curtain wall (perforated and non-perforated) with concealed fasteners. Perforated angle trim shall be used at base rain screen cavities for ventilation. Painted finish for aluminum angle trim shall be 3-coat metallic thermo-cured, PVDF system.

E. Sealant: One-part sealants complying with Section 07 92 01, Exterior Joint Sealants and approved by panel manufacturer.

F. Vapor Barrier: Refer to Section 07 27 01, Weather Resistive Barriers.

2.4 FABRICATION

A. Comply with dimensions, profile limitations, and fabrication details shown and specified.

B. Fabricate components of the system at factory, ready for field assembly, including all cutting of panel and apertures according to drawings.

C. Fabricate components and assemble units to comply with manufacturer's published performance requirements.

D. Factory-apply specified finishes in conformance with manufacturer's standards, and according to coating manufacturer's instructions.

PART III - EXECUTION

3.1 EXECUTION REQUIREMENTS

A. Refer to DDC General Conditions for execution requirements.

3.2 INSTALLATION

A. General: Comply with panel manufacturer's instructions for assembly and installation.

B. Anchor component parts of the preformed cement panel system securely in place, providing for necessary thermal and structural movement. Drill holes in structural steel members as required for anchorage in accordance with approved shop drawings.

C. Deflection Limitations: L/360.

D. Vertical structure carrying ceiling panels shall be 4'-0" o.c. at exterior and 5'-0" o.c. at interior.

3.3 CLEANING AND PROTECTION

A. Clean exposed surfaces of cladding work promptly after completion of installation. Comply with recommendations of the panel manufacturer.

B. Protection: Ensure that the work will be without damage or deterioration at the time of Substantial Completion.

END OF SECTION 07 46 46

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SECTION 07 52 16
Modified Bituminous Membrane Roofing

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The following documents apply to all required work for the Project: (1) the Contract Drawings, (2) the Specifications, (3) the General Conditions, (4) the Addendum and (5) the Contract [City of New York Standard Construction Contract].

B. Environmentally Preferable Purchase (EPP) General Requirements:
   1. Refer to the Addendum to the General Conditions

1.2 SUMMARY

A. Section Includes:

   1. Styrene-butadiene-styrene (SBS)-modified bituminous membrane roofing.
   2. Substrate board.
   3. Vapor retarder.
   4. Roof insulation.
   5. Cover board.

B. Section includes the installation of sound-absorbing insulation strips in ribs of roof deck. Sound-absorbing insulation strips are furnished under Section 053100 "Steel Decking."

C. Related Sections:

   1. Section 062000 "Carpentry"
   2. Section 072100 "Thermal Insulation"
   3. Section 076201 "Façade Sheet Metal Flashings"
   4. Section 077100 "Roof Specialties and Accessories"
   5. Section 079201 "Exterior Joint Sealants"

1.3 SCOPE OF WORK

A. The general scope of work will include a new roofing system to be installed for the existing garage building only. Work shall occur where the proposed new elevator bulkhead requires cutting and removing a portion of the existing roof and installation/patching of new infill. Continued warranty of existing roof shall be maintained.

1.4 DEFINITIONS

A. Roofing Terminology: Definitions in ASTM D 1079 and glossary of NRCA's "The NRCA Roofing Manual: Membrane Roof Systems" apply to Work of this Section.

1.5 PREINSTALLATION MEETINGS

A. Preliminary Roofing Conference: Before starting roof construction, conduct conference at District SI-3 Garage, 1000 West Service Road, Staten Island, New York 10314.

1. Meet with the Commissioner, testing and inspecting agency representative, roofing Installer, roofing system manufacturer's representative, deck Installer, air barrier Installer, and installers whose work interfaces with or affects roofing, including installers of roof accessories and roof-mounted equipment.
2. Review methods and procedures related to roofing installation, including manufacturer's written instructions.
3. Review and finalize construction schedule, and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
4. Review deck substrate requirements for conditions and finishes, including flatness and fastening.
5. Review structural loading limitations of roof deck during and after roofing.
6. Review base flashings, special roofing details, roof drainage, roof penetrations, equipment curbs, and condition of other construction that affects roofing system.
7. Review temporary protection requirements for roofing system during and after installation.
8. Review roof observation and repair procedures after roofing installation.

B. Preinstallation Roofing Conference: Conduct conference at District SI-3 Garage, 1000 West Service Road, Staten Island, New York 10314.

1. Meet with the Commissioner, testing and inspecting agency representative, roofing Installer, roofing system manufacturer's representative, deck Installer, air barrier Installer, and installers whose work interfaces with or affects roofing, including installers of roof accessories and roof-mounted equipment.
2. Review methods and procedures related to roofing installation, including manufacturer's written instructions.
3. Review and finalize construction schedule, and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
4. Examine deck substrate conditions and finishes for compliance with requirements, including flatness and fastening.
5. Review structural loading limitations of roof deck during and after roofing.
6. Review base flashings, special roofing details, roof drainage, roof penetrations, equipment curbs, and condition of other construction that affects roofing system.
7. Review temporary protection requirements for roofing system during and after installation.
8. Review roof observation and repair procedures after roofing installation.

1.6 SUBMITTAL PROCEDURES

A. Refer to DDC General Conditions Section 01 33 00 "Submittal Procedures".

1.7 SUBMITTALS

A. Product Data: For each type of product.

1. For insulation and roof system component fasteners, include copy of FM Approvals' RoofNav listing.

B. Shop Drawings: Include plans, sections, details, and attachments to other work, including the following:

1. Layout and thickness of insulation.
2. Base flashings and membrane terminations.
3. Flashing details at penetrations.
4. Tapered insulation, including slopes.
5. Roof plan showing orientation of steel roof deck and orientation of roof membrane, fastening spacings, and patterns for mechanically fastened roofing system.
6. Crickets, saddles, and tapered edge strips, including slopes.
7. Insulation fastening patterns for corner, perimeter, and field-of-roof locations.
8. Tie-in with adjoining air barrier.

C. Samples for Verification: For the following products:

1. Cap Sheet: Bright White
2. Flashing Sheet

D. Wind Uplift Resistance Submittal: For roofing system indicating compliance with wind uplift performance requirements.

E. Qualification Data: For Installer.

F. Manufacturer Certificates:

1. Performance Requirement Certificate: Signed by roof membrane manufacturer certifying that roofing system complies with requirements specified in "Performance Requirements" Article.

a. Submit evidence of complying with performance requirements.

2. Special Warranty Certificate: Signed by roof membrane manufacturer, certifying that all materials supplied under this Section are acceptable for special warranty.

G. Product Test Reports: For roof membrane and insulation, tests performed by a qualified testing agency, indicating compliance with specified requirements.

H. Evaluation Reports: For components of membrane roofing system, from ICC-ES.

I. Field Test Reports:

1. Concrete internal relative humidity test reports.
2. Fastener-pullout test results and manufacturer's revised requirements for fastener patterns.

J. Field quality-control reports.

K. Sample Warranties: For manufacturer's special warranties.

L. Maintenance Data: For roofing system to include in maintenance manuals.

1.8 QUALITY ASSURANCE

A. Refer to DDC General Conditions Section 01 40 00 "Quality Requirements".

B. Manufacturer Qualifications: A qualified manufacturer that is UL-listed for roofing system identical to that used for this Project.

C. Installer Qualifications: The contractor or subcontractor performing the work for this section must be a company regularly engaged in performing roofing projects with its own workforce and have successfully completed in a timely fashion at least three (3) roofing projects similar in scope, size and type to the required work within the last three (3) consecutive years prior to the bid opening. At least one of those projects must have been performed within the last twelve (12) months. The three (3) qualifying projects must have utilized the Siplast Paradiene roof system, been installed by the contractor's or subcontractor's company utilizing its own workforce and must have qualified for, and have been issued, the warranty provided by Siplast. In addition, the contractor or subcontractor must be a certified or authorized installer for the Siplast Paradiene roof system specified herein and shall submit proof of same.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Deliver roofing materials to Project site in original containers with seals unbroken and labeled with manufacturer's name, product brand name and type, date of manufacture, approval or listing agency markings, and directions for storing and mixing with other components.

B. Store liquid materials in their original undamaged containers in a clean, dry, protected location and within the temperature range required by roofing system manufacturer.

1. Protect stored liquid material from direct sunlight.
2. Discard and legally dispose of liquid material that cannot be applied within its stated shelf life.

C. Protect roof insulation materials from physical damage and from deterioration by sunlight, moisture, soiling, and other sources.

1. Store in a dry location.
2. Comply with insulation manufacturer's written instructions for handling, storing, and protecting during installation.

D. Handle and store roofing materials, and place equipment in a manner to avoid permanent deflection of deck.

1.10 FIELD CONDITIONS

A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit roofing system to be installed according to manufacturer's written instructions and warranty requirements.

1.11 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace components of roofing system that fail in materials or workmanship within specified warranty period.

1. Special warranty includes roof membrane, base flashings, roof insulation, fasteners, cover boards, vapor retarder, substrate board and other components of roofing system.
2. Warranty Period: 20 years of Roof Membrane/System Guarantee from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. General Performance: Installed roofing system and flashings shall withstand specified uplift pressures, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction. Roof system and flashings shall remain watertight.

1. Accelerated Weathering: Roof membrane shall withstand 2000 hours of exposure when tested according to ASTM G 152, ASTM G 154, or ASTM G 155.
2. Impact Resistance: Roof membrane shall resist impact damage when tested according to ASTM D 3746/D 3746M, ASTM D 4272/D 4272M, or the "Resistance to Foot Traffic Test" in FM Approvals 4470.

B. Material Compatibility: Roofing materials shall be compatible with one another and adjacent materials under conditions of service and application required, as demonstrated by roof membrane manufacturer based on testing and field experience.

C. Wind Uplift Resistance: Design roofing system to resist the wind uplift pressures when tested according to FM Approvals 4474, UL 580, or UL 1897.

D. ENERGY STAR Listing: Roofing system shall be listed on the DOE's ENERGY STAR "Roof Products Qualified Product List" for low slope roof products.

E. Energy Performance: Roofing system shall have initial Solar Reflectance not less than 0.70 in accordance with ASTM C1549 and Thermal Emittance not less than 0.75 in accordance with ASTM C1371.

F. Exterior Fire-Test Exposure: ASTM E 108 or UL 790, Class A; for application and roof slopes indicated; testing by a qualified testing agency.

1. Identify products with appropriate markings of applicable testing agency.

G. Fire-Resistance Ratings: Comply with fire-resistance-rated assembly designs indicated.

1. Identify products with appropriate markings of applicable testing agency.

2.2 MANUFACTURERS

A. Source Limitations: Obtain components for roofing system from:

1. Siplast, 1000 Rochelle Blvd., Irving, TX 75062-3940. No Substitutions.

2.3 BASE SHEET MATERIALS

A. SBS-Modified Bitumen Fiberglass Mat Base Sheet: ASTM D 6163/D 6163M, Type II, Grade S, SBS-modified asphalt sheet, reinforced with fiberglass fabric, smooth surfaced, suitable for cold adhesive or hot asphalt application method.

B. Product: Paradiene 20 by Siplast. No Substitutions.

2.4 STYRENE-BUTADIENE-STYRENE (SBS) MODIFIED BITUMINOUS CAP SHEET

A. Granule-Surfaced Roofing Cap Sheet: ASTM D 6163/D 6163M, Type II, Grade G, SBS-modified asphalt sheet, reinforced with fiberglass fabric, suitable for cold adhesive or hot asphalt application method.
1. Granule Color: Bright White

B. Product: Paradiene 30 FR BW by Siplast. No Substitutions.

2.5 BASE FLASHING SHEET MATERIALS

A. Backer Sheet: ASTM D 6163/D 6163M, Type I or II, Grade S, SBS-modified asphalt sheet, reinforced with glass fibers smooth surfaced, suitable for application method specified.

B. Granule-Surfaced Flashing Sheet: ASTM D 6163/D 6163M, Type II, Grade G, SBS-modified asphalt sheet, reinforced with glass fibers granule surfaced, suitable for application method specified, and as follows:
1. Product: Paradiene 40 FR BW by Siplast. No Substitutions.
2. Granule Color: Bright White

C. Glass-Fiber Fabric: Woven glass-fiber cloth, treated with asphalt, complying with ASTM D 1668/D 1668M, Type I.

D. Liquid Flashing System: Parapro 123 Flashing by Siplast. No Substitutions.

2.6 AUXILIARY ROOFING MATERIALS

A. General: Auxiliary materials recommended by roofing system manufacturer for intended use and compatible with other roofing components.

1. Adhesives and Sealants: Comply with VOC limits of NYC Building Code.

2. Bituminous Roof Coatings: Maximum concentration of VOC 300 g/L.

B. Prefabricated Pipe Flashings: As recommended by roof membrane manufacturer.

C. Roof Vents: As recommended by roof membrane manufacturer.

1. Size: Not less than 4-inch diameter.

D. Metal Termination Bars: Manufacturer's standard, predrilled stainless-steel bars, approximately 1 by 1/8 inch thick; with anchors.

E. Cold-Applied Asphalt Adhesive: PA-311M Adhesive by Siplast. At all locations receiving Parapro 123 flashing, Siplast SFT Adhesive must be used. No Substitutions.

F. Asphalt Roofing Cement: PA-828 by Siplast. No Substitutions.

G. Mastic Sealant: Polyisobutylene, plain or modified bitumen; nonhardening, nonmigrating, nonskinning, and nondrying.

H. Fasteners: Factory-coated steel fasteners and metal or plastic plates complying with corrosion-resistance provisions in FM Approvals 4470, designed for fastening roofing components to substrate; tested by manufacturer for required pullout strength, and acceptable to roofing system manufacturer.

I. Miscellaneous Accessories: Provide those recommended by roofing system manufacturer.

2.7 SUBSTRATE BOARDS

A. Substrate Board: ASTM C 1177/C 1177M, glass-mat, water-resistant gypsum substrate or ASTM C 1278/C 1278M, fiber-reinforced gypsum board.
1. Product: Dens Deck Prime - Thickness: Type X, 5/8 inch.
2. Surface finish: Factory primed.
3. USG
4. Continental Building Products
5. Or approved equal

B. Fasteners: Factory-coated steel fasteners and metal or plastic plates complying with corrosion-resistance provisions in FM Approvals 4470, designed for fastening substrate board to roof deck.

2.8 VAPOR RETARDER

A. Self-Adhering-Sheet Vapor Retarder: ASTM D 5147 self-adhesive modified bitumen base ply, 102-mil total thickness; coated with a self-adhesive bitumen layer.

B. Product: Paradiene 20 SA by Siplast. No Substitutions.

2.9 ROOF INSULATION

A. General: Preformed roof insulation boards, manufactured by roof membrane manufacturer.

B. Polyisocyanurate Board Insulation: ASTM C 1289, Type II, Class 2, Grade 3, felt or glass-fiber mat facer on both major surfaces, tapered where/as required for positive pitch to drain.
   1. Compressive Strength: 25 psi.
   2. Size: 48 by 96 inches.
   3. Thickness:
      a. Base Layer: 2.6 inches minimum.
      b. Upper Layer: 2.6 inches minimum.

C. Sheathing Panel: Dens Deck Prime – Thickness: 5/8 inches.

2.10 INSULATION ACCESSORIES

A. General: Roof insulation accessories recommended by insulation manufacturer for intended use and compatibility with other roofing system components.

B. Fasteners: Factory-coated steel fasteners and metal or plastic plates complying with corrosion-resistance provisions in FM Approvals 4470, designed for fastening roof insulation and cover boards to substrate, and acceptable to roofing system manufacturer.

C. Insulation Adhesive: Insulation manufacturer's recommended adhesive formulated to attach roof insulation to substrate or to another insulation layer as follows:
   1. Modified asphaltic, asbestos-free, cold-applied adhesive.

D. Insulation Cant Strips: ASTM C 728, perlite insulation board.

E. Wood Nailer Strips: Comply with requirements in Section 062000 "Carpentry."

F. Tapered Edge Strips: ASTM C 728, perlite insulation board.

G. Cover Board: ASTM C 1289, Type II, Class 4, Grade 1, 1/2-inch-polyisocyanurate, having a minimum compressive strength of 80 psi.

2.11 ASPHALT MATERIALS

A. Asphalt Primer: PA-917 LS by Siplast. No Substitutions.

2.12 PROTECTIVE WALKWAY PADS

A. Product: Paratread by Siplast. No Substitutions.

PART 3 - EXECUTION

3.1 EXECUTION REQUIREMENTS

A. Refer to DDC General Conditions for execution requirements.

3.2 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements and other conditions affecting performance of the Work.

1. Verify that roof openings and penetrations are in place, curbs are set and braced, and roof-drain bodies are securely clamped in place.
2. Verify that wood cants, blocking, curbs, and nailers are securely anchored to roof deck at penetrations and terminations and that nailers match thicknesses of insulation.
3. Verify that surface plane flatness and fastening of steel roof deck complies with requirements in Section 053100 "Steel Decking."
4. Verify that deck is securely fastened with no projecting fasteners and with no adjacent units in excess of 1/16 inch out of plane relative to adjoining deck.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.3 PREPARATION

A. Clean substrate of dust, debris, moisture, and other substances detrimental to roofing installation according to roofing system manufacturer's written instructions.

1. Remove sharp projections.

B. Prevent materials from entering and clogging roof drains and conductors and from spilling or migrating onto surfaces of other construction.

1. Remove roof-drain plugs when no work is taking place or when rain is forecast.

C. Perform fastener-pullout tests according to roof system manufacturer's recommendations.

1. Submit test result within 24 hours of performing tests.

a. Include manufacturer's requirements for any revision to previously submitted fastener patterns required to achieve specified wind uplift requirements.

D. Install sound absorbing insulation strips in ribs of acoustical roof decks according to acoustical roof deck manufacturer's written instructions.

3.4 ROOFING INSTALLATION, GENERAL

A. Install roofing system according to roofing system manufacturer's written instructions, FM Approvals' RoofNav assembly requirements meeting field wind uplift rating of 60 psf, perimeter wind uplift rating of 105 psf, corner wind uplift rating of 165 psf, and FM Global Property Loss Prevention Data Sheet 1-29.

B. Complete terminations and base flashings, and provide temporary seals to prevent water from entering completed sections of roofing system at the end of the workday or when rain is forecast.

1. Remove and discard temporary seals before beginning work on adjoining roofing.

C. Substrate-Joint Penetrations: Prevent roofing asphalt and adhesives from penetrating substrate joints, entering building, or damaging roofing system components or adjacent building construction.

3.5 SUBSTRATE BOARD INSTALLATION

A. Install substrate board with long joints in continuous straight lines, with end joints staggered not less than 24 inches in adjacent rows.

1. At steel roof decks, install substrate board at right angle to flutes of deck.

a. Locate end joints over crests of steel roof deck.

2. Tightly butt substrate boards together.
3. Cut substrate board to fit tight around penetrations and projections, and to fit tight to intersecting sloping roof decks.
4. Fasten substrate board to top flanges of steel deck to resist uplift pressure at corners, perimeter, and field of roof according to roofing system manufacturers' written instructions.

3.6 VAPOR RETARDER INSTALLATION

A. Self-Adhering-Sheet Vapor Retarder: Prime substrate if required by manufacturer. Install self-adhering-sheet vapor retarder over area to receive vapor retarder, side and end lapping each sheet a minimum of 3-1/2 and 6 inches, respectively.

1. Extend vertically up parapet walls and projections to a minimum height equal to height of the insulation and cover board.
2. Seal laps by rolling.

B. Completely seal vapor retarder at terminations, obstructions, and penetrations to prevent air movement into roofing system.

3.7 INSULATION INSTALLATION

A. Coordinate installing roofing system components, so insulation is not exposed to precipitation or left exposed at the end of the workday.

B. Comply with roofing system and insulation manufacturer's written instructions for installing roof insulation.

C. Nailer Strips: Mechanically fasten 4-inch nominal-width, wood nailer strips of same thickness as insulation perpendicular to sloped roof deck at the following spacing:

1. 16 feet apart for roof slopes greater than 1 inch per 12 inches (1:12) but less than 3 inches per 12 inches (3:12).

D. Insulation Cant Strips: Install and secure preformed 45-degree insulation cant strips at junctures of roofing system with vertical surfaces or angle changes greater than 45 deg F.

E. Installation Over Metal Decking:

1. Install base layer of insulation with joints staggered not less than 24 inches in adjacent rows and with long joints continuous at right angle to flutes of decking.

a. Locate end joints over crests of decking.
b. Trim insulation neatly to fit around penetrations and projections, and to fit tight to intersecting sloping roof decks.
c. Make joints between adjacent insulation boards not more than 1/4 inch in width.
d. At internal roof drains, slope insulation to create a square drain sump, with each side equal to the diameter of the drain bowl plus 24 inches.

1) Trim insulation, so that water flow is unrestricted.

e. Fill gaps exceeding 1/4 inch with insulation.
f. Cut and fit insulation within 1/4 inch of nailers, projections, and penetrations.
g. Mechanically attach base layer of insulation and substrate board using mechanical fasteners specifically designed and sized for fastening specified board-type roof insulation to metal decks.

1) Fasten insulation according to requirements in FM Approvals' RoofNav for specified Windstorm Resistance Classification.
2) Fasten insulation to resist specified uplift pressure at corners, perimeter, and field of roof.

2. Install upper layers of insulation and tapered insulation, with joints of each layer offset not less than 12 inches from previous layer of insulation.

a. Staggered end joints within each layer not less than 24 inches in adjacent rows.
b. Install with long joints continuous and with end joints staggered not less than 12 inches in adjacent rows.
c. Trim insulation neatly to fit around penetrations and projections, and to fit tight to intersecting sloping roof decks.
d. Make joints between adjacent insulation boards not more than 1/4 inch in width.
e. At internal roof drains, slope insulation to create a square drain sump, with each side equal to the diameter of the drain bowl plus 24 inches.
f. Trim insulation, so that water flow is unrestricted.
g. Fill gaps exceeding 1/4 inch with insulation.

h. Cut and fit insulation within 1/4 inch of nailers, projections, and penetrations.
i. Adhere each layer of insulation to substrate using adhesive according to FM Approvals' RoofNav assembly requirements and FM Global Property Loss Prevention Data Sheet 1-29 for specified Windstorm Resistance Classification, as follows:
   1) Set each layer of insulation in a uniform coverage of full-spread insulation adhesive, firmly pressing and maintaining insulation in place.

3.8 INSTALLATION OF COVER BOARDS

A. Install cover boards over insulation with long joints in continuous straight lines, with end joints staggered between rows. Offset joints of insulation below a minimum of 6 inches in each direction.

1. Trim cover board neatly to fit around penetrations and projections, and to fit tight to intersecting sloping roof decks.
2. At internal roof drains, conform to slope of drain sump.

   a. Trim cover board, so that water flow is unrestricted.

3. Cut and fit cover board tight to nailers, projections, and penetrations.
4. Adhere cover board to substrate using adhesive according to FM Approvals' RoofNav assembly requirements and FM Global Property Loss Prevention Data Sheet 1-29 for specified Windstorm Resistance Classification, as follows:
   a. Set cover board in a uniform coverage of full-spread insulation adhesive, firmly pressing and maintaining insulation in place.

B. Install sheathing paper over cover board and immediately beneath roof membrane.

3.9 ROOFING MEMBRANE INSTALLATION, GENERAL

A. Install roofing system according to roofing system manufacturer's written instructions and applicable recommendations in ARMA/NRCA's "Quality Control Guidelines for the Application of Polymer Modified Bitumen Roofing."

B. Start installation of roofing in presence of roofing system manufacturer's technical personnel.

C. Where roof slope exceeds 1/2 inch per 12 inches, install roofing membrane sheets parallel with slope.

1. Backnail roofing sheets to substrate according to roofing system manufacturer's written instructions.

D. Coordinate installation of roofing system so insulation and other components of the roofing system not permanently exposed are not subjected to precipitation or left uncovered at the end of the workday or when rain is forecast.

1. Provide tie-offs at end of each day's work to cover exposed roofing sheets and insulation with a course of coated felt set in roofing cement or hot roofing asphalt, with joints and edges sealed.
2. Complete terminations and base flashings, and provide temporary seals to prevent water from entering completed sections of roofing system.

3. Remove and discard temporary seals before beginning work on adjoining roofing.

3.10 BASE SHEET INSTALLATION

A. Before installing, unroll base sheet, cut into workable lengths, and allow to lie flat for a time period recommended by manufacturer for the ambient temperature.

B. Loosely lay one course of sheathing paper, lapping edges and ends a minimum of 2 inches and 6 inches, respectively.

C. Installation of SBS-Modified Bitumen Polyester and Fiberglass-Mat Base Sheet:

1. Install base sheet according to roofing manufacturer's written instructions, starting at low point of roofing system.
2. Extend roofing sheets over and terminate above cants.
3. Install base sheet in a shingle fashion.
4. Adhere to substrate in a uniform coating of cold-applied adhesive.
5. Install base sheet without wrinkles, rears, and free from air pockets.
6. Laps: Accurately align roofing sheets, without stretching, and maintain uniform side and end laps.
    a. Lap side laps as recommended by roof membrane manufacturer but not less than 3 inches.
    b. Stagger end laps not less than 18 inches.
    c. Completely bond and seal laps, leaving no voids.
    d. Roll laps with a 20-pound roller.
7. Repair tears and voids in laps and lapped seams not completely sealed.
8. Apply pressure to the body of the base sheet according to manufacturer's instructions, to remove air pockets and to result in complete adhesion of base sheet to substrate.

3.11 INSTALLATION OF INTERPLY SHEETS

A. Install two ply sheets, starting at low point of roofing.

1. Align ply sheets without stretching.
2. Shingle side laps of ply sheets uniformly to achieve required number of plies throughout thickness of roofing membrane.
    a. Shingle in direction to shed water.
3. Extend ply sheets over and terminate above cants.

3.12 SBS-MODIFIED BITUMINOUS CAP SHEET INSTALLATION

A. Before installing, unroll cap sheet, cut into workable lengths, and allow to lie flat for a time period recommended by manufacturer for the ambient temperature at which cap sheet will be installed.

B. Install modified bituminous roofing cap sheet according to roofing manufacturer's written instructions, starting at low point of roofing system.

1. Extend cap sheet over and terminate above cants.
2. Install cap sheet in a shingle fashion.
3. Install cap sheet as follows:
   a. Adhere to substrate in cold-applied adhesive.
4. Install cap sheet without wrinkles or tears, and free from air pockets.
5. Install cap sheet, so side and end laps shed water.

C. Laps: Accurately align roofing sheets, without stretching, and maintain uniform side and end laps.

1. Lap side laps as recommended by roof membrane manufacturer but not less than 3 inches.
2. Stagger end laps not less than 18 inches.
3. Completely bond and seal laps, leaving no voids.
4. Roll laps with a 20-pound roller.
5. Repair tears and voids in laps and lapped seams not completely sealed.

D. Apply pressure to the body of the cap sheet according to manufacturer's instructions, to remove air pockets and to result in complete adhesion of base sheet to substrate.

3.13 FLASHING AND STRIPPING INSTALLATION

A. Install base flashing over cant strips and other sloped and vertical surfaces, at roof edges, and at penetrations through roof, and secure to substrates according to roofing system manufacturer's written instructions and as follows:

1. Prime substrates with asphalt primer as required by roofing system manufacturer.
2. Backer Sheet Application:
   a. Mechanically fasten backer sheet to walls or parapets.
   b. Adhere backer sheet over roofing membrane at cants in cold-applied adhesive.
   c. Seal all laps.
3. Backer Sheet Application:
   a. Adhere backer sheet to substrate in cold-applied adhesive.
   b. Seal all laps.
4. Flashing Sheet Application: Adhere flashing sheet to substrate in cold-applied adhesive at rate required by roofing system manufacturer.

B. Extend base flashing up walls or parapets a minimum of 8 inches above roofing membrane and 4 inches onto field of roofing membrane.

C. Mechanically fasten top of base flashing securely at terminations and perimeter of roofing.

D. Install liquid flashing system according to manufacturer's recommendations.

1. Extend liquid flashing not less than 3 inches in all directions from edges of item being flashed.
2. Embed granules, matching color of roof membrane, into wet compound.

E. Install roofing cap-sheet stripping where metal flanges and edgings are set on roofing according to roofing system manufacturer's written instructions.

F. Roof Drains: Set 30-by-30-inch-4-pound lead flashing in bed of asphaltic adhesive on completed roofing membrane.

1. Cover lead flashing with roofing cap-sheet stripping and extend a minimum of 6 inches beyond edge of metal flashing onto field of roofing membrane.
2. Clamp roofing membrane, metal flashing, and stripping into roof-drain clamping ring.
3. Install stripping according to roofing system manufacturer's written instructions.

3.14 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to inspect substrate conditions, surface preparation, roof membrane application, flashings, protection, and drainage components, and to furnish reports to the Commissioner.

B. Perform the following tests:

1. Flood Testing: Flood test each roofing area for leaks, according to recommendations in ASTM D 5957, after completing roofing and flashing but before overlying construction is placed. Install temporary containment assemblies, plug or dam drains, and flood with potable water.

a. Perform tests before overlying construction is placed.
b. Flood to an average depth of 2-1/2 inches with a minimum depth of 1 inch and not exceeding a depth of 4 inches. Maintain 2 inches of clearance from top of base flashing.
c. Flood each area for 24 hours.
d. After flood testing, repair leaks, repeat flood tests, and make further repairs until roofing and flashing installations are watertight.

1) Cost of retesting is the responsibility of the Contractor.

e. Testing agency shall prepare survey report indicating locations of initial leaks, if any, and final survey report.

2. Testing agency shall prepare survey report indicating locations of initial discontinuities, if any.

C. Test Cuts: Remove test specimens to evaluate problems observed during quality-assurance inspections of roofing membrane as follows:

1. Determine approximate quantities of components within roofing membrane according to ASTM D 3617/D 3617M.

2. Examine test specimens for interply voids according to ASTM D 3617/D 3617M and to comply with criteria established in Appendix 3 of ARMA/NRCA's "Quality Control Guidelines for the Application of Polymer Modified Bitumen Roofing."
3. Repair areas where test cuts were made according to roofing system manufacturer's written instructions.

D. Final Roof Inspection: Arrange for roofing system manufacturer's technical personnel to inspect roofing installation on completion, in presence of the Commissioner, and to prepare inspection report.

1. Notify the Commissioner and the City of New York 48 hours in advance of date and time of inspection.

E. Repair or remove and replace components of roofing system where inspections indicate that they do not comply with specified requirements.

F. Roofing system will be considered defective if it does not pass tests and inspections.

1. Additional testing and inspecting, at Contractor's expense, will be performed to determine if replaced or additional work complies with specified requirements.

3.15 PROTECTING AND CLEANING

A. Protect roofing system from damage and wear during remainder of construction period.
1. When remaining construction does not affect or endanger roofing, inspect roofing system for deterioration and damage, describing its nature and extent in a written report, with copies to the Commissioner and the City of New York.

B. Correct deficiencies in or remove roofing system that does not comply with requirements, repair substrates, and repair or reinstall roofing system to a condition free of damage and deterioration at time of Substantial Completion and according to warranty requirements.

C. Clean overspray and spillage from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.

END OF SECTION 07 52 16

SECTION 07 62 01
Facade Sheet Metal Flashings

PART I - GENERAL

1.1 RELATED DOCUMENTS:

A. The following documents apply to all required work for the Project: (1) the Contract Drawings, (2) the Specifications, (3) the General Conditions, (4) the Addendum, and (5) the Contract (City of New York Standard Construction Contract).

B. LEED / Environmentally Preferable Purchase (EPP) General Requirements

1. Refer to DDC General Conditions and the Addendum to the General Conditions.

2. LEED requirements apply to all Phase II work with the exception of the Existing Building scope. EPP requirements apply to the Project's Existing Building scope only.

1.2 SUMMARY:

A. This Section includes the Sheet Metal Flashing (Metal Flashing) components for the associated building enclosure systems described in the Building Enclosure System Matrix. For a description of where Metal Flashings are required as well as additional requirements, refer to the Related Sections.

B. For all systems described, supply and install the following components and their subcomponents of the work required to provide a complete system, including but not limited to the following:

1. Install new Metal Flashings including the following components which comprise the Waterproofing System:

a. Sheet Metal Flashings at horizontal surfaces, transitions, and all locations shown on the Drawings. Provide cleats, hook strips, skirt flashings, and associated accessories as shown on the Drawings.

b. Sheet metal pan flashings and window and door openings where shown on the Drawings.

c. Membrane flashing, sealants, and separators as shown on the Drawings to construct Sheet Metal Flashing expansion joints.

d. Sealants, liquid membrane, and accessories at all penetrations, walls, wall openings, flashing terminations, and other locations as shown on the Drawings.

e. Ethylene-propylene diene monomer (EPDM) sheet membrane flashings. Provide uncured EPDM where shown on the Drawings.

2. This Section incorporates the use of Sealants. Requirements specified in this Section are in addition to those in the following Section:

a. Section 07 92 01 – Exterior Joint Sealants.

C. The following Sections describe systems and materials that incorporate Sheet Metal Flashings, and will require coordinated interfaces:

1. Section 07 00 01 – Rainscreen System.
2. Section 07 20 00 – Thermoplastic Membrane Roofing.
3. Section 07 27 01 – Weather Resistive Barriers.
4. Section 07 95 00 – Expansion Control.
5. Section 08 40 01 – Glazed Storefronts and Curtain Wall System.
6. Section 08 63 01 – Aluminum-Framed Skylight System.

D. Reference Documents

1. Building Enclosure System Matrix: Refer to Drawing EN1-003.

1.3 DEFINITIONS:

A. Referenced System: Building enclosure system as specified by the Building Enclosure System Matrix.

B. Waterproofing system is defined as the adjacent building enclosure system that the Metal Flashings will be integrated into.

1.4 REFERENCE STANDARDS AND REGULATIONS:

A. The Contractor's Engineering, materials, and workmanship shall comply with 2014 New York City Building Code. Where the 2014 New York City Building Code recommendations or requirements are to a lower standard than required by this Contract Document, the Contract Documents shall take precedence.

B. Comply with applicable provisions and recommendations of the following standards. Where standards conflict or conflict with the provisions of these Specifications, the more stringent shall apply. Unless otherwise noted, the latest editions of the standards shall apply:

1. American Iron and Steel Institute (AISI)
   a. AISI Cold-Formed Steel Design Manual.
2. ASTM International (ASTM)
   a. ASTM A240/A240M – Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications.
   b. ASTM B32 – Standard Specification for Solder Metal.
   c. ASTM C1513 – Standard Specification for Steel Tapping Screws for Cold-Formed Steel Framing Connections.
   d. ASTM D4637 – Standard Specification for EPDM Sheet Used in Singly-Ply Roof Membrane.

e. ASTM E488 – Standard Test Methods for Strength of Anchors in Concrete Elements.

f. ASTM E754 – Standard Test Method for Pullout Resistance of Ties and Anchors Embedded in Masonry Mortar Joints.

3. National Roofing Contractors Association (NRCA)

a. NRCA Roofing and Waterproofing Manual.

4. Sheet Metal and Air Conditioning Contractors' National Association (SMACNA)

a. SMACNA Architectural Sheet Metal Manual.

5. Single Ply Roofing Industry (SPRI)

a. ANSI/SPRI ES-1 – Wind Design Standard for Edge Systems Used with Low Slope Roof Systems.

6. Society for Protective Coatings (SSPC)

a. SSPC-SP3 – Power Tool Cleaning.

7. Revere Copper Products, Inc.

a. Copper and Common Sense.

1.5 PERFORMANCE REQUIREMENTS:

A. General Prescriptive Requirements

1. Provide Metal Flashings where indicated.

2. Site-applied Sealant is not acceptable as part of the primary Waterproofing System unless shown on the Architectural Drawings or noted within this Section.

3. All horizontal flashings, or any surface intended to drain moisture, shall be sloped to the exterior 1/4 in. per foot minimum.

4. Do not penetrate flashings unless shown on the Architectural Drawings or noted within this Section.

5. Provide upturned end dams that are riveted and fully soldered at all terminations where water would otherwise be able to flow into the wall cavity or similar areas that would result in damage.

B. General Performance

1. Install Metal Flashings according to the intended use, appropriate standards, as specified herein, and per the flashing manufacturer's recommendations.

2. A qualified Contractor shall install the specified Metal Flashing System. The system shall:

a. Include suitable allowances for the specified construction tolerances.

b. Withstand the specified deleterious and degrading effects of radiation from the sun, weathering, atmospheric pollution, vermin, fungi and other growths for the required service life without maintenance in excess of routine cleaning and minor repairs.

c. Be compatible with all materials with which it comes in contact.

d. Not stain adjacent surfaces.

C. Durability Performance

1. Horizontal Metal Flashing surfaces shall be sloped to drain water and prevent water accumulation.

2. Metal Flashings shall be separated from dissimilar metals to prevent galvanic reaction, corrosion, and/or staining.

3. Metal Flashings shall be free of excessive scratching, staining, or other aesthetic issues.

a. "Oil-canning" of exposed sheet metal surfaces is not acceptable.

4. Failure includes inability of Metal Flashings to meet the performance requirements set forth in this and all Referenced Systems, in addition to the following:

a. Ingress of water into the interior building environment through any Metal Flashing components.

b. Cracking or separation of soldered Flashing connections.

c. Corrosion and staining.

D. Structural Performance

1. Engineer Metal Flashings to resist the maximum design loads relevant to the associated system.

2. Securely attach all Metal Flashings to the structure, without noticeable deformation.

3. Engineer Metal Flashings to accommodate the structural, thermal, and moisture movements developed by the associated system and adjacent systems.

a. Provide expansion joints in Metal Flashings to allow thermal expansion without compromising water infiltration resistance performance, as specified herein and where shown on the Drawings.

E. Fire Performance

1. The Metal Flashings shall:

a. Have a resistance to combustion and fire spread appropriate to each part and assembly.

1) Ensure assembly compliance with NFPA requirements, and other applicable provisions.

b. Not give off toxic fumes.

2. Weatherproofing Performance

a. Waterproofing System, including Metal Flashings and all associated materials, shall perform as a liquid-water drainage plane that will discharge condensation or incident rainwater to the exterior. Assemblies shall accommodate substrate movement and maintain continuity at substrate expansion and control joints, construction material changes, penetrations, tie-ins to installed waterproofing, and transitions at perimeter conditions without deterioration and air leakage exceeding specified limits.

3. Volatile Organic Content (VOC) Performance

a. Provide low-VOC products where required in DDC General Conditions to reduce odor and as required to comply with the VOC content limits.

1.6 SUBMITTAL PROCEDURES:

A. Refer to DDC General Conditions.

1.7 SUBMITTALS:

A. Shop Drawings.

B. Product data.

C. LEED submittals.

D. Samples

1. Provide minimum 12 in. long Samples of all Metal Flashings, showing the exact profiles used for the Project.

a. Include one prefabricated section used beneath fenestration products which includes an upturned end dam, soldered joint, and expansion joint.

b. Include one lock seamed and soldered transverse joint in through-wall flashing cut in half so that the interior of the solder joint is visible.

c. Include one lock seamed and soldered coping sheet metal cap transverse joint cut in half so that the interior of the solder joint is visible.

2. All other Samples shall be 6 in. long or as specified.

E. Quality Control Plan

1. Provide as required and specified in Related Sections.

2. Work Sequence Plan: Provide a comprehensive work sequence plan showing areas where work will be performed by trades involved in each area and time required to complete each area. Do not commence work until receiving Commissioner's written approval of the work plan. Indicate water testing of exterior cladding or components (see Related Sections) in the sequence plan. The plan shall include the following as a minimum:

a. Notify the Commissioner in writing at least 72 hrs prior to the initial installation of the waterproofing membrane and Sheet Metal Flashings.

b. Inspect conditions and materials to ensure conformity to the Contract requirements.

c. Inspect substrate conditions and coordinate with Contractor to ensure proper substrate preparation in conformance to the manufacturer's requirements and Contract requirements.

d. Inspect work in progress to ensure that the work is in compliance with approved procedures.

e. Inspect all completed and any corrected work for compliance with the Contract Documents and the membrane manufacturer's recommendations.

F. Mockups: Provide mockups of all typical and atypical details, including window perimeter flashing, relieving angles, base of wall, parapet transitions, building corners, expansion joints, integration with other building enclosure systems, and seals at masonry ties. Mockups may be installed as part of a complete assembly for the Referenced System; allow Commissioner to review installation of the underlying waterproofing components prior to covering with the proposed cladding or other building enclosure components.

G. Product Test Reports

1. Indicating compliance with performance requirements as required and specified for adjacent systems and in the DDC General Conditions..

H. Quality Control Reports

1. Manufacturer site visit reports.

2. Field reports by Contractor and/or other third-party inspectors.

3. Protection Plan: Written procedures and plans for providing temporary protection of areas that will be exposed to weather, traffic, etc., prior to the installation of the complete Waterproofing System.

I. Maintenance Data: For Metal Flashings to include in maintenance manuals.

J. Provide closeout submittals as specified.

1.8 QUALITY ASSURANCE:

A. Refer to DDC General Conditions Section 01 40 00 – Quality Requirements.

B. Field Inspection Services: The Commissioner may inspect at the following points of the project the installation of the Metal Flashing System:

1. Project start inspection at the beginning of each phase of the Project to review special detailing conditions and substrate preparation.

2. Periodic in-progress inspections throughout the Project to evaluate Metal Flashing application.

3. Final punch-list inspection at the completion of each phase of the Project prior to installation of surfacing or overburden materials.

4. Warranty inspection confirming completion of all punch-list items, surfacing, and cladding application.

5. The manufacturer's field representative shall provide the Contractor, and the City of New York with written reports outlining observations and required corrections from each site visit.

C. Single Source: Obtain materials through one source from a single manufacturer for the Metal Flashing System to provide consistency in materials, unless otherwise approved by the Commissioner.

D. Pre-Installation Conference

1. Provide as required and specified for adjacent systems and in the DDC General Conditions.

1.9 PROJECT CONDITIONS:

A. Ensure that substrate materials are dry and free of contaminants. Do not commence with application unless substrate conditions are suitable. Contractor shall demonstrate that substrate conditions are suitable for the application of the materials.

1.10 COORDINATION AND SEQUENCING:

A. Fully coordinate construction and installation sequences with adjacent trades.

B. Provide as specified for adjacent systems and in DDC General Conditions.

1.11 WARRANTY:

A. Unless stated otherwise in these Specifications, Guarantee shall state that the Metal Flashing is free from defects in materials and workmanship and weathertight for a period of 2 yrs from the date of Substantial Completion. Contractor shall agree to promptly repair or replace defective materials and workmanship to "like new condition," including such exploratory work, required to determine the cause, during the Guarantee period, at no additional cost to the City of New York.

B. The Contractor shall be responsible for repairing damage to the building and furnishings caused by defective materials or workmanship or damage as part of repairs to the Waterproofing System.

PART II - PRODUCTS

2.1 SHEET METAL FLASHINGS AND ROOF COPINGS:

A. Manufacturer's recommended alloy, temper, and gauge meeting the requirements and standards listed herein for type of use and finish indicated in accordance with:

1. Stainless Steel

a. Type 316 conforming with ASTM A240/A240M.

b. 24 ga minimum thickness.

1) 22 ga minimum for hook strips and 20 ga for cleats, where shown on the Drawings.

c. Type 2D finish.

d. Make connections with stainless steel rivets and solder as specified below.

e. Provide geometry as indicated in drawings.

B. Provide solder complying with ASTM B32, Class 50A or 50B, bar form, 50% block tin and 50% pig lead.

1. Use an approved brand of soldering flux.

2. After soldering, immediately remove all traces of acid or flux with an appropriate neutralizer followed by repeated washing and scrubbing.

C. Fasteners

1. Rivets for Metal Flashing Connections: Solid 3/16 in. dia. flat head solid copper rivets of proper length for the material being fastened. Blind or "pop" rivets are prohibited.

D. Release Tape: 0.006 in. thick polyethylene, adhesive-backed on one side, width as required.

E. Strip Flashing for Expansion Joints: 0.060 in. thick uncured EPDM, use manufacturer's recommended primers, adhesives, sealants, and solvent cleaners.

F. Sealant, for Use in Expansion Joint Construction: Lap sealant to match EPDM membrane manufacturer.

1. Refer to requirements in Section 07 92 01 – Exterior Joint Sealants for Sealants.

2.2 ACCESSORIES:

A. Fasteners

1. Fastener engineering shall account for any reduction in safe working loads due to their spacing, edge distance, embedment, location in areas of tension, or proximity to cast-in inserts/existing fasteners, or thickness of shims. Fastener engineering shall also consider condition, thickness, and material properties of substrate. Adhesive anchoring systems shall not be used for fasteners supporting loads in tension.

2. All exterior fasteners or fasteners in wet areas shall be of a suitable grade of stainless steel. Weather coatings for corrosion resistance may only be used with the Commissioner's approval.

3. All exterior fasteners that penetrate a self-sealing weatherproofing system shall be selected and coordinated with the weatherproofing system manufacturer to ensure self-sealing occurs.

4. Fasteners Used in Cast-in-Place Concrete and Concrete Masonry Unit (CMU) Backup Construction

a. Fastener selection and sizing shall be based on applicable ICC-ES Evaluation Reports

b. Fastener selection and sizing shall be based on testing according to ASTM E488 and ASTM E754 (for CMU construction) with the same backup wall construction used on the Project.

c. Post installed anchors shall be subject to Special Inspections as required by 2014 New York City Building Code and 2016 New York City Energy Conservation Code.

5. When utilizing a fastener not included in any of the above references, available standards, or design guides, use a minimum factor of safety of 4 for permissible load design of anchoring assemblies.

6. Fasteners Used in Cold-Formed Steel Framing Backup Construction

   a. Fastener selection and sizing shall be in accordance with the AISI Cold-Formed Steel Design Manual and ASTM C1513.

7. Contractor shall provide for Commissioner's review, documentation demonstrating that the use of all fasteners installed has been reviewed and approved by the fastener manufacturer and shall, prior to installation, submit manufacturer's written certification that details proposed by the Contractor are appropriate for their intended use.

PART III - EXECUTION

3.1 EXECUTION REQUIREMENTS:

A. Refer to DDC General Conditions for execution requirements.

3.2 EXAMINATION:

A. The Contractor is to examine substrate conditions and other conditions under which this work is to be performed and notify the Commissioner, in writing, of circumstances detrimental to the proper completion of the work. Do not proceed with work until unsatisfactory conditions are corrected to permit proper installation of the work. Starting of work means acceptance of Project conditions.

3.3 DELIVERY, STORAGE, AND HANDLING:

A. Store elastomeric materials, adhesives, solvents, and sealants in their original containers and maintain at a temperature between 60°F and 80°F or as required by the manufacturer.

B. Handle all materials to avoid damage. Handle all materials in such a manner as to preclude damage and contamination with moisture or foreign matter. Keep away from open fire, flame, or any ignition source.

C. Damaged Material: Any materials found damaged or stored in any manner other than stated above will be rejected, removed, and replaced at the Contractor's expense.

3.4 STRIP FLASHING SUBSTRATE PREPARATION:

A. Prepare all substrate surfaces scheduled to receive strip Flashing in accordance with the manufacturer's recommendations and requirements and as provided in this Section.

B. Continually remove all dust and debris from all concrete surfaces by sweeping and blowing with compressed air and/or vacuuming.

C. Clean and prepare metal surfaces to near white metal in accordance with SSPC-SP3 (power tool clean) or as required by membrane manufacturer. Extend preparation a minimum of 3 in. beyond the termination of the membrane flashing materials. Notch steel surfaces to provide a rust-stop.

D. In addition to cleaning, abrade all metal surfaces to provide a rough open surface. A wire brush finish is not acceptable.

E. Wipe prepared metal surface with Methyl Ethyl Ketone (MEK) or other acceptable solvent cleaner prior to application of primer.

3.5 STRIP FLASHING INSTALLATION:

A. Prime all surfaces to receive strip Flashing membrane. Allow primer to dry until it is slightly tacky.

B. Correct deficiencies in or remove strip Flashing membrane and Flashings that do not comply with requirements; repair substrates and reapply components.

3.6 GENERAL METAL INSTALLATION:

A. Except as specified in this Section, comply with all recommendations of the current edition of the referenced standards. Completed metal shall be straight, flat, and without buckles, dents, scratches, or other blemishes.

B. Form sheet metal on a bending brake. Perform shaping, trimming, and hand seaming in the shop as far as practicable, with the proper sheet-metal working tools. Make the angle of the bends and the folds for interlocking the metal with full regard for expansion and contraction, to avoid buckling or other deformation in service. All lines shall be straight and crisp, except where thickness of metal dictates radius bend, and all exposed edges shall be hemmed 1/2 in. minimum.

C. Soldering: Mechanically clean all metal to be soldered with stainless-steel brushes or by other acceptable means, apply flux, and pre-tin. Do not use carbon steel brushes or steel wool. Perform all soldering slowly with well-heated heavy (3 lbs per pair) coppers (irons) with properly tinned clean blunt tips. Do not use torches or irons with integral torches for soldering. Apply enough heat to sweat the solder completely through the full width of the seam. Close clinch lock seams gently with a block of wood and mallet, then flux and show at least one-full inch of continuous and evenly-flowed solder. Do all soldering in flat position. All sloped and vertical seams shall be laced and soldered a second time. Perform all soldering in shop to the extent practical. Clean all joints after soldering. Clean joints by wetting the area with water and scrubbing with a soft bristle brush. Neutralize any harmful flux residue by washing the area with a 5% neutralizing solution. Wash area with water before neutralizing. The neutralizing solution can be made by adding 3/4 cup baking soda to 1 gal of water. Rinse the neutralizing solution with running water and wipe dry.

D. Lay out Metal Flashing to minimize transverse joints. Detail transverse joints in all flashing pieces to provide a watertight connection, and allow for expansion/contraction of the metal as shown on the Drawings. Provide prefabricated corner pieces with joints locked, riveted, and soldered watertight. Space rivets at 1 in. o.c. in staggered pattern, unless otherwise indicated. Unless shown otherwise on the Drawings, provide expansion joints at 20 ft o.c. maximum and within 3 ft away from all changes in flashing direction (each side), and from all terminations of flashing.

1. Apply EPDM strip flashing at expansion joints in through-wall flashing. Follow manufacturer's written recommendations for EPDM installation, as modified below.

   a. Apply 1 in. wide release tape over all joints and edges of the flashing to be covered by adhered EPDM sheet and where shown on the Drawings.

   b. Cut and position EPDM sheets in place and allow sheets to relax 1/2 hr after unrolling before removing backer. Inspect sheet for any discontinuities or deficiencies; do not use defective sheets.

   c. Clean and prime all metal surfaces scheduled to receive EPDM with clean, lint-free rags and allow primer to dry. Re-prime areas not covered by adhered EPDM within 12 hrs.

d. Once the primer is dry, lay sheets into it promptly. Adhere sheets 3 in. minimum to the underlying metal on each side of the release tape. Do not move or reposition sheets. Immediately roll entire sheet into firm contact with the substrate using a smooth metal roller. Form sheets tightly into bends in flashing without stretching or cutting rubber sheet.

e. Cover the expansion joints with hemmed-edge metal cover plates bent over the flashings as shown in the Drawings.

E. Where flashing terminates or is discontinuous, pan up ends of flashing. Fully solder end dams watertight prior to installation.

F. Provide 1/4 in. per foot minimum slope on all horizontal surfaces to prevent ponding, unless otherwise indicated.

G. Provide metal skirt flashing, as shown in the Drawings, to cover the waterproofing base flashing. At transverse joints, lock the adjacent skirt flashings together using a 1/2 in. flat seam. Form a hem on the bottom edges of the skirt to form a smooth surface, and at the top to hook into the flashing receiver.

H. Provide metal receiver strips (blind nailers) at vertical terminations and as where shown on the Contract Drawings. Provide a solid bed of sealant in joints, behind and within receiver metal.

I. Exposed fasteners are prohibited.

J. Do not penetrate the horizontal portion of any flashing with fasteners.

3.7 FIELD QUALITY CONTROL:

A. Inform the Commissioner in writing on a daily basis of any of the following events. State specific locations of each occurrence.

1. Damage by other trades.

2. "Oil-canning," separated, or cracked solder joints in Metal Flashings.

B. Provide site access to inspectors, Commissioner, and manufacturers for inspection of the Metal Flashing.

C. Inspections: Arrange for the Commissioner to inspect the Metal Flashings prior to installation of subsequent materials and to review the completed work, during all phases of installation, and as required to assure conformance with the Contract Documents.

3.8 CLEANING AND PROTECTION:

A. Refer to requirements in the DDC General Conditions and for systems that incorporate Facade Sheet Metal Flashing.

B. Coordinate with other trades to avoid traffic over completed work areas. Move equipment and ground storage areas as work progresses to avoid abuse of Metal Flashing, as permitted by the Commissioner. Notify the Commissioner immediately and in writing if anyone abuses or damages Metal Flashing components, and make necessary restoration at no additional cost to the City of New York.

C. Against Loads: Protect work of this Section against concentrated loads and any other loads or equipment that would damage the materials or work.

D. Take and maintain necessary preventative measures to protect work of this Section from damage until Project reaches substantial completion.

END OF SECTION 07 62 01

SECTION 07 71 00
Roof Specialties and Accessories

PART I - GENERAL

1.1 RELATED DOCUMENTS

A. The following documents apply to all required work for the Project: (1) the Contract Drawings, (2) the Specifications, (3) the General Conditions, (4) the Addendum and (5) the Contract (City of New York Standard Construction Contract).

B. LEED General Requirements:

1. Refer to DDC General Conditions

   a. Section 01 33 00 "Submittal Procedures"
   b. Section 01 74 19 "Construction Waste Management and Disposal"
   c. Section 01 81 13.04 "Sustainable Design Requirements for LEED v4 Buildings"
   d. Section 01 81 13.13 "Volatile Organic Compound Limits for Adhesives, Sealants, Paints and Coatings for LEED Buildings"

1.2 SUMMARY

A. Section includes:

1. Roof expansion joints.
2. Aluminum copings.
3. Roof smoke vents.
4. Prefabricated roof curbs.

B. Related Sections

1. Carpentry - Section 06 20 00.
2. Thermoplastic Membrane Roofing - Section 07 20 00.
3. Sheet Metal Flashing - Section 07 62 00.

1.3 SUBMITTAL PROCEDURES

A. Refer to DDC General Conditions Section 01 33 00 "Submittal Procedures".

1.4 QUALITY ASSURANCE

A. Refer to DDC General Conditions Section 01 40 00 "Quality Requirements".

PART II - PRODUCTS

2.1 ROOF EXPANSION JOINTS

A. Provide neoprene and metal insulated expansion joint assemblies made of 1/16" stainless steel flanges and insulated with 1/2" thick foam insulation. Provide pre-fabricated units for corners and intersections and provide manufacturer's standard splicing strips and adhesives for installation and splicing of units.

B. Basis of Design: Subject to compliance with requirements, provide Johns Manville; Expand-O-Flash or comparable product by one of the following:

1). Construction Specialties
2). Nystrom
3). E-Z Flash
4). Or approved equal

2.2 SMOKE VENTS

A. Provide shop primed galvanized steel heat and smoke vent units of sizes shown on drawings, with 1" rigid insulation at curbs and door, standard lifting mechanism and automatic heat and smoke sensitive release devices. Provide manufacturer's standard hardware including hold-open device, hinges, latch and operating handles for inside and outside operation.

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1). Bilco
2). Babcock-Davis
3). Milcor
4). Or approved equal

2.3 PRE-FABRICATED ROOF CURBS

A. Provide manufacturer's standard shop fabricated units made of 14 ga. zinc coated steel factory primed with rust inhibitive primer, and insulated with 1-1/2" thick fiberglass board.

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1). Pate
2). Louvers & Dampers, Inc.
3). Industrial Louvers, Inc.
4). Or approved equal.

C. Reinforce units over 8'-0" long and units requiring reinforcement due to heavy loads by forming units of double-walled box-type construction with stiffeners of heavy gauge with flanges as required to provide sufficient rigidity and strength to withstand max. lateral forces in addition to super imposed vertical loads.

D. Sloping Roof Decks: For deck slopes of 1" per ft. and more, fabricate curb units (except expansion joint curbs) to form a level top edge. Where slope is less than 1" per ft., and curb is used to support equipment with moving parts, or supports vertical elements such as gravity ventilators which are intended to be plumb, provide tapered wood nailers (treated wood) at top of curb units to form a level top edge.

E. Provide treated wood nailer, not less than 1-5/8" thick and of the width shown, but not less than the width of the curb wall assembly. Anchor nailer securely to the top of the metal frame unit. Refer to Section 06 20 00, Carpentry, for pressure-treatment required for wood nailers.

F. Provide 22 ga. galvanized steel curb liners; where required extend curb liners through deck construction to coordinate with work below.

G. Provide 18 ga. galvanized steel cap flashing to cover a min. of 3" over roof flashing.

H. Where curb units are shown to support shop fabricated items of equipment, do not proceed with fabrication of curb units until size or dimensions have been checked for coordination with equipment.

PART III - EXECUTION

3.1 EXECUTION REQUIREMENTS

A. Refer to DDC General Conditions for execution requirements.

3.2 INSTALLATION

A. General: Comply with manufacturer's instructions and recommendations. Coordinate with installation of roof deck and other substrates to receive accessory units, and with roof insulation, roofing and flashing; as required to ensure that each element of the work performs properly, and that combined elements are waterproof and weathertight. Anchor units securely to supporting structural substrates, adequate to withstand lateral and thermal stresses as well as inward and outward loading pressures.

B. Isolation: Where metal surfaces of units are to be installed in contact with non-compatible metal or corrosive substrates, including wood, apply bituminous coating on concealed metal surfaces, or provide other permanent separation.

C. Cap Flashing: Where cap flashing is required as component of accessory, install to provide adequate waterproof overlap with roofing or roof flashing (as counter flashing). Seal with thick bead of mastic sealant, except where overlap is indicated to be left open for ventilation.

D. Operational Units: Test operational units with operable components. Clean and lubricate joints and hardware. Adjust for proper operation.

E. Roof Expansion Joint:

1. Provide uniform profile throughout the length of the installation, and do not stretch the elastic sheet.

2. Nail metal flanges to curbs and cant strips securely as recommended by the manufacturer for waterproof construction.

3. Anchor edges of expansion joint units in the manner indicated, complying with manufacturer's instructions. Provide not less than 4" embedment in bituminous membranes, with hot bitumen or with roofing cement. Cover with composition stripping as specified for the membrane work.

END OF SECTION 07 71 00

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SECTION 07 81 00
Sprayed Fire-Resistive Materials

PART I - GENERAL

1.1 RELATED DOCUMENTS

A. The following documents apply to all required work for the Project: (1) the Contract Drawings, (2) the Specifications, (3) the General Conditions, (4) the Addendum and (5) the Contract (City of New York Standard Construction Contract).

B. LEED General Requirements:

1. Refer to DDC General Conditions

a. Section 01 33 00 "Submittal Procedures"
b. Section 01 81 13.04 "Sustainable Design Requirements for LEED v4 Buildings"
c. Section 01 81 13.13 "Volatile Organic Compound Limits for Adhesives, Sealants, Paints and Coatings for LEED Buildings"
d. Section 01 81 19 "Indoor Air Quality Requirements for LEED Buildings"

1.2 SUMMARY

A. Section includes:

1. Spray-on fireproofing for structural steel and metal decking.
2. Seal coat over fireproofing in special areas.
3. Preparation of surfaces.
4. Field quality control.

B. Related Sections

1. Structural Steel - Section 05 12 00.
2. Steel Decking - Section 05 31 00.
3. Firestops and Smokeseals - Section 07 84 13.

1.3 SUBMITTAL PROCEDURES

A. Refer to DDC General Conditions Section 01 33 00 "Submittal Procedures".

1.4 SUBMITTALS

A. Product Data: For each fire-resistive product specified.

B. Shop Drawings: Submit structural framing plans indicating the following:

1. Locations and types of surface preparations required before applying sprayed fire-resistive material.

2. Extent of sprayed fire-resistive material for each construction and fire-resistance rating, including the following:

   a. Applicable fire-resistive design designations of a qualified testing and inspecting agency acceptable to New York City Building Department.
   b. Minimum thicknesses needed to achieve required fire-resistance ratings of structural components and assemblies.

3. Identify restrained and unrestrained assemblies on shop drawings, show required thickness of fireproofing for each assembly.

C. Product Certificates: Signed by manufacturer of sprayed fire-resistive material certifying that the products furnished comply with requirements.

D. Installer Certificates: Signed by manufacturer certifying that installers comply with specified requirements.

E. Qualification Data: For firms and persons specified in "Quality Assurance" Article to demonstrate their capabilities and experience.

F. If primer is to be used steel and/or metal deck, submit certifications by supplier of primer that primer is compatible with materials, and will not impair the required performance of the installed fireproofing. Such certification shall be accompanied by evidence that the primer was successfully used in conjunction with the fireproofing material in a UL test applicable to the construction. Submit his certification prior to application of primer.

1. Coordinate with Section 05 12 00 – Structural Steel and 05 31 00 – Metal Decking, and Structural Drawings prior to application of primer.

G. Product Test Reports: Indicate that physical properties of proposed sprayed fire-resistive materials comply with specified requirements based on comprehensive testing of current product formulations by a qualified testing and inspecting agency according to requirements specified in "Quality Assurance" Article.

H. Code Compliance: Proposed product must comply with 2014 New York City Building Code and be approved by New York City Building Department.

I. Letter from manufacturer stating that the UL Design selected for the project are not load restricted.

1.5 QUALITY ASSURANCE

A. Refer to DDC General Conditions Section 01 40 00 "Quality Requirements".

B. Installer Qualifications: Engage an experienced installer.

C. Submit data indicating that products containing no detectable asbestos as determined according to the method specified in 40 CFR, Part 763, Subpart E, Appendix E, Section 1, "Polarized Light Microscopy."

D. Mockups: After processing of initial submittals and before delivery and installation of fireproofing materials, prepare a sample installation of fireproofing work, approximately 100 sq. ft. in area; providing an example of each type required, applied on each different substrate, to produce each different rating as required and reasonably representative of entire sprayed on fireproofing work, for joint approval by representative of fire resistant material manufacturer and the Commissioner. Work in other areas shall not

proceed until mock-up has been completed. Mock-up work which remains in compliance with requirements and is in undamaged and acceptable condition may be retained as final work in place.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to Project site in original, unopened packages with intact and legible manufacturers' labels identifying product and manufacturer; date of manufacture; shelf life, if applicable; and fire-resistance ratings applicable to Project.

B. Use materials with limited shelf life within period indicated. Remove from Project site and discard materials whose shelf life has expired.

C. Store materials inside, under cover, aboveground, so they are kept dry until ready for use. Remove from Project site and discard materials that have deteriorated.

1.7 PROJECT CONDITIONS

A. Environmental Limitations: Do not apply sprayed fire-resistive material when ambient or substrate temperatures are 40 deg F. or lower, unless temporary protection and heat is provided to maintain temperatures at or above this level for 24 hours before, during, and for 24 hours after product application.

B. Ventilation: Ventilate building spaces during and after application of sprayed fire-resistive material to achieve a minimum of four air changes per hour. Use natural means or, where this is inadequate, forced-air circulation until fire-resistive material dries thoroughly.

1.8 SEQUENCING

A. Sequence and coordinate application of sprayed fire-resistive materials with other related work specified in other Sections to comply with the following requirements:

1. Provide temporary enclosures for interior applications to prevent deterioration of fire-resistive material due to exposure to unfavorable environmental conditions.

2. Avoid unnecessary exposure of fire-resistive material to abrasion and other damage likely to occur during construction operations subsequent to its application.

3. Do not apply fire-resistive material to metal roof deck substrates until roofing has been completed; prohibit roof traffic during application and drying of fire-resistive material. Fireproofing shall be considered dry when the moisture content is 6% or less.

4. Do not begin applying fire-resistive material until clips, hangers, supports, sleeves, and other items penetrating fire protection are in place.

5. Defer installing ducts, piping, and other items that would interfere with applying fire-resistive material until application of fire protection is completed.

6. Do not install enclosing or concealing construction until after fire-resistive material has been applied, inspected, tested, and corrections have been made to defective applications.

7. Protect permanently exposed walls, floor or special surfaces.

1.9 GUARANTEE

A. Guarantee: Submit a written warranty, executed by Contractor and cosigned by Installer, agreeing to repair or replace sprayed fire-resistive materials that fail within the specified warranty period.

1. Failures include, but are not limited to, cracking, flaking, eroding in excess of specified requirements; peeling; and delaminating of sprayed fire-resistive materials from substrates due to defective materials and workmanship within the specified warranty period.

B. Guarantee Period: One (1) year from date of Substantial Completion.

PART II - PRODUCTS

2.1 CONCEALED SPRAYED FIRE-RESISTIVE MATERIALS

A. General: For concealed applications of sprayed fire-resistive materials, provide manufacturer's standard products complying with requirements indicated in this Article for material composition and physical properties representative of installed products.

B. UL design listings must state that the loading was determined by Allowable Stress Design Method or Load and Resistance Factor Design Method. UL design listings requiring a load restriction factor will not be allowed.

C. Material Composition: As follows:

1. Cementitious sprayed fire-resistive material consisting of factory-mixed, dry formulation of gypsum or Portland cement binders and lightweight mineral or synthetic aggregates mixed with water at Project site to form a slurry or mortar for conveyance and application.

D. Physical Properties: Minimum values, unless otherwise indicated, or higher values required to attain designated fire-resistance ratings, measured per standard test methods referenced with each property listed as follows:

1. Dry Density: 15 lb./cu. ft. for average and individual densities regardless of density indicated in referenced fire-resistive design, or greater if required to attain fire-resistance ratings indicated, per ASTM E 605 or AWCI Technical Manual 12-A, Appendix A, "Alternate Method for Density Determination."

2. Thickness: Provide minimum average thickness required for fire-resistive design shown on approved submittals.

a. Fireproofing shall be of thicknesses and density to meet the requirements of the 2014 New York City Building Code.

3. Bond Strength: 430 lbf/sq. ft. per ASTM E 736.

4. Compressive Strength: 5.21 lbf/sq. in. as determined in the laboratory per ASTM E 761. Minimum thickness of sprayed fire-resistive material tested shall be 0.75 inch and minimum dry density shall be as specified, but not less than 15 lb./cu. ft.

5. Corrosion Resistance: No evidence of corrosion per ASTM E 937.

6. Deflection: No cracking, spalling, delamination, or the like per ASTM E 759.

7. Effect of Impact on Bonding: No cracking, spalling, delamination, or the like per ASTM E 760.

8. Air Erosion: Maximum weight loss of 0.025 g/sq. ft. in 24 hours per ASTM E 859. For laboratory tests, minimum thickness of sprayed fire-resistive material is 0.75 inch, maximum dry density is 15 lb./cu. ft., test specimens are not prepurged by mechanically induced air velocities, and tests are terminated after 24 hours.

9. Fire-Test-Response Characteristics: Provide sprayed fire-resistive materials with the following surface-burning characteristics as determined by testing identical products per ASTM E 84 by UL or another testing and inspecting agency acceptable to New York City Building Department.

   a. Flame Spread: 10 or less.
   b. Smoke Developed: 0.

10. Fungal Resistance: No observed growth on specimens per ASTM G 21.

E. Cementitious Sprayed Fire-Resistive Material: Subject to compliance with requirements, products that may be incorporated into the Work include the following:

1. GCP Applied Technologies; Monokote Type MK-10HB

2. Isolatek International Corp., Cafco Products; Cafco 300HS

3. Southwest Fireproofing Products Co.; Type 5MD

4. Carboline Company, A Subsidiary of RPM International; Pyrolite 15

5. Or approved equal.

2.2 SPRAYED FIRE-RESISTIVE MATERIALS FOR EXPOSED FIREPROOFING

A. General: For exposed applications of sprayed fire-resistive materials, provide manufacturer's standard products complying with requirements indicated for material composition and for minimum physical properties of each product listed, measured by standard test methods referenced with each property.

B. UL design listings must state that the loading was determined by Allowable Stress Design Method or Load and Resistance Factor Design Method. UL design listings requiring a load restriction factor will not be allowed.

C. Cementitious Sprayed Fire-Resistive Material: Factory-mixed, dry, cement aggregate formulation, chloride-free formulation of Portland cement binders, additives, and inorganic aggregates, mixed with water at Project site to form a slurry or mortar for conveyance and application, complying with the following requirements:

1. Dry Density: Values for average and individual densities as required for fire-resistance ratings indicated, per ASTM E 605 or AWCI Technical Manual 12-A, Appendix A, "Alternate Method for Density Determination," but with an average density of not less than 22 lb./cu. ft.

2. Bond Strength: 425 psf minimum per ASTM E 736.

3. Compressive Strength: 10,000 psf. per ASTM E 761.

4. Corrosion Resistance: No evidence of corrosion per ASTM E 937.

5. Deflection: No cracking, spalling, delamination, or the like per ASTM E 759.

6. Effect of Impact on Bonding: No cracking, spalling, delamination, or the like per ASTM E 760.

7. Air Erosion: Maximum weight loss of 0.025 g/sq. ft. per ASTM E 859.

8. Combustion Characteristics: Passes ASTM E 136.

9. Fire-Test-Response Characteristics: Provide sprayed fire-resistive materials with the following surface-burning characteristics as determined by testing identical products per ASTM E 84 by UL or another testing and inspecting agency acceptable to New York City Building Department.

   a. Flame Spread: 10 or less.
   b. Smoke Developed: 0.

10. Fungal Resistance: No observed growth on specimens per ASTM G 21.

11. For exterior applications of sprayed fire-resistive material, provide manufacturer's formulation approved for surfaces exposed to the exterior.

D. Cement-Aggregate Cementitious Sprayed Fire-Resistive Material: Subject to compliance with requirements, products that may be incorporated into the Work include the following:

1. Carboline Co., Fireproofing Products Div.; Pyrocrete 239

2. GCP Applied Technologies; Monokote Type Z106HY

3. Promat Firetemp; F4

4. Isolatek International Corp., Cafco Products; Cafco 400

5. Or approved equal.

2.3 AUXILIARY FIRE-RESISTIVE MATERIALS

A. General: Provide auxiliary fire-resistive materials that are compatible with sprayed fire-resistive materials and substrates and are approved by UL or another testing and inspecting agency acceptable to New York City Building Department for use in fire-resistive designs indicated.

B. Adhesive for Bonding Fire-Resistive Material: Product approved by manufacturer of sprayed fire-resistive material, used where required by manufacturer to ensure proper bond.

C. Metal Lath: Expanded metal lath fabricated from material of weight, configuration, and finish required to comply with fire-resistive designs indicated and fire-resistive product manufacturer's written recommendations. Include clips, lathing accessories, corner beads, and other anchorage devices required to attach lath to substrates and to receive sprayed fire-resistive material.

D. Sealer for Sprayed Fire-Resistive Material in Elevator Shafts and Open Area Plenums: Transparent-drying, water-dispersible protective coating compatible with sprayed fire-resistive material and recommended by sprayed fire-resistive material manufacturer.

PART III - EXECUTION

3.1 EXECUTION REQUIREMENTS

A. Refer to DDC General Conditions for execution requirements.

3.2 PREPARATION

A. Clean substrates of substances that could impair bond of fire-resistive material, including oil, grease, rolling compounds, incompatible primers, and loose mill scale.

B. For exposed applications, repair substrates to remove any surface imperfections that could affect uniformity of texture and thickness in finished surface of sprayed fire-resistive material. Remove minor projections and fill voids that would telegraph through fire-resistive products after application.

C. Cover other work subject to damage from fallout or overspray of fire-resistive materials during application. Provide temporary enclosure as required to confine spraying operations, protect the environment, and ensure maintenance of adequate ambient conditions for temperature and ventilation.

3.3 INSTALLATION

A. Comply with fire-resistive material manufacturer's written instructions for mixing materials, application procedures, and types of equipment used to convey and spray on fire-resistive material, as applicable to particular conditions of installation and as required to achieve fire-resistance ratings indicated.

B. Install metal lath, as required, to comply with fire-resistance ratings and fire-resistive material manufacturer's written recommendations for conditions of exposure and intended use. Securely attach lath to substrate in position required for support and reinforcement of fire-resistive material. Use anchorage devices of type recommended in writing by fire-resistive material manufacturer. Attach lathing accessories where indicated or required for secure attachment to substrate.

C. Coat substrates with adhesive before applying fire-resistive material where required to achieve fire-resistance rating or as recommended in writing by fire-resistive material manufacturer for material and application indicated.

D. Extend fire-resistive material in full thickness over entire area of each substrate to be protected.

E. Spray apply fire-resistive materials to maximum extent possible. Following the spraying operation in each area, complete the coverage by method recommended by the manufacturer.

F. Where sealers are used, apply products that are tinted to differentiate them from the sprayed fire-resistive material over which they are applied. Apply sealers at rated recommended by sprayed fire-resistive material manufacturer to maintain fire-resistance ratings.

G. Maintain ambient conditions during installation and for cure period following installation, as recommended by manufacturer. Provide ventilation and avoid excessive rate of drying.

H. Fireproofing to the underside of roof deck assemblies shall be done only after roofing application is complete, all roof mounted mechanical equipment is in place, and the roof is watertight.

I. No fireproofing shall be applied prior to completion of concrete work on steel decking.

J. Installation Sequence of Fireproofing

1. All patching and repairing of sprayed fireproofing, due to cutting trades or testing and inspection, shall be performed under this Section.

K. Provisions shall be made for ventilation to properly dry the fireproofing after application. In enclosed areas lacking natural ventilation, air circulation and ventilation must be provided.

3.4 FIELD QUALITY CONTROL

A. Testing Agency: City of New York will engage a special inspecting agency to perform field tests and inspections and to prepare test reports.

1. Testing and inspecting agency will interpret tests and state in each report whether tested work complies with or deviates from requirements.

B. Testing and inspecting of completed applications of sprayed fire-resistive material will take place in successive stages, in areas of extent and using methods as follows. Do not proceed with application of fire-resistive material for the next area until test results for previously completed applications of fire-resistive material show compliance with requirements.

1. For each 1000-sq. ft. area, or partial area, on each floor, testing and inspecting agency will evaluate the following characteristics. Tested values must equal or exceed values indicated and values required for approved fire-resistance design.

a. Thickness for Floors, Roofs, and Walls: From the average of 10 measurements from a 144-sq. in. sample area, with sample width of not less than 6 inches per ASTM E 605.

b. Thickness for Structural Frame Members: From a sample of 25 percent of structural members per floor, taking 9 measurements at a single cross section for structural frame beams or girders, 7 measurements of a single cross section for joists and trusses, and 12 measurements of a single cross section for columns per ASTM E 605.

2. For each 10,000 sq. ft. area, or partial area, on each floor, testing and inspection agency will evaluate the following characteristics. Tested values must equal or exceed values indicated and values required for approved fire resistance design.

a. Bond Strength for Floors, Roofs, Walls, and Structural Framing Members: Cohesion and adhesion at frequency and from sample size indicated for determining thickness of each type of construction, per ASTM E 736.

3. Density for Floors, Roofs, Walls, and Structural Frame Members: At frequency and from sample size indicated for determining thickness of each type of construction, per ASTM E 605 or AWCI Technical Manual 12-A, Appendix A, "Alternate Method for Density Determination."

4. When testing discovers applications of fire-resistive material not in compliance with requirements, testing and inspecting agency will perform additional random testing to determine extent of noncompliance.

C. Remove and replace applications of fire-resistive material where test results indicate that they do not comply with specified requirements for cohesion and adhesion or for density, or both.

D. Apply additional fire-resistive material per manufacturer's written instructions where test results indicate that thickness does not comply with specified requirements.

E. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

END OF SECTION 07 81 00

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SECTION 07 81 23
Intumescent Fireproofing

PART I - GENERAL

1.1 RELATED DOCUMENTS

A. The following documents apply to all required work for the Project: (1) the Contract Drawings, (2) the Specifications, (3) the General Conditions, (4) the Addendum and (5) the Contract (City of New York Standard Construction Contract).

B. LEED General Requirements:

1. Refer to DDC General Conditions

a. Section 01 33 00 "Submittal Procedures"
b. Section 01 81 13.04 "Sustainable Design Requirements for LEED v4 Buildings"
c. Section 01 81 13.13 "Volatile Organic Compound Limits for Adhesives, Sealants, Paints and Coatings for LEED Buildings"
d. Section 01 81 19 "Indoor Air Quality Requirements for LEED Buildings"

1.2 SUMMARY

A. Section includes intumescent fireproofing for interior applications.

B. Related Sections

1. Structural Steel - Section 05 12 00.

2. Painting and Finishing - Section 09 90 00.

1.3 REFERENCES

A. ASTM Test Standards

1. ASTM D 2240 – Durometer Hardness (Shore D Only).

2. ASTM D 2794 – Impact Resistance.

3. ASTM D 4060 – Abrasion Resistance.

4. ASTM D 4541 – Bond Strength.

5. ASTM E 84 – Surface Burning Characteristics of Building Materials.

6. ASTM E 119 – Fire Tests of Building Construction and Materials.

B. The Society of Protective Coatings (SSPC):

1. SSPC SP-6: Commercial Blast Cleaning Standard.

C. Underwriters' Laboratories Inc. (UL):

1. Fire Resistive Directory, Volume 1; Current edition. Classification identified as Mastic and Intumescent Coatings (CDWZ)

2. UL 263 - Fire Test of Building Construction and Material

1.4 SUBMITTAL PROCEDURES

A. Refer to DDC General Conditions Section 01 33 00 "Submittal Procedures".

1.5 SUBMITTALS

A. Product Data: Submit product data including manufacturer's technical information indicating product performance characteristics, performance and limitation criteria for each product specified herein.

B. Submit evidence indicating that manufacturer of the intumescent fireproofing coating has reviewed and approved shop primer to be used by the structural steel fabricator; refer to Section 05 12 00, "Structural Steel," for primer description.

C. Submit evidence indication that manufacturer of the intumescent fireproofing coating has reviewed and approved proposed topcoat.

D. Fire Test Evidence: Submit published third party design listings for fire resistance ratings and product thickness. Include evidence that the fire testing was sponsored by the manufacturer and that the material tested was produced at the manufacturers facility under the supervision of third party certification personnel.

E. Installation Instructions: Submit manufacturer's written installation instructions.

F. Shop Drawings: Submit plan, section, elevation and perspective drawings as necessary to depict system configuration, design considerations and application procedures.

G. Selection Samples: For each finish product specified, submit samples representing manufacturer's range of available materials, finishes and shapes.

1.6 QUALITY ASSURANCE

A. Refer to DDC General Conditions Section 01 40 00 "Quality Requirements".

B. Material Manufacturer: Company specializing in manufacturing products listed in this Section.

C. Fire Protection Factory Manufacturer: Company specializing in manufacturing the work of this Section with a minimum of three years' documented experience.

D. Fire Protection Installer: Company specializing in installing the work of this Section with a minimum of three years' documented experience.

E. Product

1. All products listed in this Section must be manufactured under the appropriate follow-up service with each container bearing the certified label (mark).

2. Intumescent fireproofing shall be a complete system consisting of compatible primer, intumescent fireproofing coating, adhesive, edge sealant and decorative topcoat.

F. Mock-Up: Provide a mock-up for evaluation of surface preparation techniques and application workmanship.

1. Before proceeding with the work, the installer will apply the primer, intumescent fireproofing, and decorative top coat to a representative substrate section of 10 square feet in size. Areas will be designated by the Commissioner.

2. Materials must be applied in accordance with the project requirements for fire rating thickness, finish texture and color.

3. The application must be witnessed by the Commissioner and is subject to their approval. Once agreed upon in writing, it serves as a guide for the finished work.

4. Do not proceed with remaining work until workmanship, color, and sheen are approved by Commissioner.

5. Refinish mock-up area as required to produce acceptable work.

1.7 DELIVERY, STORAGE AND HANDLING

A. Delivery: Deliver materials in manufacturer's original, sealed, undamaged container with identification label intact. Packaged materials must bear the appropriate labels, seals and designated certification mark for fire resistive ratings.

B. Storage: Store materials in strict accordance with manufacturer's documented instructions.

C. Documentation: All batch number, product identification and quantities shall be recorded on appropriate QC documents. A copy of the transport document and manufacturers conformance certificate shall be attached to the material delivery QC form.

1.8 PROJECT CONDITIONS

A. Project Environmental Requirements: Substrate and air temperature shall be in accordance with the manufacturer's requirements.

1. Protect work area from windblown dust and rain. Protect adjacent areas from over spray of fireproofing material.

2. Provide ventilation in areas to receive work of this Section during application and minimum 24 hours after application.

B. Temperature and Humidity Requirements: Maintain air temperature and relative humidity in areas where products will be applied for a time period before during and after application as recommended by manufacturer.

1. Do not install intumescent fire protection system when temperature of substrate and/or surrounding ambient air temperature is below 41 degrees F. Temporary protection and heat shall be maintained at this minimum temperature for 24 hours before, during and 24 hours after material application.

2. Steel substrate temperature shall be a minimum of 5 deg F. above the dew point of the surrounding air for a period of 24 hours prior and during the application of the material.

3. If necessary for job schedule, the Contractor shall provide enclosures and heat to maintain proper temperatures and humidity levels in the application areas.

4. The relative humidity of the application area shall not exceed a maximum of 85 percent for 24 hours prior, during and 24 hours after the application of the material.

1.9 WARRANTY

A. Provide to City of New York an executed copy of the manufacturer's standard limited warranty against manufacturing defect, outlining its terms, conditions, and exclusions from coverage.

1. Duration: Minimum two years.

PART II - PRODUCTS

2.1 INTUMESCENT FIREPROOFING COATING FOR INTERIOR APPLICATIONS

A. Manufactures: Subject to compliance with requirements, provide products by one of the following:
1. International Paint; Interchar 1120
2. Carboline; Thermo-Lag-Series
3. Albi Mfg. Co.; Albi Clad TF
4. Isolatek International; Cafco Spray Film WB-5 for columns only; and WB-3 for beams, joists and girders
5. Promat Firestop; Promapaint P-3
6. Or approved equal

B. Description: A single pack, chlorine-free, water borne intumescent coating site applied over shop applied prime coat (see Section 05 10 00 Structural Steel). Coating must meet the following minimum physical requirements:

PROPERTY	TEST METHOD	VALUE
Dry Applied Density	N/A	85 PCF
Hardness	ASTM D 2440	60
Compressive Strength	ASTM D 695	500 psi
Bond Strength	ASTM D 4541	145 psi
Abrasion Resistance	ASTM D 4060	0.16 g loss @1000 cycles
Flame Spread	ASTM E 84	Class A
Smoke Developed	ASTM E 84	Class A

1. Application: Site-applied coatings.

C. Fireproofing Performance: Provide intumescent fireproofing, tested by independent testing agency in accordance with ASTM E 119/UL 263, and acceptable to the City of New York:

1. Listed by UL and bearing the UL label.

D. Structural Steel Fire Resistance Rating

1. Fire Resistance Rating: 2 hours for primary structure.

E. Accessory Materials: Manufacturer's recommended adhesive and edge sealant.

F. Shop Primer Coating: Refer to Section 05 12 00, "Structural Steel."

G. Decorative Topcoat: As recommended by the intumescent fireproofing material manufacturer and applied in accordance with the topcoat manufacturer's documented instructions, custom colors as selected by the Commissioner.

1. Provide aliphatic urethane finish coat.

2. Basis of Design: Subject to compliance with requirements, provide: Sherwin Williams; Acrolon 318 HS or comparable product by one of the following:

1). Carboline
2). Tnemec
3). Or approved equal.

PART III - EXECUTION

3.1 EXECUTION REQUIREMENTS

A. Refer to DDC General Conditions for execution requirements.

3.2 EXAMINATION

A. All surfaces to receive the fire protection material must be clean, dry and free of oil, grease, loose mill scale, loose shop primer, dirt, dust or other foreign substances which would impair bond of the fire protection material to the substrate.

B. Do not commence installation of the fire protection system until the contractor, installer and fire protection manufacturer's representative have examined the surfaces to receive the fire protection and determined the surfaces are acceptable to receive the fire protection material. Commencement of installation is acceptance of substrate.

C. Verify that substrate and workspace temperature and humidity conditions are in accordance with requirements of this Section.

D. Verify that all clip hangers, piping, ducts, equipment or other items which would interfere with the installation of the factory-manufactured architectural fire protection system are not positioned or installed until installation is complete.

3.3 PREPARATION

A. Provide masking, drop cloths or other suitable coverings to prevent overspray onto surfaces not intended to be affected by Work in this Section.

B. Clean substrate free of dust, dirt, grease or other foreign substances that would impair with the bond of the intumescent fireproofing protection adhesive material.

C. Grind smooth all weld spatter and defects prior to commencement of fire protection installation and touch-up shop primer in the field using same paint as shop primer.

3.4 APPLICATION (FIELD APPLIED)

A. Equipment and installation procedures must conform to the manufacturer's installation instructions. The intumescent fireproofing protection material shall be applied at the required dry film thickness to achieve fire resistance rating specified herein.

B. Install fire protection material only to primed surfaces and in accordance with manufacturer's installation instructions. Refer to Section 05 12 00 Structural Steel for steel shop primer.

C. Final texture and finish of the intumescent fireproofing must be completed prior to the application of the decorative top coat and in accordance with the Commissioner's approval and approved mock-up samples. Finish shall be level 4 (high end architectural – spray applied, back rolled and sanded smooth).

D. Apply decorative top coat in accordance with the manufacturer's application instructions. Final color, gloss and finish will be determined and approved by the Commissioner. See Finish Schedule.

3.5 FIELD QUALITY CONTROL

A. The City of New York shall retain the services of an independent testing laboratory to inspect and verify the installation of the intumescent fireproofing material in accordance with the provisions of AWCI Technical Manual 12-B, Standard Practice for the Testing and Inspection of Field Applied Thin-Film Intumescent Fire-Resistive Materials; an Annotated Guide.

B. The fire protection material inspection must be performed prior to the application of the decorative top coat.

C. All test results must be made available to all parties at the completion of each pre-designated area and approved prior to the application of top-coat.

D. Intumescent fireproofing not in compliance with the specification requirements must be corrected prior to the application of the decorative top coat.

END OF SECTION 07 81 23

SECTION 07 84 13
Firestops and Smokeseals

PART I - GENERAL

1.1 RELATED DOCUMENTS

A. The following documents apply to all required work for the Project: (1) the Contract Drawings, (2) the Specifications, (3) the General Conditions, (4) the Addendum and (5) the Contract (City of New York Standard Construction Contract).

B. LEED / Environmentally Preferable Purchase (EPP) General Requirements:

1. Refer to DDC General Conditions and the Addendum to the General Conditions

2. LEED requirements apply to all Phase II work with the exception of the Existing Building scope. EPP requirements apply to the project's Existing Building scope only.

1.2 SUMMARY

A. Section includes:

1. Penetrations through fire-resistance-rated floor and roof construction including both empty openings and openings containing cables, pipes, ducts, conduits, and other penetrating items.

2. Penetrations through fire-resistance-rated walls and partitions including both empty openings and openings containing cables, pipes, ducts, conduits, and other penetrating items.

3. Penetrations through smoke barriers and construction enclosing compartmentalized areas involving both empty openings and openings containing penetrating items.

4. Sealant joints in fire-resistance-rated construction.

5. Penetrations at each floor level in shafts and/or stairwells.

6. Construction joints, including those between top of fire rated walls and underside of floors above; and those between exterior curtain walls and the outer perimeter edge of floor assemblies.

B. Related Sections

1. Cast-in-Place Concrete - Section 03 30 00.

2. Unit Masonry - Section 04 20 00.

3. Interior Joint Sealants - Section 07 92 00.

4. Gypsum Drywall - Section 09 29 00.

1.3 REFERENCES

A. ASTM E 814 "Standard Method of Fire Tests of Through-Penetration Firestops."

B. UL 1479, UBC 7-5 (Both are same as A. above).

C. ASTM E 119 "Standard Method of Fire Tests of Building Construction and Materials."

D. UL 263, UBC 7-1 (Both are same as C. above).

E. UL 2079 "Tests For Fire Resistance of Building Joint Systems."

F. ASTM E 1399 "Test For Dynamic Movement Conditions."

G. ASTM E 1966 (Same as E. above).

H. ASTM G 21 "Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi."

I. Test Requirements: ASTM E 2307, "Standard Test Method for Determining Fire Resistance of Perimeter Fire Barrier Systems Using Intermediate-Scale, Multi-story Test Apparatus."

J. Inspection Requirements: ASTM E 2174, "Standard Practice for On-site Inspection of Installed Firestops."

K. Published Through-Penetration Systems by recognized independent testing agencies.

1. UL Fire Resistance Directory, Volume II of current year.
2. Warnock Hersey Certification Listings, current year.
3. Omega Point Laboratories, current year.

L. International Firestop Council Guidelines for Evaluating Firestop Systems Engineering Judgments.

1.4 SUBMITTAL PROCEDURES

A. Refer to DDC General Conditions Section 01 33 00 "Submittal Procedures".

1.5 SUBMITTALS

A. Submit manufacturer's product literature for each type of firestop material to be installed. Literature shall indicate product characteristics, typical uses, performance, limitation criteria, test data and indication that products comply with specified requirements.

B. Submit shop drawings detailing materials, installation methods, and relationships to adjoining construction for each firestop system, and each kind of construction condition penetrated and kind of penetrating item. Include firestop design designation of qualified testing and inspection agency evidencing compliance with requirements for each condition indicated.

1. Submit documentation, including illustrations, for proposed UL listed (or equal) firestop and smokeseal assembly required for the Project.

C. Material Safety Data Sheets: Submit MSDS for each firestop product.

D. Qualification Data: For Installer.

1.6 QUALITY ASSURANCE

A. Refer to DDC General Conditions Section 01 40 00 "Quality Requirements".

B. General: Provide firestopping systems that are produced and installed to resist the spread of fire and the passage of smoke and other gases.

C. Installation Responsibility: Assign installation of through-penetration firestop systems and fire-resistive joint systems in Project to a single sole source firestop specialty contractor.

D. Firestopping materials shall conform to Flame (F) and Temperature (T) ratings as required by 2014 New York City Building Code and as tested by nationally accepted test agencies per ASTM E 814 or UL 1479. The F-rating must be a minimum of one (1) hour, but not less than the fire resistance rating of the assembly being penetrated. T-rating, when required by 2014 New York City Building Code, shall be based on measurement of the temperature rise on the penetrating item(s). The fire test shall be conducted with a minimum positive pressure differential of 0.01 inches of water column.

1. Penetrations in Horizontal Assemblies: Provide firestopping with ratings determined in accordance with UL 1479 or ASTM E 814.

   a. F-Rating: Minimum of 1-hour rating, but not less than the fire-resistance rating of the floor construction being penetrated.
   b. T-Rating: When penetrant is located outside of a wall cavity, minimum of 1-hour rating, but not less than the fire-resistance rating of the floor construction being penetrated.
   c. W-Rating: Class 1 rating in accordance with water leakage test per UL 1479.

2. Penetrations in Smoke Barriers: Provide firestopping with ratings determined in accordance with UL 1479 or ASTM E 814.

   a. L-Rating: Not exceeding 5.0 cfm/sq. ft. of penetration opening at both ambient and elevated temperatures.

E. Firestopping products shall be asbestos free and free of any PCBs.

F. Do not use any product containing solvents.

G. Do not use firestop products which after curing, dissolve in water.

H. Do not use firestop products that contain ceramic fibers.

I. Installer Qualifications: A firm that has been approved by FM Approval according to FM Approval 4991, "Approval Standard for Firestop Contractors," or been evaluated by UL and found to comply with its "Qualified Firestop Contractor Program Requirements."

J. Mock-Up: Prepare job site mock-ups of each typical Firestop System proposed for use in the project. Approved mock-ups will be left in place as part of the finished project and will constitute the quality standard for the remaining work.

K. For firestopping exposed to view, traffic, moisture, and physical damage, provide products that do not deteriorate when exposed to these conditions.

1. For piping penetrations for plumbing and wet-pipe sprinkler systems, provide moisture-resistant through-penetration firestop systems.

2. For floor penetrations with annular spaces exceeding 4 inches or more in width and exposed to possible loading and traffic, provide firestop systems capable of supporting the floor loads involved either by installing floor plates or alternative means.

3. For penetrations involving insulated piping, provide through-penetration firestop systems not requiring removal of insulation.

L. Mold Resistance: Provide penetration firestopping with mold and mildew resistance rating of less than or equal to 1 as determined by ASTM G 21.

M. Firestopping Materials are either "cast-in-place" (integral with concrete placement) or "post-installed." Provide cast-in-place firestop devices prior to concrete placement.

N. Firestop systems do not reestablish the structural integrity of load bearing partitions or assemblies, or support live loads and traffic. Installer shall consult the Commissioner prior to penetrating any load bearing assembly.

1.7 DELIVERY, STORAGE AND HANDLING

A. Deliver materials in manufacturer's original unopened containers with manufacturer's name, product identification, lot numbers, UL or Warnock Hersey labels, and mixing and installation instructions, as applicable.

B. Store materials in the original, unopened containers or packages, and under conditions recommended by manufacturer.

C. All firestop materials shall be installed prior to expiration of shelf life.

1.8 PROJECT CONDITIONS

A. Do not use materials that contain solvents, show sign of damage or are beyond their shelf life.

B. During installation, provide masking and drop cloths as needed to prevent firestopping products from contaminating any adjacent surfaces.

C. Conform to ventilation requirements if required by manufacturer's installation instructions or Material Safety Data Sheet.

D. Weather Conditions: Do not proceed with installation of firestop products when temperatures are in excess or below the manufacturer's recommendations.

E. Schedule installation of firestop products after completion of penetrating item installation but prior to covering or concealing of openings.

1.9 SEQUENCING AND SCHEDULING

A. Pre-Installation Conference: Convene a pre-installation conference to establish procedures to maintain optimum working conditions and to coordinate this work with related and adjacent work.

B. Install all firestop systems after voids and joints are prepared sufficiently to accept the applicable firestop system.

C. Do not cover firestop systems until they have been properly inspected and accepted by the inspecting agency.

PART II - PRODUCTS

2.1 MANUFACTURERS

A. Manufactures: Subject to compliance with requirements, provide products of one of the following:
1. Tremco
2. Bio-Fireshield
3. 3M
4. Specified Technologies Inc.
5. U.S. Gypsum Co.
6. Nelson
7. Hilti, Inc.
8. Grace Flame Safe
9. Or approved equal

2.2 FIRESTOPPING, GENERAL

A. Compatibility: Provide firestopping composed of components that are compatible with each other, the substrates forming openings, and the items, if any, penetrating the firestopping under conditions of service and application, as demonstrated by firestopping manufacturer based on testing and field experience.

B. Accessories: Provide components for each firestopping system that are needed to install fill materials. Use only components specified by the firestopping manufacturer and approved by the qualified testing and inspecting agency for the designated fire-resistance-rated systems. Accessories include but are not limited to the following items:

1. Permanent forming/damming/backing materials including the following:

   a. Semirefractory fiber (mineral wool) insulation.
   b. Sealants used in combination with other forming/damming materials to prevent leakage of fill materials in liquid state.
   c. Fire-rated form board.
   d. Joint fillers for joint sealants.

2. Temporary forming materials.

3. Substrate primers.

4. Collars.

5. Steel sleeves.

C. Applications: Provide firestopping systems composed of materials specified in this Section that comply with system performance and other requirements.

D. Smokeseals at top of partitions shall be flexible to allow for partition deflection.

E. Polypropylene Sleeves (PP): For cast-in device options.

2.3 FILL MATERIALS FOR THROUGH-PENETRATION FIRESTOP SYSTEMS

A. Endothermic, Latex Compound Sealant: Single-component, endothermic, latex formulation.

B. Intumescent, Latex Sealant: Single-component, Intumescent, latex formulation.

C. Intumescent Putty: Non-hardening, dielectric, water-resistant putty containing no solvents, inorganic fibers, or silicone compounds.

D. Intumescent Wrap Strips: Single-component, elastomeric sheet with aluminum or polyethelene foil on one side.

E. Job-Mixed Vinyl Compound: Prepackaged vinyl-based powder product for mixing with water at Project site to produce a paintable compound, passing ASTM E 136, with flame-spread and smoke-developed ratings of zero per ASTM E 84.

F. Mortar: Prepackaged dry mix composed of a blend of inorganic binders, fillers, and lightweight aggregate formulated for mixing with water at Project site to form a non-shrinking, homogeneous mortar.

G. Pillows/Bags: Re-usable, heat-expanding pillows/bags composed of glass-fiber cloth cases filled with a combination of mineral-fiber, water-insoluble expansion agents and fire-retardant additives.

H. Silicone Foam: Two-component, silicone-based liquid elastomer that, when mixed, expands and cures in place to produce a flexible, non-shrinking foam.

I. Silicone Sealant: Moisture-curing, single-component, silicone-based, neutral-curing elastomeric sealant of grade indicated below:

1. Grade: Pourable (self-leveling) formulation for openings in floors and other horizontal surfaces and non-sag formulation for openings in vertical and other surfaces requiring a non-slumping/gunnable sealant, unless firestop system limits use to non-sag grade for both opening conditions.

J. Cast-in-Place Firestop Devices: Factory-assembled devices for use in cast-in-place concrete floors and consisting of an outer metallic or polyprolyene sleeve lined with an intumescent strip, an extended rectangular flange attached to one end of the sleeve for fastening to concrete formwork, and a neoprene gasket.

K. Fire Rated Cable Management Devices: Factory-assembled round metallic sleeve device for use with cable penetrations, containing an integrated smoke seal fabric membrane that can be opened and closed for re-penetration.

L. Drop-In Firestop Devices: Factory-assembled devices for use with combustible or noncombustible penetrants in cored holes within concrete floors. Device shall consist of galvanized steel sleeve lined with an intumescent strip, an extended rectangular flange attached to one end of the sleeve for fastening to concrete floor, and neoprene gasket.

M. Firestop Devices: Factory-assembled collars formed from galvanized steel and lined with intumescent material sized to fit specific diameter of penetrant.

N. Intumescent Composite Sheets: Rigid panels consisting of aluminum-foil-faced elastomeric sheet bonded to galvanized-steel sheet.

O. Blocks/Plugs: Intumescent flexible block/plug suitable for reuse in re-penetration of openings. Blocks shall allow up to 12" of unreinforced annular space.

P. Tub Box Kit: Cast-in place pre-formed plastic tub box kit with three support legs for use with drain piping assembly associated with bathtub installations.

2.4 FIRE-RESISTIVE ELASTOMERIC JOINT SEALANTS

A. Elastomeric Sealant Standard: Provide manufacturer's standard chemically curing, elastomeric sealant of base polymer indicated that complies with ASTM C 920 requirements, including those referenced for Type, Grade, Class, and Uses, and requirements specified in this Section applicable to fire-resistive joint sealants.

1. Sealant Colors: Color of exposed joint sealants as selected by the Commissioner.

B. Single-Component, Neutral-Curing Silicone Sealant: Type S; Grade NS; Class 25; exposure-related Use NT, and joint-substrate-related Uses M, G, A, and (as applicable to joint substrates indicated) O.

1. Additional Movement Capability: Provide sealant with the capability to withstand 33 percent movement in both extension and compression for a total of 66 percent movement.

C. Multi-Component, Non-Sag, Urethane Sealant: Type M; Grade NS; Class 25; exposure-related Use NT, and joint-substrate-related Uses M, A, and (as applicable to joint substrates indicated) O.

1. Additional Movement Capability: Provide sealant with the capability to withstand 40 percent movement in extension and 25 percent in compression for a total of 65 percent movement in joint width existing at time of installation, when tested for adhesion and cohesion under maximum cyclic movement per ASTM C 719, and remain in compliance with other requirements of ASTM C 920 for uses indicated.

D. Single-Component, Non-Sag, Urethane Sealant: Type S; Grade NS; Class 25; and Uses NT, M, A, and (as applicable to joint substrates indicated) O.

2.5 MINERAL FIBER/CERAMIC WOOL NON-COMBUSTIBLE INSULATION (FIRE SAFING)

A. Provide min. 4 pcf safing insulation to suit conditions and to comply with fire resistance and firestop manufacturer's requirements.

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Thermafiber Safing Mineral Wool Insulation by Thermafiber, Inc. (an Owens Corning company)

2. Roxul Safe Fire Safing Insulation by Rockwool

3. Mineral Wool Safing by Johns Manville

4. Or approved equal

C. Material shall be classified non-combustible when tested per ASTM E 136.

2.6 MIXING

A. For those products requiring mixing prior to application, comply with firestopping manufacturer's directions for accurate proportioning of materials, water (if required), type of mixing equipment, selection of mixer speeds, mixing containers, mixing time, and other procedures needed to produce firestopping products of uniform quality with optimum performance characteristics for application indicated.

PART III - EXECUTION

3.1 EXECUTION REQUIREMENTS

A. Refer to DDC General Conditions for execution requirements.

3.2 PREPARATION

A. Surface Cleaning: Clean out openings and joints immediately prior to installing firestopping to comply with recommendations of firestopping manufacturer and the following requirements:

1. Remove all foreign materials from surfaces of opening and joint substrates and from penetrating items that could interfere with adhesion of firestopping.

2. Clean opening and joint substrates and penetrating items to produce clean, sound surfaces capable of developing optimum bond with firestopping. Remove loose particles remaining from cleaning operation.

3. Remove laitance and form release agents from concrete.

B. Priming: Prime substrates where recommended by firestopping manufacturer using that manufacturer's recommended products and methods. Confine primers to areas of bond; do not allow spillage and migration onto exposed surfaces.

C. Masking Tape: Use masking tape to prevent firestopping from contacting adjoining surfaces that will remain exposed upon completion of work and that would otherwise be permanently stained or damaged by such contact or by cleaning methods used to remove smears from firestopping materials. Remove tape as soon as it is possible to do so without disturbing seal of firestopping with substrates.

3.3 CONDITIONS REQUIRING FIRESTOPPING

A. Building Exterior Perimeters

1. Where exterior facing construction is continuous past a structural floor, and a space (i.e. construction joint) would otherwise remain open between the inner face of the wall construction and the outer perimeter edge of the structural floor, provide firestopping to equal the fire resistance of the floor assembly.

   a. If mineral wool is part of firestop system, the mineral wool must be completely covered by appropriate thickness of UL or Warnock Hersey listed firestop sealant or spray.
   b. Refer to Article 3.6 herein for description of fire safing insulation.

2. Firestopping shall be provided whether or not there are any clips, angles, plates, or other members bridging or interconnecting the facing and floor systems, and whether or not such items are continuous.

3. Where an exterior wall passes a perimeter structural member, such as a girder, beam, or spandrel, and the finish on the interior wall face does not continue up to close with the underside of the structural floor above, thus interrupting the fire-resistive integrity of the wall system, and a space would otherwise remain open between the interior face of the wall and the structural member, provide firestopping to continuously fill such open space.

B. Interior Walls and Partitions

1. Construction joints between top of fire rated walls and underside of floors above, shall be firestopped.

2. Firestop system installed shall have been tested by either UL or Omega Point, including exposure to hose stream test and including for use with steel fluted deck floor assemblies.

3. Firestop system used shall allow for deflection of floor above.

C. Penetrations

1. Penetrations include conduit, cable, wire, pipe, duct, or other elements which pass through one or both outer surfaces of a fire rated floor, wall, or partition.

2. Except for floors on grade, where a penetration occurs through a structural floor or roof and a space would otherwise remain open between the surfaces of the penetration and the edge of the adjoining structural floor or roof, provide firestopping to fill such spaces in accordance with ASTM E 814.

3. These requirements for penetrations shall apply whether or not sleeves have been provided, and whether or not penetrations are to be equipped with escutcheons or other trim. If penetrations are sleeved, firestop annular space, if any, between sleeve and wall of opening.

D. Provide firestopping to fill miscellaneous voids and openings in fire rated construction in a manner essentially the same as specified herein before.

3.4 INSTALLING THROUGH PENETRATION FIRESTOPS

A. General: Comply with the through penetrations firestop manufacturer's installation instructions and drawings pertaining to products and applications indicated.

B. Install forming/damming materials and other accessories of types required to support fill materials during their application and in the position needed to produce the cross sectional shapes and depths required to achieve fire ratings of designated through-penetration firestop systems. After installing fill materials, remove combustible forming materials and other accessories not indicated as permanent components of firestop systems.

C. Install fill materials for through penetration firestop systems by proven techniques to produce the following results:

1. Completely fill voids and cavities formed by openings, forming materials, accessories, and penetrating items.

2. Apply materials so they contact and adhere to substrates formed by openings and penetrating items.

3. For fill materials that will remain exposed after completing work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.

3.5 INSTALLING FIRE RESISTIVE JOINT SEALANTS

A. General: Comply with ASTM C 1193, and with the sealant manufacturer's installation instructions and drawings pertaining to products and applications indicated.

B. Install joint fillers to provide support of sealants during application and at position required to produce the cross sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability and develop fire resistance rating required.

C. Install sealants by proven techniques that result in sealants directly contacting and fully wetting joint substrates, completely filling recesses provided for each joint configuration, and providing uniform, cross sectional shapes and depths relative to joint width that optimum sealant movement capability. Install sealants at the same time joint fillers are installed.

D. Tool no sag sealants immediately after sealant application and prior to the time skinning or curing begins. Form smooth, uniform beads of configuration indicated or required to produce fire resistance rating, as well as to eliminate air pockets, and to ensure contact and adhesion of sealants with sides of joint. Remove excess sealant from surfaces adjacent to joint. Do not use tooling agents that discolor sealants or adjacent surfaces or are not approved by sealant manufacturer.

3.6 INSTALLING FIRESAFING INSULATION

A. Install fire safing insulation utilizing welded or screw applied galvanized steel impaling pins and retaining clips; space clips or pins 24" o.c. maximum.

B. Completely fill voids in areas where safing insulation is required. At spandrel conditions/floor edges, depth of insulation top to bottom shall be at least four (4) inches.

C. Cover top of all safing insulation with firestop sealant or spray.

3.7 FIELD QUALITY CONTROL

A. Special inspecting agency retained by the City of New York will examine completed firestopping to determine, in general, if it is being installed in compliance with requirements.

B. Inspecting agency will report observations promptly and in writing to Contractor, City of New York and Commissioner.

C. Do not proceed to enclose firestopping with other construction until reports of examinations are issued.

D. Where deficiencies are found, Contractor must repair or replace firestopping so that it complies with requirements.

END OF SECTION 07 84 13

SECTION 07 92 00
Interior Joint Sealants

PART I - GENERAL

1.1 RELATED DOCUMENTS

A. The following documents apply to all required work for the Project: (1) the Contract Drawings, (2) the Specifications, (3) the General Conditions, (4) the Addendum and (5) the Contract (City of New York Standard Construction Contract).

B. LEED / Environmentally Preferable Purchase (EPP) General Requirements:

1. Refer to DDC General Conditions and the Addendum to the General Conditions

2. LEED requirements apply to all Phase II work with the exception of the Existing Building scope. EPP requirements apply to the project's Existing Building scope only.

1.2 SUMMARY

A. Section includes:

1. Interior wall joints not specified to be sealed in other Sections of work, including caulking to fill between architectural woodwork and any wall, floor and/or ceiling imperfections.

2. Control and expansion joints in walls.

3. Joints at wall penetrations.

4. Joints between items of equipment and other construction.

5. All other joints required to be sealed to provide a positive barrier against penetration of air. All sealants must be chemically and adhesion compatible with adjacent materials, especially weather resistive barriers (of any type).

B. Related sections

1. Firestops and Smokeseals - Section 07 84 13.

2. Gypsum Drywall - Section 09 29 00.

3. Ceramic Tiling - Section 09 30 13.

1.3 QUALITY ASSURANCE

A. Refer to DDC General Conditions Section 01 40 00 "Quality Requirements".

B. Qualification of Installers: Use only personnel who are experienced in the techniques of sealant work, and who are completely familiar with the published recommendations of the sealant manufacturer.

1.4 SUBMITTAL PROCEDURES

A. Refer to DDC General Conditions Section 01 33 00 "Submittal Procedures".

1.5 SUBMITTALS

A. Shop Drawings: Submit shop drawings showing all joint conditions, indicating relation of adjacent materials, all sealant materials (sealant, bond breakers, backing, primers, etc.), and method of installation.

1. Submit joint sizing calculations certifying that movement capability of sealant is not being exceeded.

B. Samples: Submit the following:

1. Color samples of sealants, submit physical samples (not color chart).

2. Sealant bond breaker and joint backing.

C. Product Data: Submit manufacturer's technical information and installation instructions for:

1. Sealant materials, indicating that material meets standards specified herein.

2. Backing rods.

1.6 ENVIRONMENTAL CONDITIONS

A. Temperature: Install all work of this Section when air temperature is above forty (40) degrees F. and below eighty (80) degrees F., unless manufacturer submits written instructions permitting sealant use outside of this temperature range.

B. Moisture: Do not apply work of this Section on surfaces which are wet, damp, or have frost.

1.7 DELIVERY, STORAGE AND HANDLING

A. Storage: Store sealant materials and equipment under conditions recommended by their manufacturer.

1. Do not use materials stored for a period of time exceeding the maximum recommended shelf life of the material.

2. Material shall be stored in unopened containers with manufacturers' name, batch number and date when shelf life expires.

1.8 WARRANTY

A. Provide a written, notarized warranty from the manufacturer stating that the applied sealants shall show no material failure for a period of ten (10) years.

B. Contractor to provide a written, notarized, guarantee stating that the applied sealants shall show no failure due to improper installation for a period of two (2) years.

C. Guarantee shall be in a form acceptable to the City of New York.

D. Include in guarantee provision, agreement to repair and/or replace, at Contractor's expense, sealant defects which develop during guarantee period, because of faulty labor and/or materials.

PART II - PRODUCTS

2.1 SEALANT MATERIALS

A. Interior Sealant: Provide a one (1) part acrylic based sealant conforming to ASTM C 834.

1. Basis of Design: Subject to compliance with requirements, provide Pecora; AC-20+ Silicone or comparable product by one of the following:
   a. Tremco
   b. Sherwin Williams
   c. Or approved equal

B. Colors: Colors as selected by Commissioner from manufacturer's standard selection. Contractor to provide Commissioner with physical samples for color selection.

2.2 MISCELLANEOUS MATERIALS

A. Back-Up Materials: Provide back-up materials and preformed joint fillers, non-staining, non-absorbent, compatible with sealant and primer, and of a resilient nature, twenty-five (25) percent wider than joint width. Materials impregnated with oil, bitumen or similar materials shall not be used. Provide back-up materials only as recommended by sealant manufacturer in writing.

B. Provide bond breakers, where required, of polyethylene tape as recommended by manufacturer of sealant.

C. Provide primers recommended by the sealant manufacturer for each material to receive sealant. Note that each exterior joint must be primed prior to sealing.

D. Provide solvent, cleaning agents and other accessory materials as recommended by the sealant manufacturer.

E. Materials shall be used per manufacturer's printed instructions.

PART III - EXECUTION

3.1 EXECUTION REQUIREMENTS

A. Refer to DDC General Conditions for execution requirements.

3.2 INSTALLATION

A. Sealant Installation Standard: Comply with instructions and recommendations of the manufacturer and in accordance with ASTM C 1193 for use of joint sealants as applicable to materials, applications and conditions required by this Project where more stringent installation requirements are specified herein, such requirements shall apply.

B. Supervision: The Contractor shall submit to the Commissioner written certification from the sealant manufacturer that the applicators have been instructed in the proper application of their materials. The Contractor shall use only skilled and experienced workmen for installation of sealant.

C. Apply sealant under pressure with a hand or power actuated gun or other appropriate means. Gun shall have nozzle of proper size and provide sufficient pressure to completely fill joints as detailed. Neatly point or tool joint to provide the contour as indicated on the drawings.

D. Preparation and Application

1. Thoroughly clean all joints, removing all foreign matter such as dust, oil, grease, water, surface dirt and frost. Sealant must be applied to the base surface. Previously applied film must be entirely removed.

2. Stone, masonry and concrete surfaces to receive sealant shall be cleaned where necessary by grinding, water blast cleaning, mechanical abrading, or combination of these methods as required to provide a clean, sound base surface for sealant adhesion.

   a. Do not use any acid or other material which might stain surfaces.
   b. Remove laitance by grinding or mechanical abrading.
   c. Remove loose particles present or resulting from grinding, abrading, or blast cleaning by blowing out joints with compressed air, oil and water free, or vacuuming joints prior to application of primer or sealant.

3. Clean non-porous surfaces such as metal and glass chemically. Remove protective coatings on metallic surfaces by solvent that leaves no residue and is compatible with sealant. Use solvent and wipe dry with clean, dry lint free paper towels. Do not allow solvent to air dry without wiping. Clean joint areas protected with masking tape or strippable films as above after removal of tape film.

4. Do not seal joints until they are in compliance with drawings, or meet with the control section standard.

5. Joint Size and Sealant Size: Joints to receive sealant shall be at least 1/4" wide. In joint 1/4" to 3/8" wide, sealant shall be 1/4" deep. In joints wider than 3/8" and up to 1" wide, sealant depth shall be one half the joint width. For joints wider than 1", sealant depth shall be as recommended by the sealant manufacturer. Depth of joint is defined as distance from outside face of joint to closest point of the filler.

6. Primer: Thoroughly clean joints and apply primer to all surfaces that will receive sealant. Apply primer on clean, dry surfaces, and prior to installation of joint backing. Completely wet both inner faces of the joint with primer. Mask adjacent surfaces of joint with non-staining masking tape prior to priming. Apply primer with clean brush and only when temperature is above 45 deg. F.

7. Joint Backing: In joints where depth of joint exceeds required depth of sealant, install joint backing (after primer is dry) in joints to provide backing and proper joint shape for sealant. Proper shape for sealant is a very slight "hourglass" shape, with back and front face having slight concave curvature. Use special blunt T-shaped tool or roller to install joint backing to the proper and uniform depth required for the sealant. Joint backing shall be installed with approximately twenty-five (25) percent

compressions. Do not stretch, twist, braid, puncture, or tear joint backing. Butt joint backing at intersections.

8. Bond Breaker: Install bond breaker smoothly over joint backing so that sealant adheres only to the sides of the joint and not backing.

9. Sealant Application: Apply sealant in accordance with the manufacturer's application manual and manufacturer's instructions, using hand guns or pressure equipment, on clean, dry, properly prepared substrates, completely filling joints to eliminate air pockets and voids. Mask adjacent surfaces of joint with non-staining masking tape. Force sealant into joint in front of the tip of the "caulking gun" (not pulled after it) and force sealant against sides to make uniform contact with sides of joint and to prevent entrapped air or pulling of sealant off of sides. Fill sealant space solid with sealant.

10. Tooling: Tool exposed joints to form smooth and uniform beds, with slightly concave surface conforming to joint configuration per Figure 4A in ASTM C 1193. Finished joints shall be straight, uniform, smooth and neatly finished. Remove masking tape immediately after tooling of sealant and before sealant face starts to "skin" over. Neatly remove any excess sealant from adjacent surfaces of joint, leaving the work in a neat, clean condition.

END OF SECTION 07 92 00

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SECTION 07 92 01
Exterior Joint Sealants

PART I - GENERAL

1.1 RELATED DOCUMENTS:

A. The following documents apply to all required work for the Project: (1) the Contract Drawings, (2) the Specifications, (3) the General Conditions, (4) the Addendum, and (5) the Contract (City of New York Standard Construction Contract).

B. LEED / Environmentally Preferable Purchase (EPP) General Requirements

1. Refer to DDC General Conditions and the Addendum to the General Conditoins.

2. LEED requirements apply to all Phase II work with the exception of the Existing Building scope. EPP requirements apply to the Project's Existing Building scope only.

1.2 SUMMARY:

A. This Section includes the Sealant components for the associated building enclosure and glazing systems described in the Building Enclosure System Matrix and Exterior Glass Type Matrix. For a description of where Sealants are required, refer to the Drawings

B. This Section requires Engineering Services.

C. The following Sections describe systems and materials that incorporate Sealants, and will require coordinated interfaces:

1. Section 03 45 00 – Architectural Precast Concrete.

2. Section 07 00 01 – Rainscreen System.

3. Section 07 20 00 – Thermoplastic Membrane Roofing.

4. Section 07 27 01 - Weather Resistive Barriers.

5. Section 07 62 01 – Facade Sheet Metal Flashings.

6. Section 07 95 00 – Expansion Control.

7. Section 08 40 01 – Glazed Storefronts and Curtain Wall System.

8. Section 08 63 01 – Aluminum-Framed Skylight System.

9. Section 08 80 00 – Exterior Glazing.

D. Reference Documents

1. Building Enclosure System Matrix: Refer to Drawing EN1-003.

2. Exterior Glass Type Matrix: Refer to Drawing EN1-003.

1.3 DEFINITIONS:

A. Referenced System: Building Enclosure System as specified by the Building Enclosure System Matrix.

1.4 REFERENCE STANDARDS AND REGULATIONS:

A. Refer to DDC General Conditions.

B. The Contractor's Engineering, materials, and workmanship shall comply with 2014 New York City Building Code. Where the 2014 New York City Building Code recommendations or requirements are to a lower standard than required by this Contract Document, the Contract Documents shall take precedence.

C. Comply with applicable provisions and recommendations of the standards listed below. Where standards conflict or conflict with the provisions of these Specifications, the more stringent shall apply. Unless otherwise noted the latest editions of the standards shall apply:

1. ASTM International (ASTM)

   a. ASTM C794 – Standard Test Method for Adhesion-in-Peel of Elastomeric Joint Sealants.

   b. ASTM C920 – Standard Specification for Elastomeric Joint Sealants.

   c. ASTM C1021 – Standard Practice for Laboratories Engaged in Testing of Building Sealants.

   d. ASTM C1087 – Standard Test Method for Determining Compatibility of Liquid-Applied Sealants with Accessories Used in Structural Glazing Systems.

   e. ASTM C1193 – Standard Guide for Use of Joint Sealants.

   f. ASTM C1247 – Standard Test Method for Durability of Sealants Exposed to Continuous Immersion in Liquids.

   g. ASTM C1248 – Standard Test Method for Staining of Porous Substrate by Joint Sealants.

   h. ASTM C1281 – Standard Specification for Preformed Tape Sealants for Glazing Applications.

   i. ASTM C1330 – Standard Specification for Cylindrical Sealant Backing for Use with Cold Liquid-Applied Sealants.

   j. ASTM C1401 – Standard Guide for Structural Sealant Glazing.

   k. ASTM C1521 – Standard Practice for Evaluating Adhesion of Installed Weatherproofing Sealant Joints.

2. Code of Federal Regulations (CFR)

   a. 40 CFR Part 59, Subpart D – National Volatile Organic Compound Emission Standards for Architectural Coatings.

1.5 PERFORMANCE REQUIREMENTS:

A. General Prescriptive Requirements

1. Provide Sealants where indicated on the Drawings for each Referenced System and incorporated material.

B. General Performance

1. Comprehensively engineer Sealants according to the intended use, appropriate standards, and per the Sealant manufacturer's recommendations.

   a. All structural Sealants used shall be engineered by a qualified Professional Engineer licensed in the State of New York.

2. Liquid-Applied Joint Sealants

   a. Comply with ASTM C920 and other requirements indicated for each liquid-applied joint Sealant specified, including those referencing ASTM C920 classifications for type, grade, class, and uses related to exposure and joint substrates.

   b. Suitability for Immersion in Liquids: Where Sealants are indicated for use in joints that will be continuously immersed in liquids, provide products that have been tested according to ASTM C1247. Liquid used for testing Sealants is to be representative of Project conditions, unless otherwise indicated.

3. VOC Content of Interior Sealants: Comply with the following limits for VOC content of Sealants and Sealant primers used inside the weatherproofing system when calculated according to 40 CFR Part 59, Subpart D (EPA Method 24):

   a. Architectural Sealants: 250 g/L.

   b. Sealant Primers for Nonporous Substrates: 250 g/L.

   c. Sealant Primers for Porous Substrates: 775 g/L.

C. Durability Performance

1. Use Sealant products that withstand the specified deleterious and degrading effects of radiation from the sun, weathering, atmospheric pollution, vermin, fungi, and other growths for the required service life, without maintenance in excess of routine cleaning and minor repairs.

2. Failure includes inability of the Sealant to meet the performance requirements set forth in this Section and in the manufacturer's literature, in addition to the following:

   a. Adhesive or cohesive failure of Sealants.

   b. Crazing on surface of Sealant.

   c. Non-structural Sealant hardening beyond Shore A Durometer 50 or softening below Durometer 20.

D. Compatibility Performance

1. Provide joint Sealants, backings, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by joint Sealant manufacturer, based on testing and field experience.

2. Suitability for Glazing: Comply with Sealant and glass manufacturers' written instructions for selecting glazing Sealants suitable for applications indicated and for conditions existing at time of installation.

3. Stain-Test-Response Characteristics: Where Sealants are specified to be non-staining to porous substrates, provide products tested according to ASTM C1248 and that have not stained porous joint substrates indicated for Project.

1.6 SUBMITTAL PROCEDURES:

A. Refer to DDC General Conditions Section 01 33 00 – Submittal Procedures.

1.7 SUBMITTALS:

A. Testing reports.

B. Product Data

1. Sealant product data for each Sealant used.

C. LEED Submittals

1. Provide as required and specified in the DDC General Conditions.

D. Samples

1. Samples for Initial Selection: Manufacturer's color charts consisting of strips of cured Sealants showing full range of colors available for each product exposed to view.

2. Samples for Verification: For each kind and color of joint Sealant required, provide three Samples with joint Sealants in 1/2 in. wide joints formed between two 6 in. long strips of material matching the appearance of exposed surfaces adjacent to joint Sealants.

3. Provide two tubes of each type of sealant used on the Project to the Commissioner.

E. Testing Reports

1. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified Independent Testing and Inspection Agency, indicating that Sealants comply with requirements.

2. Pre-Construction Compatibility and Adhesion Test Reports: From Sealant manufacturer, indicating the following:

a. Materials forming joint substrates and joint Sealant backings have been tested for compatibility and adhesion with joint Sealants.

b. Interpretation of test results and written recommendations for primers and substrate preparation needed for adhesion.

3. Pre-Construction Field-Adhesion Test Reports: Indicate which Sealants and joint preparation methods resulted in optimum adhesion to joint substrates based on testing specified in Pre-Construction Compatibility and Adhesion Testing.

F. Certificates

1. Provide certification that structural Sealant manufacturer has reviewed the details, joint dimensions, and adjacent finishes to which Sealants will be bonded and finds same suitable for the purpose intended in accordance with its published literature and with these Specifications. This includes but is not limited to a written analysis of stress due to loads and environmental conditions.

2. Sealant, Waterproofing, and Restoration Institute (SWRI) Validation Certificate: For each Sealant specified to be validated by SWRI's Sealant Validation Program.

G. Completion of Work: Upon completion of installation of the Glazing, submit written certification that the manufacturer's representative has supervised the work of this Section and that all materials are correctly installed.

1.8 WARRANTY:

A. Special Manufacturer's Warranty: Manufacturer's standard form in which joint Sealant manufacturer agrees to furnish joint Sealants to repair or replace those that do not comply with performance and other requirements specified in this Section within specified warranty period.

1. Warranty Period: 5 yrs from date of Substantial Completion.

B. Special Manufacturer's Warranty on Structural Silicone: Written warranty made out to City of New York and signed by the Structural Silicone manufacturer agreeing to promptly furnish replacement structural silicone due to defects in silicone materials, or application of structural silicone in the fabrication, and/or installation of other components. Upon notification of such deterioration within the warranty period, promptly furnish replacement structural silicone, including labor for installation, for failed structural joints units at no additional cost to the City of New York.

1. Warranty Period: 20 yrs from date of Substantial Completion.

1.9 PROJECT CONDITIONS:

A. Do not proceed with installation of joint Sealants under the following conditions:

1. When ambient and substrate temperature conditions are outside limits permitted by joint Sealant manufacturer or are below 40°F.

2. When joint substrates are wet.

3. Where joint widths are less than those permitted by joint Sealant manufacturer for applications indicated. Notify Commissioner of condition.

4. Where contaminants capable of interfering with adhesion have not been removed from joint substrates.

1.10 QUALITY ASSURANCE:

A. Refer to DDC General Conditions Section 01 40 00 – Quality Requirements.

B. Installer Qualifications: Properly trained by the sealant manufacturer for installation of Sealants and systems required for this Project.

C. Source Limitations: Obtain each kind of joint Sealant from single source from single manufacturer.

D. Testing Agency Qualifications: An Independent Testing and Inspection Agency qualified according to ASTM C1021 to conduct the testing indicated.

1. Test according to SWRI's Sealant Validation Program for compliance with requirements specified by ASTM C920 for adhesion and cohesion under cyclic movement, adhesion-in-peel, and indentation hardness.

E. Product Testing: Test joint Sealants using an Independent Testing and Inspection Agency.

F. Pre-Construction Compatibility and Adhesion Testing

1. Test results confirming compatibility and adhesion are mandatory for all concealed and exposed Sealant materials in contact with all adjacent materials including but not limited to glazing, other Sealants, flashings, metal framing, shims prior to mockup, and testing constructions.

2. Submit to joint Sealant manufacturers, for testing indicated below, Samples of materials that will contact or affect joint Sealants.

a. Use ASTM C1087 to determine whether priming and other specific joint preparation techniques are required to obtain rapid, optimum adhesion of joint Sealants to joint substrates.

b. Submit not fewer than eight (8), but no less than requested by the Sealant manufacturer, pieces of each kind of material, including joint substrates, shims, joint Sealant backings, secondary seals, and miscellaneous materials.

c. Schedule sufficient time for testing and analyzing results to prevent delaying the Referenced Systems.

d. For materials failing tests, obtain joint Sealant manufacturer's written instructions for corrective measures including use of specially formulated primers.

e. With Commissioner's approval, testing will not be required if joint Sealant manufacturers submit joint preparation data based on previous testing, not older than twenty-four (24) months, of Sealant products for adhesion to, and compatibility with, joint substrates and other materials matching those submitted.

G. Pre-Construction Field-Adhesion Testing: Before installing Sealants, field test their adhesion to Project joint substrates as follows:

1. Locate test joints where indicated on Project or, if not indicated, as directed by Commissioner.
2. Provide testing for prefabricated components that incorporate Sealants prior to Project fabrication.
3. Conduct field tests for each combination of utilized substrate type and Sealant type.
4. Notify Commissioner seven (7) days in advance of dates and times when test joints will be erected.
5. Arrange for tests to take place with joint Sealant manufacturer's technical representative present.
6. Test Method: Test joint sealants according to Method A, Field-Applied Sealant Joint Hand Pull Tab, in ASTM C1193, Tail Procedure, in ASTM C1521.
   a. For joints with dissimilar substrates, verify adhesion to each substrate separately; extend cut along one side, verifying adhesion to opposite side. Repeat procedure for opposite side.
7. Report whether Sealant failed to adhere to joint substrates or tore cohesively. Include data on pull distance used to test each kind of product and joint substrate. For Sealants that fail adhesively, retest until satisfactory adhesion is obtained.
8. Evaluation of Pre-Construction Field-Adhesion-Test Results: Sealants not evidencing adhesive failure from testing, in absence of other indications of noncompliance with requirements, will be considered satisfactory. Do not use Sealants that fail to adhere to joint substrates during testing.

PART II - PRODUCTS

2.1 SILICONE JOINT SEALANTS:

A. Single-component sealants shall be non-sag, neutral-curing silicone complying with ASTM C920, Grade NS, for Use NT. Type S or M Class shall be selected based upon specific use in each Referenced System and the movement requirements of the locations where Sealants will be applied.

B. Products

1. Weather Sealant for Cementitious Substrates
   a. Dow Corning 790 Silicone Building Sealant.
   b. GE SCS90000 Silpruf NB Sealant.
   c. Sikasil WS-295.
   d. Or approved equal.
2. Weather Sealants for Metal Substrates
   a. Dow Corning 795 Silicone Building Sealant.
   b. GE SCS2000 SilPruf Sealant.
   c. Sikasil WS-295.

d. Or approved equal.

3. Structural Sealant

a. Dow Corning 983 Structural Glazing Sealant.

b. GE SSG4600 UltraGlaze.

c. Sikasil SG-20.

d. Or approved equal.

4. Sealant Used Adjacent to Weather Resistive Barrier:

a. Dow Corning 758 Weather Barrier Sealant.

b. GCP Applied Technologies Bituthene Liquid Membrane, Two-Component, Asphalt-Modified Urethane.

c. HE 925 BES Sealant.

d. Or approved equal.

5. High-Temperature Sealant

a. Dow Corning 736 Heat Resistant Sealant.

b. Sikasil GP HT

c. Trempro 644 HT

d. Or approved equal.

6. Other Sealants: Subject to compliance with requirements and Commissioner's approval.

C. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Dow Corning Corporation.

2. GE Advanced Materials.

3. Sika Corporation.

4. Or approved equal.

D. Colors of Exposed Joint Sealants

1. As selected by Commissioner from manufacturer's full range.

E. Structural Silicone Joints

1. Comply with the following standards:

a. ASTM C1087.

b. ASTM C1401.

2. Able to withstand tensile and shear stresses imposed by structural system without failing adhesively or cohesively. When tested for pre-construction adhesion and compatibility, cohesive failure of Sealant shall occur before adhesive failure.

a. Adhesive failure occurs when Sealant pulls away from substrate cleanly, leaving no Sealant material behind.

b. Cohesive failure occurs when Sealant breaks or tears within itself but does not separate from each substrate because Sealant-to-substrate bond strength exceeds Sealant's internal strength.

3. Structural Sealant Joint Design

a. Engineered to produce tensile, shear, or compressive stress of less than the manufacturer's recommendations.

2.2 PREFORMED JOINT SEALANTS:

A. Preformed Silicone Joint Sealants: Manufacturer's standard Sealant consisting of pre-cured low-modulus silicone extrusion, in sizes to fit joint widths indicated, combined with a neutral-curing silicone Sealant for bonding extrusions to substrates.

B. Products

1. Dow Corning 123 Silicone Seal

2. GE Ultraspan 1100.

3. Tremco Proglaze ETA.

4. Or approved equal.

C. Manufacturers may include the following:

1. Dow Corning Corporation.

2. GE Advanced Materials.

3. Tremco Inc.

4. Or approved equal.

2.3 JOINT SEALANT BACKING:

A. General: Provide Sealant backings of material that are non-staining; compatible with joint substrates, Sealants, primers, and other joint fillers; and are approved for applications indicated by Sealant manufacturer based on field experience and laboratory testing.

B. Cylindrical Sealant Backings: ASTM C1330, Type C (closed-cell material with a surface skin), as approved in writing by joint Sealant manufacturer for joint application indicated, and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance.

C. Bond-Breaker Tape: Polyethylene tape or other plastic tape recommended by Sealant manufacturer for preventing Sealant from adhering to rigid, inflexible joint-filler materials or joint surfaces at back of joint. Provide self-adhesive tape where applicable.

2.4 MISCELLANEOUS MATERIALS:

A. Primer: Material recommended by joint Sealant manufacturer where required for adhesion of Sealant to joint substrates indicated, as determined from preconstruction joint Sealant-substrate tests and field tests. All Sealants to receive primer unless the manufacturer states in writing that use of primer will adversely affect the Sealant's adhesion or long-term performance.

B. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of Sealants and Sealant-backing materials, free of oily residues or other substances capable of staining or harming joint substrates and adjacent nonporous surfaces in any way, and formulated to promote optimum adhesion of Sealants to joint substrates.

C. Masking Tape: Non-staining, nonabsorbent material compatible with joint Sealants and surfaces adjacent to joints.

PART III - EXECUTION

3.1 EXECUTION REQUIREMENTS:

A. Refer to DDC General Conditions for execution requirements.

3.2 EXAMINATION:

A. Examine joints indicated to receive joint Sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting joint Sealant performance.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.3 PREPARATION:

A. Surface Cleaning of Joints: Clean out joints immediately before installing joint Sealants to comply with joint Sealant manufacturer's written instructions and the following requirements:

1. Remove all foreign material from joint substrates that could interfere with adhesion of joint Sealant, including dust, paints (except for permanent, protective coatings tested and approved for Sealant adhesion and compatibility by Sealant manufacturer), old joint Sealants, oil, grease, waterproofing, water repellents, water, surface dirt, and frost. Sealant must be installed to the bare substrate.

2. Clean porous joint substrate surfaces by brushing, grinding, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint Sealants. Remove loose particles remaining after cleaning operations above by vacuuming or blowing out joints with oil-free compressed air. Porous joint substrates include, but are not limited to the following:

a. Concrete.

b. Masonry.

c. Unglazed surfaces of ceramic tile.

d. Exterior insulation and finish systems.

3. Remove laitance and form-release agents from concrete.

4. Clean nonporous joint substrate surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint Sealants. Nonporous joint substrates include but are not limited to the following:

a. Metal.

b. Glass.

c. Porcelain enamel.

d. Glazed surfaces of ceramic tile.

B. Joint Priming: Prime joint substrates where recommended by joint Sealant manufacturer or as indicated/required by pre-construction joint-Sealant-substrate tests. Apply primer to comply with joint Sealant manufacturer's written instructions. Confine primers to areas of joint Sealant bond; do not allow spillage or migration onto adjoining surfaces.

1. Use only one coat of primer. Do not apply primer in a thick layer.

2. Apply primer to clean, dry substrates at ambient temperatures above 50°F.

3. Pour primer into a clean container for use and apply primer with a clean brush. Do not pour more than a 10 min. supply into container to prevent deterioration. Replace cap on primer immediately after use.

4. Remove from site any primer that is discolored, contains a precipitate, or has thickened.

5. Do not apply primer to Sealant backings. Remove and replace all Sealant backings exposed to primer.

C. Masking Tape: Use masking tape at all Sealant joints to prevent contact of Sealant or primer with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove Sealant smears and to create a clean Sealant joint edge. Remove tape immediately after tooling, without disturbing joint seal.

3.4 INSTALLATION OF JOINT SEALANTS:

A. General: Comply with joint Sealant manufacturer's written installation instructions for products and applications indicated, unless more stringent requirements apply.

B. Sealant Installation Standard: Comply with recommendations in ASTM C1193 for use of joint Sealants as applicable to materials, applications, and conditions indicated.

C. Install Sealant backings of kind indicated to support Sealants during application and prevent three-sided adhesion, and at position required to produce cross-sectional shapes and depths of installed Sealants relative to joint widths that allow optimum Sealant movement capability.

1. Do not leave gaps between ends of Sealant backings.
2. Do not stretch, twist, puncture, or tear Sealant backings.
3. Do not cut Sealant backings lengthwise.
4. Install one unit of backer rod sized according to the Project Specifications at each Sealant joint. Change backer rod sizes as frequently as required by the variation in the joint width. Do not twist rods together, fold over, or stack backer rods to fit small rods into a wider opening. Provide a full range of rod sizes at the site of all Sealant work.
5. Remove absorbent Sealant backings that have become wet before Sealant application and replace with dry materials.
6. Do not touch with fingers or otherwise contaminate the substrate surfaces while inserting the Sealant backings.
7. Do not rupture the skin of the backer rod during installation. Remove any backer rod containing punctures and solvent-clean the surfaces again.
8. Replace any backer rod not sealed over by end of each day and solvent-clean surfaces again.

D. Install bond-breaker tape to prevent three-sided adhesion behind Sealants where Sealant backings are not used between Sealants and backs of joints.

E. Install Sealants using proven techniques complying with the following and at the same time backings are installed:

1. Place Sealants so they directly contact and fully wet joint substrates. When installing Sealant, push Sealant ahead of caulking gun nozzle. Do not drag nozzle across joint when installing Sealant.
2. Completely fill recesses in each joint configuration.
3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum Sealant movement capability.
4. For weather Sealants, construct Sealant with a width-to-depth ratio of 2:1, with maximum thickness of 1/2 in. and minimum thickness of 1/4 in.
5. At fillet (triangular) joints, extend sealant at least 3/8 in. onto the surface beyond and parallel to the bond breaker (tape or backer rod) and 5/8 in. onto the surface perpendicular to the bond breaker, unless otherwise detailed or required by the Sealant manufacturer.
6. At dual-stage joints, provide a 1/2 in. deep drainage cavity between the exterior face of the secondary joint and the back-up material of the primary joint.
7. Keep sealants a minimum of 1/2 in. from asphalt-based membranes unless otherwise noted.

8. Inspect each cartridge or container of Sealant before use and verify that the production date is within six months of the date of application. Remove all Sealant more than six months old from the site.

9. Mask exposed surfaces along joint before applying Sealant.

10. Recheck correct backer rod and bond breaker tape positioning before applying Sealant.

11. Seal joints within 10 hrs of primer application.

12. Within 5 min. of Sealant application and before skin develops on Sealant, dry tool the joint surface with a concave tool to ensure intimate contact with substrate and to eliminate air bubbles. Do not use any liquid for tooling. Provide a smooth, uniform, finished surface.

13. Remove masking tape within 10 min. of tooling liquid Sealant. Avoid contaminating adjacent surfaces with excess Sealant. Remove all traces of smears and droppings on metal or glass surfaces promptly, using a solvent recommended by the Sealant manufacturer and that will not damage or discolor the building surfaces. Remove smears and droppings on porous surfaces by mechanical means after the initial cure of the Sealant.

14. Coordinate work to prevent contamination of fresh Sealant by dust or other debris.

F. Tooling of Non-Sag Sealants: Immediately after Sealant application and before skinning or curing begins, tool Sealants according to requirements specified in subparagraphs below to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of Sealant with sides of joint.

1. Remove excess Sealant from surfaces adjacent to joints.

2. Provide concave joint profile per Fig. 8A in ASTM C1193, unless otherwise indicated.

3. Provide flush joint profile where indicated per Fig. 8B in ASTM C1193.

4. Provide recessed joint configuration of recess depth and at locations indicated per Fig. 8C in ASTM C1193.

   a. Use masking tape to protect surfaces adjacent to recessed tooled joints.

G. Installation of Preformed Silicone-Sealant System

1. Apply masking tape to each side of joint, outside of area to be covered by Sealant system.

2. Apply silicone sealant to each side of joint to produce a bead of size complying with preformed silicone Sealant system manufacturer's written instructions and covering a bonding area of not less than 3/8 in. Hold edge of Sealant bead 1/4 in. inside masking tape.

3. Within 10 min. of Sealant application, press silicone extrusion into Sealant to wet extrusion and substrate. Use a roller to apply consistent pressure and ensure uniform contact between Sealant and both extrusion and substrate.

4. Complete installation of Sealant system in horizontal joints before installing in vertical joints. Lap vertical joints over horizontal joints. At ends of joints, cut silicone extrusion with a razor knife.

5. Tool the edge of Sealant that oozes out beyond the edge of the silicone extrusion during rolling to create a fillet profile.

3.5 FIELD QUALITY CONTROL

A. Field-Adhesion Testing: Field test joint Sealant adhesion to joint substrates as follows:

1. Extent of Testing: Test completed and cured Sealant joints as follows:

   a. Perform five (5) tests for the first 500 ft of joint length for each kind of Sealant and joint substrate.

   b. Perform one (1) test for each 1,000 ft of joint length thereafter or one (1) test per each floor per elevation.

2. Test Method: Test joint Sealants according to Method A, Field-Applied Sealant Joint Hand Pull Tab, in ASTM C1193, Tail Procedure, in ASTM C1521.

   a. For joints with dissimilar substrates, verify adhesion to each substrate separately; extend cut along one side, verifying adhesion to opposite side. Repeat procedure for opposite side.

3. Inspect tested joints and report on the following:

   a. Whether Sealant-filled joint cavities and are free of voids.

   b. Whether Sealant dimensions and configurations comply with specified requirements.

   c. Whether Sealants in joints connected to pulled-out portion failed to adhere to joint substrates or tore cohesively. Include data on pull distance used to test each kind of product and joint substrate. Compare these results to determine if adhesion passes Sealant manufacturer's field-adhesion hand-pull test criteria.

4. Record test results in a field-adhesion-test log. Include dates when Sealants were installed, names of persons who installed Sealants, test dates, test locations, whether joints were primed, adhesion results and percent elongations, Sealant fill, Sealant configuration, and Sealant dimensions.

5. Repair Sealants pulled from test area by applying new Sealants following same procedures used originally to seal joints. Ensure that original Sealant surfaces are clean and that new Sealant contacts original Sealant.

B. Evaluation of Field-Adhesion Test Results: Sealants not evidencing adhesive failure from testing or noncompliance with other indicated requirements will be considered satisfactory. Remove Sealants that fail to adhere to joint substrates during testing or to comply with other requirements. Retest failed applications until test results prove Sealants comply with indicated requirements. For every failure, perform two additional tests.

3.6 CLEANING:

A. Clean off excess Sealant or Sealant smears adjacent to joints as the Work progresses by methods and with cleaning materials approved in writing by:

1. Joint Sealant manufacturers.

2. Manufacturers' of products adjacent to joints.

3.7 PROTECTION:

A. Protect joint Sealants during and after curing period from contact with contaminating substances and from damage resulting from construction operations or other causes so Sealants are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated joint Sealants immediately so installations with repaired areas are indistinguishable from original work.

END OF SECTION 07 92 00

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SECTION 07 95 00
Expansion Control

PART I - GENERAL

1.1 RELATED DOCUMENTS

A. The following documents apply to all required work for the Project: (1) the Contract Drawings, (2) the Specifications, (3) the General Conditions, (4) the Addendum and (5) the Contract (City of New York Standard Construction Contract).

B. LEED General Requirements:

1. Refer to DDC General Conditions

a. Section 01 33 00 "Submittal Procedures"
b. Section 01 81 13.04 "Sustainable Design Requirements for LEED v4 Buildings"

1.2 SUMMARY

A. Section includes:

1. Wall expansion joint cover assemblies.

2. Fire rated expansion joint cover assemblies where required.

B. Related Sections

1. Selective Demolition and Alteration Work - Section 02 41 19.

2. Cast-in-Place Concrete - Section 03 30 00.

3. Architectural Pre-Cast Concrete - Section 03 45 00.

4. Unit Masonry - Section 04 20 00.

5. Thermoplastic Membrane Roofing - Section 07 20 00.

6. Metal Panels - Section 07 42 14.

7. Roof Specialties and Accessories - Section 07 71 00, for roof expansion joint cover assemblies.

8. Painting and Finishing - Section 09 90 00.

1.3 SUBMITTAL PROCEDURES

A. Refer to DDC General Conditions Section 01 33 00 "Submittal Procedures".

1.4 SUBMITTALS

A. Submit product data for each type of expansion joint cover assembly specified, including manufacturer's product specifications, installation instructions, details of construction relative to materials, dimensions of individual components, profiles, and finishes.

B. Submit shop drawings showing fabrication and installation of expansion joint cover assemblies, including plans, elevations, sections, details of components, joints, splices, and attachments to other units of work.

C. Submit samples for verification purposes in full size units of each type of expansion joint cover assembly indicated; within sets for each finish, color, texture, and pattern specified, showing full range of variations expected in these characteristics. Install elastomeric material for joints, samples to verify color selected.

1.5 QUALITY ASSURANCE

A. Refer to DDC General Conditions Section 01 40 00 "Quality Requirements".

PART II - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire Test Response Characteristics: Where indicated, provide expansion joint cover assemblies identical to those assemblies whose fire resistance has been determined per ANSI/UL 263, NFPA 251, U.B.C. 43-1, or ASTM E 119, including hose stream test of vertical wall assemblies, by a testing and inspecting agency acceptable to the Building Department.

1. Fire Resistance Ratings: As shown on drawings.

B. Joint covers shall permit unrestrained movement of joint without disengagement of cover.

2.2 MANUFACTURER

A. Basis of Design: Subject to compliance with requirements, provide Balco; Profiles and details as shown on drawings or comparable product by one of the following:
   1). Watson Bowman Acme
   2). Construction Specialties
   3). MM Systems
   4). Or approved equal

B. Provide cut sheets for each type and location being used for aesthetic approval.

1. Black elastomeric seal at concrete.

2. Aluminum metal cover at corrugated metal. Color to match.

3. Standard metal cover at roof joint.

2.3 MATERIALS

A. Aluminum: ASTM B 221, alloy 6063-T5 for extrusions; ASTM B 209, alloy 6061-T6, sheet and plate; aluminum to have the following finishes:

1. Exterior surfaces not subject to pedestrian traffic shall have a fluoropolymer finish conforming to NAAMM 605.2; two (2) colors shall be required, one (1) color to match metal siding and the other color to match adjacent concrete surfaces.

2. Interior surfaces not subject to pedestrian traffic shall be shop primed with rust inhibitive primer, minimum 2 mils thick, ready to receive field painted finish.

B. Stainless Steel: ASTM A 666, Type 304, No. 4 finish.

C. Protect metal surfaces to be placed in contact with cementitious materials with a protective coating.

D. Extruded Preformed Seals: Single or multi-cellular elastomeric profiles as classified under ASTM D 2000, designed with or without continuous, longitudinal, internal baffles. Formed to fit compatible frames, in color, as selected by Commissioner from manufacturer's standard colors.

E. Fire Barriers: Designed for indicated or required dynamic structural movement without material degradation or fatigue when tested according to ASTM E-1399. Tested in maximum joint width condition with a field splice as a component of an expansion joint cover per ANSI/UL 263, NFPA 251, U.B.C. 43-1, or ASTM E 119, including hose stream test of vertical wall assemblies by a nationally recognized testing and inspecting agency acceptable to NYC Building Department.

F. Accessories: Manufacturer's standard anchors, fasteners, set screws, spacers, flexible moisture barrier and filler materials, drain tubes, lubricants, adhesive, and other accessories compatible with material in contact, as indicated or required for complete installations.

2.4 EXPANSION JOINT COVER ASSEMBLIES

A. General: Provide expansion joint cover assemblies of design, basic profile, materials, and operation indicated on drawings. Provide units comparable to those indicated or required to accommodate joint size, variations in adjacent surfaces, and dynamic structural movement without material degradation or fatigue when tested according to ASTM E 1399. Furnish units in longest practical lengths to minimize number of end joints. Provide hairline mitered corners where joint changes direction or abuts other materials. Include closure materials and transition pieces, tee-joints, corners, transition pieces, curbs, cross-connections, and other accessories as required to provide continuous joint cover assemblies.

1. Special conditions shall be shop fabricated.

2. Fabricate components in largest practical lengths to minimize field splicing.

B. Moisture Barrier: Provide manufacturer's continuous, standard, flexible vinyl moisture barrier under covers at locations indicated.

C. Fire Rated Joint Covers: Provide expansion joint cover assemblies with manufacturer's continuous, standard, flexible fire barrier seals under covers at locations indicated to provide fire-resistive rating not less than the rating of adjacent construction.

D. All transitions between vertical and horizontal joints shall be factory fabricated.

PART III - EXECUTION

3.1 EXECUTION REQUIREMENTS

A. Refer to DDC General Conditions for execution requirements.

3.2 PREPARATION

A. Manufacturer's Instructions: In addition to requirements of these specifications, comply with manufacturer's instructions and recommendations for phases of Work, including preparing substrate, applying materials, and protecting installed units.

B. Coordinate and furnish anchorages, setting drawings, templates, and instructions for installation of expansion joint cover assemblies to be embedded in or anchored to concrete or to have recesses formed into edges of concrete slab for later placement and grouting-in of frames.

C. Fastening to In-Place Construction: Provide anchorage devices and fasteners where necessary to secure expansion joint cover assemblies to in-place construction, including threaded fasteners with drilled-in expansion shields for masonry and concrete where anchoring members are not embedded in concrete. Provide fasteners of metal, type, and size to suit type of construction indicated and provide for secure attachment of expansion joint cover assemblies.

3.3 INSTALLATION

A. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting into new and existing construction as required to install expansion joint covers. Install joint cover assemblies in true alignment and proper relationship to expansion joints and adjoining finished surfaces measured from established lines and levels. Allow adequate free movement of thermal expansion and contraction of metal to avoid buckling. Set floor covers at elevations to be flush. Locate wall, ceiling, roof, and soffit covers in continuous contact with adjacent surfaces. Securely attach in place with required accessories. Locate anchors at interval recommended by manufacturer, but not less than 3" from each end and not more than 24" o.c.

1. Where cutting into existing construction, conform to the requirements of Section 02 41 19, Selective Demolition and Alteration Work.

B. Continuity: Maintain continuity of expansion joint cover assemblies with a minimum number of end joints and align metal members mechanically using splice joints. Cut and fit ends to produce joints that will accommodate thermal expansion and contraction of metal to avoid buckling of frames. Adhere flexible filler materials (if any) to frames with adhesive or pressure sensitive tape as recommended by manufacturer.

C. Extruded Preformed Seals: Install seals complying with manufacturer's instructions and with minimum number of end joints. For straight sections provide preformed seals in continual lengths. Vulcanize or heat-weld field splice joints in preformed seal material to provide watertight joints using procedures recommended by manufacturer. Apply adhesive, epoxy, or lubricant adhesive approved by manufacturer to both frame interfaces before installing preformed seal. Seal transitions according to manufacturer's instructions.

D. Elastomeric Sealant Joint Assemblies: Seal end joints within continuous runs and joints at transitions according to manufacturer's directions to provide a watertight installation.

E. Fire Barriers: Install fire barriers, including transitions and end joints, according to manufacturer's instructions so that fire-rated construction is continuous.

END OF SECTION 07 95 00

SECTION 08 11 13
Steel Doors and Frames

PART I - GENERAL

1.1 RELATED DOCUMENTS

A. The following documents apply to all required work for the Project: (1) the Contract Drawings, (2) the Specifications, (3) the General Conditions, (4) the Addendum and (5) the Contract (City of New York Standard Construction Contract).

B. LEED / Environmentally Preferable Purchase (EPP) General Requirements:

1. Refer to DDC General Conditions and the Addendum to the General Conditions

2. LEED requirements apply to all Phase II work with the exception of the Existing Building scope. EPP requirements apply to the project's Existing Building scope only.

1.2 SUMMARY

A. Section includes:

1. Interior and exterior hollow metal doors and frames for fire rated and unrated door openings.

2. Interior hollow metal vision panels.

3. Preparation of metal doors and frames to receive finish hardware, including reinforcements, drilling and tapping, as necessary.

4. Preparation of hollow metal doors to receive glazing where required.

5. Steel louvers for hollow metal doors.

6. Furnishing anchors for building into masonry and drywall as well as precast panels and structural steel.

7. Factory prime painting of work of this Section.

B. Related Sections

1. Unit Masonry - Section 04 20 00.

2. Carpentry - Section 06 20 00, for installation of doors and frames.

3. Door Hardware - Section 08 71 00.

4. Exterior Glazing - Section 08 80 00.

5. Interior Glass and Glazing - Section 08 80 10.

6. Gypsum Drywall - Section 09 29 00.

7. Painting and Finishing - Section 09 90 00.

1.3 SUBMITTAL PROCEDURES

A. Refer to DDC General Conditions Section 01 33 00 "Submittal Procedures".

1.4 SUBMITTALS

A. Product Data: Include construction details, material descriptions, core descriptions, label compliance, compliance with standards referenced herein, sound and fire-resistance ratings, and finishes for each type of door and frame specified.

B. Shop Drawings: Show fabrication and installation of doors and frames. Include details of each frame type, elevations of door design types, conditions at openings, details of construction, reinforcement for surface applied hardware, dimensions of profiles and hardware preparation, location and installation requirements of door and frame hardware and reinforcements, and details of joints and connections. Show anchorage and accessories.

C. Door Schedule: Submit schedule of doors and frames using same reference numbers for details and openings as those on Drawings.

1. Coordinate glazing frames and stops with glass and glazing requirements.

D. Oversize Construction Certification: For door assemblies required to be fire rated and exceeding limitations of labeled assemblies, submit UL certification that each door and frame assembly has been constructed to comply with design, materials, and construction equivalent to requirements for labeled construction.

1.5 QUALITY ASSURANCE

A. Refer to DDC General Conditions Section 01 40 00 "Quality Requirements".

B. Manufacturer Qualifications: A firm experienced in manufacturing custom steel doors and frames similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.

C. Testing Agency Qualifications: An independent agency qualified according to ASTM E 329, Standard Specification for Agencies Engaged in Construction Inspection, Testing, or Special Inspection, for testing indicated.

D. Source Limitations: Obtain custom steel doors and frames through one source from a single manufacturer.

E. Fire-Rated Door and Frame Assemblies: Assemblies complying with NFPA 80, Standard for Fire Doors and Other Opening Protectives, that are listed and labeled by UL, for fire-protection ratings indicated.

1. Test Pressure: Test according to NFPA 252, Standard Methods of Fire Tests of Door Assemblies, or UL 10C, Standard for Positive Pressure Fire Tests of Door Assemblies. After 5 minutes into the test, the neutral pressure level in furnace shall be established at 40" or less above the sill.

2. Oversize Fire-Rated Door Assemblies: For units exceeding sizes of tested assemblies, provide UL certification that doors comply with standard construction requirements for tested and labeled fire-protection-rated door assemblies except for size.

3. Temperature-Rise Rating: At exit enclosures, provide doors that have a temperature-rise rating as required by 2014 New York City Building Code in 30 minutes of fire exposure.

F. Fire-Rated, Borrowed-Light Frame Assemblies: Assemblies complying with NFPA 80, Standard for Fire Doors and Other Opening Protectives, that are listed and labeled, by a testing and inspecting agency acceptable to the Commissioner, for fire-protection ratings indicated, based on testing according to NFPA 257, Standard on Fire Test for Window and Glass Block Assemblies, or UL 9, Standard for Fire Tests of Window Assemblies. Label each individual glazed lite.

G. Smoke-Control Door Assemblies: Comply with NFPA 105, Standard for Smoke Door Assemblies and Other Opening Protectives, or UL 1784, Standard for Air Leakage Tests of Door Assemblies and Other Opening Protectives.

H. Thermally Rated Door Assemblies: Provide door assemblies with U-factor of not more than 0.50 deg Btu/F x h x sq. ft. when tested according to ASTM C 518.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver doors and frames palleted, wrapped, or crated to provide protection during transit and Project site storage. Do not use nonvented plastic.

B. Store doors and frames under cover at building site. Conform to the requirements of ANSI/SDI A250.11, Recommended Erection Instructions for Steel Frames, for site storage unless more stringent requirements are noted herein. Place units on minimum 4-inch high wood blocking. Avoid using nonvented plastic or canvas shelters that could create a humidity chamber. If wrappers on doors become wet, remove cartons immediately. Provide minimum 1/4-inch spaces between stacked doors to permit air circulation.

PART II - PRODUCTS

2.1 FABRICATION - GENERAL

A. Fabricate hollow metal units to be rigid, neat in appearance and free from defects, warp or buckle. Accurately form metal to required sizes and profiles. Weld exposed joints continuously, grind, dress, and make smooth, flush and invisible. Metallic filler to conceal manufacturing defects is not acceptable.

B. Unless otherwise indicated, provide countersunk flat Phillips or Jackson heads for exposed screws and bolts.

C. Prepare hollow metal units to receive finish hardware, including cutouts, reinforcing, drilling and tapping in accordance with Finish Hardware Schedule and templates provided by hardware suppliers. Comply with applicable requirements of ANSI A115 "Specifications for Door and Frame Preparation for Hardware."

D. Locate finish hardware as shown on final shop drawings in accordance with locations noted herein.

2.2 MANUFACTURERS

A. Subject to compliance with requirements, provide products by one of the following:

1. Steelcraft

2. Curries

3. Ceco Door Products

4. Or approved equal.

2.3 FRAMES

A. Materials

1. Frames for exterior openings shall be made of commercial grade cold-rolled steel conforming to ASTM A 1008, Standard Specification For Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy With Improved Formability, Solution Hardened, And Bake Hardenable, Type B not less than 14 ga., and shall have a hot dipped galvannealed coating conforming to ASTM A 924, Standard Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process, and A 653, Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process, with A-60 coating. The zinc-alloy coating shall be a dull matte surface treated for paint adhesion.

2. Frames for interior openings shall be either commercial grade cold-rolled steel conforming to ASTM A 1008, Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy With Improved Formability, Solution Hardened, And Bake Hardenable, Type B or commercial grade hot-rolled steel conforming to ASTM A 1011, Commercial Steel, Type B. Metal thickness shall be not less than sixteen (16) ga. for frames in openings 4'-0" or less in width; not less than fourteen (14) ga. for frames in openings over 4'-0" in width.

B. Design and Construction

1. All frames shall be welded units with integral trim, of the sizes and shapes shown on approved shop drawings. Unless otherwise noted, knock-down frames will not be accepted.

2. All finished work shall be strong and rigid, neat in appearance, square, true and free of defects, warp or buckle. Molded members shall be clean cut, straight and of uniform profile throughout their lengths.

3. Jamb depths, trim, profile and backbends shall be as shown on drawings.

   a. Frames at drywall partitions shall be formed with double return backbends to prevent cutting into drywall surface.

4. Welded frames shall have corners mitered and reinforced and faces of welded frames shall be continuously back welded full depth and width of frame conforming to NAAMM Standard HMMA-820; face joints shall be hairline.

5. Minimum depth of stops shall be 5/8".

6. Frames for multiple or special openings shall have mullion and/or rail members which are closed tubular shapes having no visible seams or joints. All joints between faces of abutting members shall be securely welded and finished smooth.

   a. Mullions shall have 16 ga. internal steel stiffeners welded not less than 4" o.c.

7. Hardware Reinforcements

   a. Frames shall be mortised, reinforced, drilled and tapped at the factory for fully-templated mortised hardware only, in accordance with approved hardware schedule and templates provided by the hardware supplier. Where surface-mounted hardware is to be applied, frames shall have reinforcing plates.
   b. Minimum thickness of hardware reinforcing plates shall be as follows:
      1). Hinge and pivot reinforcements - seven (7) ga., 1-1/4" x 10" minimum size.
      2). Strike reinforcements - twelve (12) gauge
      3). Flush bolt reinforcements - twelve (12) gauge
      4). Closer reinforcements - twelve (12) gauge
      5). Reinforcements for surface mounted hardware - twelve (12) gauge.

8. Floor Anchors

   a. Provide adjustable floor anchors, providing not less than two (2) inch height adjustment.
   b. Minimum thickness of floor anchors shall be fourteen (14) gauge.

9. Jamb Anchors

   a. Frames for installation in masonry walls shall be provided with adjustable jamb anchors of the wire type. Anchors shall be not less than 0.156" diameter steel wire. The number of anchors provided on each jamb shall be as follows:
      1). Frames up to 7'-6" height - three (3) anchors.
      2). Frames 7'-6" to 8'-0" height - four (4) anchors.
      3). Frames over 8'-0" height - one (1) anchor for each 2'-0" or fraction thereof in height.
   b. Frames for installation in stud partitions shall be provided with steel anchors of suitable design, not less than eighteen (18) gauge thickness, securely welded inside each jamb as follows:
      1). Frames up to 7'-6" height - four (4) anchors.
      2). Frames 7'-6" to 8'-0" height - five (5) anchors.
      3). Frames over 8'-0" height - five (5) anchors plus one additional for each 2'-0" or fraction thereof over 8'-0".

10. Anchors in exterior frames and in masonry walls shall be hot dip galvanized per ASTM A 153.

11. Frames for installation in masonry wall openings more than 4'-0" in width shall have an angle or channel stiffener factory welded into the head. Such stiffeners shall be not less than twelve (12) gauge steel and not longer than the opening width and shall not be used as lintels or load bearing members.

12. Dust cover boxes (or mortar guards) of not thinner than twenty-six (26) gauge steel shall be provided at all hardware mortises on frames to be set in masonry or plaster partitions.

13. Ceiling Struts: Minimum 3/8" thick x 2" wide steel.

14. All frames shall be provided with a steel spreader temporarily attached to the feet of both jambs to serve as a brace during shipping and handling.

15. Loose glazing stops shall be of cold rolled steel, not less than twenty (20) gauge thickness, butted at corner joints and secured to the frame with countersunk cadmium-or zinc-plated screws. Interior frames may be provided with snap-on glazing stops.

16. Except on weatherstripped frames, drill stops to receive three (3) silencers on strike jambs of single door frames and two (2) silencers on heads of double-door frames.

C. Finish: After fabrication, all tool marks and surface imperfections shall be removed, and exposed faces of all welded joints shall be dressed smooth. Frames shall then be chemically treated to ensure maximum paint adhesion and shall be coated on all surfaces with one coat of rust-inhibitive baked-on alkyd primer standard with the manufacturer which is fully cured before shipment to a dry film thickness of 2.0 mils.

1. Frames set in masonry walls shall be grouted in as described in Section 04 20 00, "Unit Masonry." These frames shall have surfaces in contact with grout shop coated with epoxy coating, spray applied at 4 to 6 mils, passing NFPA 101, Class A for smoke and flame spread, tested per ASTM E 84.

2. Basis of Design: Subject to compliance with requirements, provide Tnemec; Series 27 FC Typoxy or comparable product by one of the following:
   a. PPG
   b. Benjamin Moore
   c. Sherwin Williams
   d. Or approved equal

2.4 HOLLOW METAL DOORS

A. Materials: Doors shall be made of commercial quality, level, cold rolled steel conforming to ASTM A 1008/A, Commercial Steel, Type B and free of scale, pitting or other surface defects. Face sheets for interior doors shall be not less than eighteen (18) gauge. Face sheets for exterior doors shall be not less than sixteen (16) gauge and shall have a hot dipped galvannealed coating conforming to ASTM A 924 and A 653, A-60 coating. The zinc alloy coating shall be a dull matte surface treated for paint adhesion.

B. Design and Construction

1. All doors shall be of the types and sizes shown on the approved shop drawings and shall be fully welded seamless construction with no visible seams or joints on their faces or vertical edges. Minimum door thickness shall be 1-3/4".

2. All doors shall be strong, rigid and neat in appearance, free from warpage or buckles. Corner bends shall be true and straight and of minimum radius for the gauge of metal used.

3. Face sheets shall be stiffened by continuous vertical formed steel sections spanning the full thickness of the interior space between door faces. These stiffeners shall be not less than twenty two (22) gauge spaced not more than six (6) inches apart and securely attached to face sheets by spot welds not more than five (5) inches o.c. Spaces between stiffeners shall be sound deadened and thermal insulated the full height of the door with an inorganic non-combustible batt type material.

4. Door faces shall be joined at their vertical edges by a continuous weld extending the full height of the door. All such welds shall be ground, filled and dressed smooth to make them invisible and provide a smooth flush surface.

5. Top and bottom edges of all doors shall be closed with a continuous recessed steel channel not less than fourteen (14) gauge, extending the full width of the door and spot welded to both faces. Exterior doors shall have an additional flush closing channel at their top edges and, where required for attachment of weatherstripping, a flush closure also at their bottom edges. Openings shall be provided in the bottom closure of exterior doors to permit the escape of entrapped moisture.

6. Edge profiles shall be provided on both vertical edges of doors as follows:

   a. Single-Acting Swing Doors: Beveled 1/8" in two (2) inches.
   b. Double-Acting Swing Doors: Rounded on 2-1/8" radius.
   c. No square edge doors permitted.

7. Hardware Reinforcements

   a. Doors shall be mortised, reinforced, drilled and tapped at the factory for fully templated hardware only in accord with the approved hardware schedule and templates provided by the hardware supplier. Where surface-mounted hardware (or hardware, the interrelation of which is to be adjusted upon installation - such as top and bottom pivots, floor closers, etc.) is to be applied, doors shall have reinforcing plates.
   b. Minimum gauges for hardware reinforcing plates shall be as follows:
      1). Hinge and pivot reinforcement - seven (7) gauge.
      2). Reinforcement for lock face, flush bolts, concealed holders, concealed or surface mounted closers - twelve (12) gauge.
      3). Reinforcements for all other surface mounted hardware - sixteen (16) gauge.

8. Glass Moldings and Stops

   a. Where specified or scheduled, doors shall be provided with hollow metal moldings to secure glazing in accordance with glass opening sizes shown on drawings.
   b. Fixed moldings shall be securely welded to the door on the security side.
   c. Loose stops shall be not less than twenty (20) gauge steel, with mitered corner joints, secured to the framed opening by cadmium or zinc-coated countersunk screws spaced eight (8) inches o.c. Snap-on attachments will not be permitted. Stops shall be flush with face of door.

9. Louvers shall be sixteen (16) gauge sheet steel, stationary type, closely spaced inverted "V" blade design, flush with face sheets of door, integral with and welded to door. Fifty (50) percent free area, unless indicated otherwise on drawings.

C. Finish: After fabrication, all tool marks and surface imperfections shall be dressed, filled and sanded as required to make all faces and vertical edges smooth, level and free of all irregularities. Doors shall then be chemically treated to ensure maximum paint adhesion and shall be coated, on all exposed surfaces, with manufacturer's standard rust-inhibitive alkyd primer as specified for frames which shall be fully cured before shipment.

D. Flatness: Doors shall maintain a flatness tolerance of 1/16" maximum, in any direction, including in a diagonal direction.

2.5 LABELED DOORS AND FRAMES

A. Labeled doors and frames shall be provided for those openings requiring fire protection ratings as scheduled on drawings. Such doors and frames shall be labeled by Underwriters' Laboratories or other nationally recognized agency having a factory inspection service.

B. If any door or frame specified by the Commissioner to be fire-rated cannot qualify for appropriate labeling because of its design, size, hardware or any other reason, the Commissioner shall be so advised before fabricating work on that item is started.

2.6 HARDWARE LOCATIONS

A. The location of hardware on doors and frames shall be as noted in "Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames" of the Door Hardware Institute unless otherwise required by 2014 New York City Building Code.

2.7 CLEARANCES

A. Fabricate doors and frames to meet edge clearances as follows:

1. Jambs and Head: 1/8" plus or minus 1/16".
2. Meeting Edges, Pairs of Doors: 1/8" plus or minus 1/16".
3. Bottom: 3/8" at threshold; 3/4" if no threshold.

B. Fire rated doors shall have clearances as required by NFPA 80.

2.8 MANUFACTURING TOLERANCES

A. Manufacturing tolerance shall be maintained within the limits given in HMMA 841 of ANSI/NAAMM, current edition.

2.9 PREPARATION FOR FINISH HARDWARE

A. Prepare door and frames to receive hardware:

1. Hardware supplier shall furnish hollow metal manufacturer approved hardware schedule, hardware templates, and samples of physical hardware where necessary to ensure correct fitting and installation.
2. Preparation includes sinkages and cut-outs for mortise and concealed hardware.

B. Provide reinforcements for both concealed and surface applied hardware:

1. Drill and tap mortise reinforcements at factory, using templates.
2. Install reinforcements with concealed connections designed to develop full strength of reinforcements.

PART III - EXECUTION

3.1 EXECUTION REQUIREMENTS

A. Refer to DDC General Conditions for execution requirements.

3.2 INSTALLATION

A. Refer to Section 06 20 00, Carpentry, for installation procedures for all work of this Section.

END OF SECTION 08 11 13

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SECTION 08 31 13
Access Doors

PART I - GENERAL

1.1 RELATED DOCUMENTS

A. The following documents apply to all required work for the Project: (1) the Contract Drawings, (2) the Specifications, (3) the General Conditions, (4) the Addendum and (5) the Contract (City of New York Standard Construction Contract).

B. LEED General Requirements:

1. Refer to DDC General Conditions

   a. Section 01 33 00 "Submittal Procedures"
   b. Section 01 81 13.04 "Sustainable Design Requirements for LEED v4 Buildings"

1.2 SUMMARY

A. Section includes:

1. Frameless recessed panel access doors at drywall ceilings and walls.

2. Framed flush panel access doors at masonry and tile walls.

3. Provide access doors and frames for access from occupied spaces to the following, where indicated or required.

   a. All shutoff or balancing valves.
   b. Fire dampers, as required.
   c. Points of duct access.
   d. Pull boxes.
   e. Controls of mechanical and electrical items.
   f. Masonry shafts for pipes and conduits, as required.
   g. Pipe spaces, if required.
   h. Inlets of fans.
   i. Fusible link and splitter damper at filter bank.
   j. Automatic damper and motor.
   k. Equipment not otherwise accessible.

B. Related Sections

1. Unit Masonry - Section 04 20 00.

2. Gypsum Drywall - Section 09 29 00.

3. Ceramic Tiling - Section 09 30 13.

4. General Duty Valves for Plumbing - Section 22 05 23.

5. General Duty Valves for HVAC - Section 23 05 23.

6. Air Duct Accessories - Section 23 33 00, for HVAC duct access doors.

1.3 QUALITY ASSURANCE

A. Refer to DDC General Conditions Section 01 40 00 "Quality Requirements".

B. For actual installation of the work of this Section, use only personnel who are thoroughly familiar with the manufacturer's recommended methods of installation and experienced in the skills required.

C. Fire-Resistance Ratings: Wherever a fire-resistance classification is shown, or for construction where access doors are installed, provide required access door assembly with panel door, frame, hinge and latch from manufacturers listed in Underwriters' Laboratories, Inc. "Classified Building Materials Index" for the rating shown.

1. Provide UL label on each access panel.

2. Provide flush, key operated cylinder lock.

D. Size Variations: Obtain Commissioner's acceptance of manufacturer's standard size units which may vary slightly from sizes shown or scheduled.

1.4 SUBMITTAL PROCEDURES

A. Refer to DDC General Conditions Section 01 33 00 "Submittal Procedures".

B. Before any materials of this Section are delivered to the job site, submit complete manufacturer's literature to the Commissioner. Submit plans and schedules showing size and location of each and every access door for Commissioner's acceptance prior to installation.

PART II - PRODUCTS

2.1 MATERIALS AND FABRICATION

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Milcor Inc
2. Nystrom Inc.
3. Karp Associates, Inc.
4. Or approved equal

B. Assembly shall be an integral unit complete with all parts and ready for installation.

C. Fabricate units of continuous welded steel construction. Grind welds smooth and flush with adjacent surfaces. Provide attachment devices and fasteners of the type required to secure access panels to the types of supports shown.

D. Frames for Masonry and Tile Wall Only (Flush Panel Units): Fabricate frame from sixteen (16) gauge steel. Provide frame with exposed flange not less than one (1) inch wide around perimeter of frame for exposed masonry and tile finishes.

1. For installation in masonry construction, provide frames with adjustable metal masonry anchors.

E. Frameless Units for Drywall Surfaces (Recessed Panel Units): Provide access doors without exposed frames for drywall adhered to recessed panel.

F. Panels: Fabricate from fourteen (14) gauge steel, with concealed spring hinges set to open to 175 degrees. Provide removable pin type hinges of the quantity required to support the access panel sizes used in the work. Finish with manufacturer's factory applied baked enamel prime coat applied over phosphate protective coating on steel.

G. Locking Devices

1. For non-rated access doors, provide flush, screwdriver operated cam locks of number required to hold door in flush, smooth plane when closed.

2. For fire rated doors, provide locks as described in paragraph 1.3, C. herein.

H. Inserts and Anchorage: Furnish inserts and anchoring devices which must be built into masonry for the installation of access panels. Provide setting drawings, templates, instructions, and directions for installation of anchorage devices.

PART III - EXECUTION

3.1 EXECUTION REQUIREMENTS

A. Refer to DDC General Conditions for execution requirements.

3.2 COORDINATION

A. Coordinate all work with the mechanical trades to ensure proper locations and in a timely manner to permit orderly progress of the total work.

B. Set frames accurately in position and securely attach to supports with face panels plumb or level in relation to adjacent finish surfaces.

C. Adjust hardware and panels after installation for proper operation.

END OF SECTION 08 31 13

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SECTION 08 33 23
Overhead Coiling Doors

PART I - GENERAL

1.1 RELATED DOCUMENTS

A. The following documents apply to all required work for the Project: (1) the Contract Drawings, (2) the Specifications, (3) the General Conditions, (4) the Addendum and (5) the Contract (City of New York Standard Construction Contract).

B. LEED / Environmentally Preferable Purchase (EPP) General Requirements:

1. Refer to DDC General Conditions and the Addendum to the General Conditions

2. LEED requirements apply to all Phase II work with the exception of the Existing Building scope. EPP requirements apply to the project's Existing Building scope only.

1.2 SUMMARY

A. Section includes:

1. Coiling insulated service doors.

2. 45 minute rated interior overhead doors between garage and repair bay.

3. Hardware and accessories.

4. Motor operation.

B. Related Sections

1. Door Hardware - Section 08 71 00.

2. Painting and Finishing - Section 09 90 00.

1.3 QUALITY ASSURANCE

A. Refer to DDC General Conditions Section 01 40 00 "Quality Requirements".

B. Provide each overhead coiling door as a complete unit produced by one manufacturer, including hardware, accessories, mounting and installation components.

C. Provide each type of overhead coiling door by one manufacturer for entire project.

D. Wind Loading: Design and reinforce exterior overhead coiling doors to withstand a thirty (30) lb. per square foot wind loading pressure, unless otherwise indicated.

1.4 SUBMITTAL PROCEDURES

A. Refer to DDC General Conditions Section 01 33 00 "Submittal Procedures".

1.5 SUBMITTALS

A. Product Data: Submit manufacturer's product data, roughing-in diagrams, and installation instructions for each type and size of overhead coiling door. Include operating instructions and maintenance information.

B. Shop Drawings: Submit shop drawings for components and installations that are not fully dimensioned or detailed on manufacturer's product data sheets.

C. Samples: Submit six (6) inches square samples of each required finish. Prepare samples on metal of same gauge and alloy to be used in work. Where normal color and texture variations are to be expected, include two (2) or more units in each sample showing limits of such variation.

PART II - PRODUCTS

2.1 MANUFACTURER

Basis of Design: Subject to compliance with requirements, provide McKeon Door Company; power-operated Climateguard, IS3000 Series, Model IS3018-ADF-G (Heavy Duty / High Cycle) overhead coiling insulated service doors or comparable product by one of the following:

1). Overhead Door Corp.
2). Cornell Iron Works Inc.
3). Or approved equal

2.2 MATERIALS

A. Curtain: Shall be assembled of interlocking galvanized steel slats. Slats shall have a combination of endlocks and widlocks locking each end of all alternate slats to act as a wearing surface, maintain slat alignment and retain the curtain in the guides under wind pressure. Curtain shall be formed of 18 gauge front and back panel slats. The void of the curtain slats shall be filled with foamed-in-place polyurethane insulation and the front and back panel slats must have a positive interlock. Slats with snap-in back panels are not acceptable.

1. Slats: Cross section not less than 3" high by 1" deep.

2. Minimum R value for slat shall be 8.0 as calculated using the ASHRAE Handbook of Fundamentals.

B. Bottom Bar: Two (2) angles, each not less than 2" x 2" x 3/16". per DSNY Guidelines.

1. Bottom 6" strip of door should be painted OSHA safety orange, per DSNY Guidelines.

2. Bottom bars should be equipped with weather stripping and extends to the guides.

C. Guides: Each guide assembly shall be fabricated of a minimum 4" x 4" steel support angle, a 2 1/2" x 4" inner guide angle and a 4" x 4" outer guide angle. Guides shall be designed with integral windbars in order to engage and retain the curtain under heavy wind pressures. Provide neoprene weather seals extending the full height of both guides.

D. Mounting Brackets: Fabricated of hot rolled 3/16" steel plate minimum, brackets shall be provided to house ends of the counterbalance barrel assembly.

E. Hood: Shall be provided to entirely enclose curtain and counterbalance barrel assembly. Hood shall be fabricated 22 gauge galvanized steel and designed to match brackets. Top and bottom shall be bent and reinforced for stiffness. Provide internal neoprene air baffle to minimize air infiltration at the head.

F. Counterbalance Assembly: Coiling insulated service door shall be counterbalanced by means of adjustable steel helical torsion springs attached to shaft enclosed in pipe with required mounting blocks or rings for attachment of curtain. Grease sealed bearings or self-lubricating graphite bearings shall be attached to the spring barrel which shall be fabricated of hot formed structural quality carbon steel seamless pipe.

G. Electric Motor Operator: Coiling insulated service door shall be provided with a direct drive power unit. The operator shall not utilize any drive chains between the door's inner shaft and the motor operator, the drive shaft of the door shall run directly into the gearbox of the operator without the use of any drive chains or drive sprockets. High efficiency helical gearing running in an oil bath shall be furnished together with a rectifier-operated brake completely housed to protect against damage, dust, and moisture. An efficient overload protection device, which will break the power circuit and protect against damage to the motor windings shall be integral with the unit. The motor operator shall be designed to operate the door at an average speed of 6" per second. Operator is to be NEMA type 1 enclosure.

1. Motor: Shall be intermediate duty, thermally protected, ball bearing type with a class A or better insulation. Horsepower of motor is to be 3/4hp minimum or of manufacturer's recommended size, whichever is greater.

2. Starter: Shall be size "0" magnetic reversing starter, across the line type with mechanical and electrical interlocks, with 10 amp continuous rating and 24 volt control circuit.

3. Reducer: Heliacal gear type, 75% efficiency minimum.

4. Brake: Magnetically activated, integral within the operator's housing.

5. Control Station: Provide surface mount push button control station marked open, close and stop.

H. Obstruction Sensing Device: The coiling insulated service door shall be designed with an obstruction sensing safety edge. In the event that the safety edge meets an obstruction during the normal closing operation, the coiling insulated service door shall stop, reverse and return to the open position.

I. Finish: After completion of fabrication, clean all metal surfaces to remove dirt and chemically treat to provide for paint adhesion. Curtain assembly is to receive a prime coat finish of .2 mils of epoxy primer and .8 mils of polyester paint in manufacturer's standard gray finish.

J. Vision Panels: Approximately 10" by 1-5/8" openings spaced approximately 2" apart and beginning 12" from end guides; in rows of slats at height indicated on Drawings; installed with insulated vision panel glazing.

K. Door Finish

1. Baked-Enamel or Powder-Coated Finish: Color as indicated on drawings, or if not indicated, as selected by Commissioner from manufacturer's full range.
2. Interior Curtain-Slat Facing: Match finish of exterior curtain-slat face.
3. Interior and exterior faces of curtain slats within 12 inches of floor to be painted OSHA Orange.

PART III - EXECUTION

3.1 EXECUTION REQUIREMENTS

A. Refer to DDC General Conditions for execution requirements.

3.2 INSTALLATION

A. Install door assemblies at locations shown in perfect alignment and elevation, plumb, level, straight and true.

B. Adjust door installation to provide uniform clearances and smooth non-binding operation.

C. Install wiring in accordance with the 2014 New York City Building Code and the National Electrical Code Standard. Materials shall be UL listed.

END OF SECTION 08 33 23

SECTION 08 33 24
Roll-Up Doors

PART I - GENERAL

1.1 RELATED DOCUMENTS

A. The following documents apply to all required work for the Project: (1) the Contract Drawings, (2) the Specifications, (3) the General Conditions, (4) the Addendum and (5) the Contract (City of New York Standard Construction Contract).

B. LEED / Environmentally Preferable Purchase (EPP) General Requirements:

1. Refer to DDC General Conditions and the Addendum to the General Conditions

2. LEED requirements apply to all Phase II work with the exception of the Existing Building scope. EPP requirements apply to the project's Existing Building scope only.

1.2 SUMMARY

A. Section includes rubber rapid roll-up door assembly.

B. Related Sections

1. Door Hardware - Section 08 71 00.

2. Painting and Finishing - Section 09 90 00.

1.3 QUALITY ASSURANCE

A. Refer to DDC General Conditions Section 01 40 00 "Quality Requirements".

1.4 SUBMITTAL PROCEDURES

A. Refer to DDC General Conditions Section 01 33 00 "Submittal Procedures".

1.5 SUBMITTALS

A. Shop Drawings

1. Indicate each type of door arrangement of hardware, required clearances, electrical characteristics including voltages, size of motors, auxiliary controls and wiring diagrams.

2. Indicate assembly details and dimensions of fabrication, required clearances and electrical connections.

B. Samples: Submit six (6) inches square samples of each required finish. Prepare samples on metal of same gauge and alloy to be used in work. Where normal color and texture variations are to be expected, include two (2) or more units in each sample showing limits of such variation.

PART II - PRODUCTS

2.1 ROLL-UP DOOR ASSEMBLY

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Rubber roll-up door assembly shall be Model HDXL Door System by TNR Industrial Doors
   2. Applied Handling - PerforMax MaxPower
   3. PerforMax Global
   4. Rytec
   5. Or approved equal

B. Rolling door shall have a guide and curtain lock retention system to provide a near airtight seal and knock-away feature for easy reassembly upon impact. After accidental impact, door must be capable of reset from ground level without the use of ladders, tools or lift equipment.

2.2 MATERIALS

A. Curtain

   1. Two (2) layers of Styrene Butadiene Rubber (SBR) each 1/8" thick, 70 durometer; sandwiched with 1-ply, 110 lbs. polyester cord center. Material shall provide normal resiliency and flexibility at temperatures ranging from -40° F to +180°F.

   2. Retention System: Provide molded curtain locks that are mechanically attached to the vertical edges of the curtain material. This retention system maintains and holds the curtain in guides under extreme windload conditions. Continuous glued SBR windlock or molded-in place Teflon windlock designs will not be accepted.

   3. Color: Black

B. Guides

   1. Side Curtain Retention: Guides shall be one-piece extruded aluminum to form a slot of sufficient depth to allow the retention system to move freely in the guides at all times. Aluminum members shall be of sufficient thickness and rigidity to maintain the retention system within the guides during normal operation while enabling the retention system to release during impacts.

   2. Steel guides (bolted or spring-loaded) will not be accepted.

   3. Side Frame: Provide mounting steel channel assembly for installation directly onto concrete or steel door framing.

C. Bottom Rail

   1. Bottom bar shall extend the full width of the curtain, sufficient to maintain the bottom edge of the curtain parallel to the door threshold at all times. The bottom bar shall be constructed of two steel angles bolted together and shall have a knock-away section to reduce risk of damage during accidental impacts.

2. Knock-away bottom bar shall be able be reset without the need to open side frames. Single angle design will not be accepted.

D. Roll-Up Door System

1. Curtain shall be rolled on a barrel of sufficient size to carry the door load with a deflection of not more than .03" per foot of opening width and shall be evenly balanced by 50,000 cycle oil-tempered, helical outboard torsion springs. Both the drive barrel shafts shall be constructed of minimum 2 1/2" C1018 cold rolled steel shafts.

2. Idler barrel shall be constructed of 6 5/8" O.D. round H.S.S. structural tubing with a minimum wall thickness of .188" and supported by 1 1/2" C1018 Cold Rolled steel shafts at either end. Idler must be guide mounted, not end bracket mounted, for proper tracking of curtain into guides.

3. End brackets are constructed of 1/2" hot-rolled steel plate c/w sealed, heavy-duty, self-aligning bearings with cast iron housings to support the drive barrel. Bearings shall be load-rated at 11023 lbs. dynamic and 6614 lbs. static.

4. Welded truss shall brace endplates together at the top and bottom with 2"x4"x.188" HSS and 2"x1"x.125" HSS diagonal bracing.

E. Reversing Edge: Door shall be equipped with reversing sensing edge to stop and reverse door to manufacturer's standard. A 1/8" thick EPDM rubber loop shall wrap the reversing edge. Both the reversing edge and rubber loop must be replaceable without removing the bottom bar from the curtain.

F. Accessories: Radio controls, motion sensors, loop detectors, pull cords, traffic lights etc. as selected by the Commissioner.

G. Construction

1. Doors: Constructed of steel, aluminum and SBR rubber/woven curtain.

2. Structural elements: Assembled by welding or by mechanical fasteners.

H. Operation of Door: Doors shall be equipped for operation by:

1. Electric operator

2. Manual chain hoist

I. Manual Operation

1. Provide emergency manual chain hoist to allow manual door operation.

2. Chain hoist shall be of sufficient capacity to operate a door at a maximum pull requirement of 20 to 30 lbs. The static load on the hand chain to hold the door in any position must not exceed 11 lbs.

J. Electrical Operation

1. Electric door operators shall be CSA/UL approved, heavy-duty gearhead type c/w pre-wired, number coded control cabinet as required, to manufacturer's standard. Panel enclosure to NEMA-4 rating.

2. Motor shall be T.E.F.C., high-starting torque, flange and foot mount, hoist-type, operating through a parallel helical gear reducer mechanism. The gear reducer shall be mounted on a heavy-duty base of 5/16" steel.

3. Motor and sprocketing shall be of capacity to open door at maximum speeds of up to 12" per second, depending on door size to manufacturer's standard, rated for X-HP power, "X" Voltage, "X"- phase, "X" Hz.

4. Operator shall be equipped with rotary screw-type limit switches to control open and close door positions as well as an electro mechanical brake system to stop and hold door in any position to manufacturer's standards.

5. Operator shall be equipped with built-in manual emergency chain hoist. Built-in electrical interlock shall prevent motor operation during use of manual chain hoist.

K. Control Panel: Panel enclosure shall be NEMA-4. Wiring shall be completed by manufacturer and shall be UL listed. Drive system shall be controlled by programmable logic controller (PLC). Control panel shall have adjustable closing timer, three push buttons for open, close and stop functions and a cycle counter.

PART III - EXECUTION

3.1 EXECUTION REQUIREMENTS

A. Refer to DDC General Conditions for execution requirements.

3.2 INSTALLATION

A. Install doors in accordance with manufacturer's printed instructions.

B. Install electrical motors, controller units, push-button stations and other electrical equipment required for door operation.

C. Upon completion of the door and electrical installation, make necessary adjustments to the door to ensure smooth operation.

END OF SECTION 08 33 24

SECTION 08 40 01
Glazed Storefronts and Curtain Wall System

PART I - GENERAL

1.1 RELATED DOCUMENTS:

A. The following documents apply to all required work for the Project: (1) the Contract Drawings, (2) the Specifications, (3) the General Conditions, (4) the Addendum, and (5) the Contract (City of New York Standard Construction Contract).

B. LEED General Requirements

1. Refer to DDC General Conditions.

   a. Section 01 33 00 – Submittal Procedures.

   b. Section 01 81 13.04 – Sustainable Design Requirements for LEED v4 Buildings.

1.2 SUMMARY:

A. Refer to Building Enclosure System Matrix for a description of the systems included in this Section as well as the requirements listed there.

B. For all Work described, supply and install the following components and their subcomponents of the work required to provide a complete system, including but not limited to the following:

1. Glass and glazing.
2. Framing systems which may include aluminum framing with steel stiffeners.
3. Back pans and insulation.
4. Sealants and gaskets.
5. Fixings and fastenings.
6. Flashings.
7. Finishes, coatings, and surface treatments.
8. Extruded aluminum trim.
9. Anchors and inserts used to attach to building structure.

   a. Supply any anchors and/or inserts to be cast or fabricated into/onto the building structure by others.

   b. Survey anchor locations prior to concrete placement.

10. Perimeter firesafing and smoke seal at interfaces with slab.

11. Penetrations for other services.

12. Pre-construction mockups, Samples, and testing.

13. Field testing.

C. This Section requires Engineering Services.

D. The work in this Section incorporates the work of the following Sections. Requirements specified in this Section are in addition to those in the following Sections:

1. Section 07 27 01 – Weather Resistive Barriers.

2. Section 07 42 14 – Metal Panels.

3. Section 07 62 01 – Facade Sheet Metal Flashings.

4. Section 07 84 13 – Firestops and Smokeseals.

5. Section 07 92 01 – Exterior Joint Sealants.

6. Section 08 71 00 – Door Hardware.

7. Section 08 71 01 – Door Hardware Schedule.

8. Section 08 80 00 – Exterior Glazing.

E. The following Sections describe systems that are adjacent to that of this Section, and will require coordinated interfaces:

1. Section 02 01 02 – Vapor Barrier Installation.

2. Section 03 30 00 – Cast-in-Place Concrete.

3. Section 03 45 00 – Architectural Precast Concrete.

4. Section 04 20 00 – Unit Masonry.

5. Section 05 12 00 – Structural Steel.

6. Section 05 40 00 – Cold-Formed Metal Framing.

7. Section 05 50 00 – Miscellaneous Metals.

8. Section 07 00 01 – Rainscreen System.

9. Section 07 13 26 – Sheet Membrane Waterproofing.

10. Section 07 20 00 – Thermoplastic Membrane Roofing System.

11. Section 07 95 00 – Expansion Control.

F. Reference Documents

1. Building Enclosure System Matrix: Refer to Drawing EN1-003.

2. Samples Matrix: Refer to Drawing EN1-003.

3. Exterior Glass Type Matrix: Refer to Drawing EN1-003.

1.3 REFERENCE STANDARDS AND REGULATIONS:

A. Refer to DDC General Conditions.

B. The Contractor's engineering, materials, and workmanship shall comply with 2014 New York City Building Code and 2016 New York City Energy Conservation Code. Where their recommendations or requirements are to a lower standard than required by this Contract Document, the Contract Document shall take precedence.

C. Comply with the applicable provisions and recommendations of the standards listed below. Where standards conflict with each other or with the provisions of these Specifications, the more stringent shall apply. Unless otherwise noted, the latest editions of the standards shall apply:

1. American Architectural Manufacturers Association (AAMA)

   a. AAMA CW-DG-1 – Aluminum Curtain Wall Design Guide Manual.

   b. AAMA CW-10 – Care and Handling of Architectural Aluminum from Shop to Site.

   c. AAMA IPCB – Standard Practice for the Installation of Windows and Doors in Commercial Buildings.

   d. AAMA MCW-1 – Metal Curtain Wall Manual.

   e. AAMA TIR-A9 with amendments – Design Guide for Metal Cladding Fasteners.

   f. AAMA VOL-1 – Windows and Doors.

   g. AAMA WSG – Window and Door Selection Guide.

   h. AAMA 101 – Voluntary Specifications for Aluminum, Vinyl (PVC), and Wood Windows and Glass Doors.

   i. AAMA 501.1 – Standard Test Method for Water Penetration of Windows, Curtain Walls and Doors Using Dynamic Pressure.

   j. AAMA 501.2 – Quality Assurance and Diagnostic Water Leakage Field Check of Installed Storefronts, Curtain Walls, and Sloped Glazing Systems.

   k. AAMA 501.4 – Recommended Static Test Method for Evaluating Curtain Wall and Storefront Systems Subjected to Seismic and Wind Induced Interstory Drifts.

   l. AAMA 501.5 – Test Method for Thermal Cycling of Exterior Walls.

   m. AAMA 501.6 – Recommended Dynamic Test Method for Determining Seismic Drift Causing Glass Fallout from a Wall System.

n. AAMA 501.7 – Recommended Static Test Method for Evaluating Windows, Window Wall, Curtain Wall and Storefront Systems Subjected to Vertical Inter-Story Movements.

o. AAMA 502 – Voluntary Specification for Field Testing of Newly Installed Fenestration Products.

p. AAMA 503 – Voluntary Specification for Field Testing of Newly Installed Storefronts, Curtain Walls, and Sloped Glazing Systems.

q. AAMA 513 – Standard Laboratory Test Method for Determination of Forces and Motions Required to Activate Operable Parts of CW and AW Class Operable Windows, Sliding Glass Doors and Terrace Doors in Accessible Spaces.

r. AAMA 611 – Voluntary Specification for Anodized Architectural Aluminum.

s. AAMA 910 – Voluntary "Life Cycle" Specifications and Test Methods for Architectural Grade Windows and Sliding Glass Doors.

t. AAMA 2605 – Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels.

2. Aluminum Association (AA)

a. AA Aluminum Standards and Data.

b. AA ADM-1 – Aluminum Design Manual.

3. American Institute of Steel Construction (AISC)

a. AISC Steel Construction Manual.

b. AISC 303 – Code of Standard Practice for Steel Buildings and Bridges.

4. American Society of Civil Engineers (ASCE)

a. ASCE 7 – Minimum Design Loads for Buildings and Other Structures.

5. American National Standards Institute (ANSI)

a. ANSI/ICC A117.1 – Accessible and Usable Buildings and Facilities.

b. ANSI Z97.1 – Safety Glazing Materials Used in Buildings – Safety Performance Specifications and Methods of Test.

6. American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE)

a. ASHRAE 90.1 – Energy Standards for Buildings Except Low-Rise Residential Buildings.

b. ASHRAE Fundamentals Handbook.

7. ASTM International (ASTM)

a. ASTM A36/A36M – Standard Specification for Carbon Structural Steel.

b. ASTM A108 – Standard Specification for Steel Bar, Carbon and Alloy, Cold-Finished.

c. ASTM A123/A123M – Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.

d. ASTM A153/A153M – Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.

e. ASTM A240/A240M – Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications.

f. ASTM A276 – Standard Specification for Stainless Steel Bars and Shapes.

g. ASTM A307 – Standard Specification for Carbon Steel Bolts and Studs, and Threaded Rod 60,000 PSI Tensile Strength.

h. ASTM A325 – Standard Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength.

i. ASTM A370 – Standard Test Methods and Definitions for Mechanical Testing of Steel Products.

j. ASTM A380 – Standard Practice for Cleaning, Descaling, and Passivation of Stainless Steel Parts, Equipment, and Systems.

k. ASTM A500 – Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.

l. ASTM A572/A572M – Standard Specification for High-Strength Low-Alloy Columbium-Vanadium Structural Steel.

m. ASTM A582 – Specification for Free-Machining Stainless and Heat-Resisting Steel Bars.

n. ASTM A653/A653M – Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

o. ASTM A780/A780M – Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings.

p. ASTM A923 – Standard Test Methods for Detecting Detrimental Intermetallic Phase in Duplex Austenitic/Ferritic Stainless Steels.

q. ASTM A967 – Standard Specification for Chemical Passivation Treatments for Stainless Steel Parts.

r. ASTM A992 – Standard Specification for Structural Steel Shapes.

s. ASTM A1008/A1008M – Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Solution Hardened, and Bake Hardenable.

t. ASTM A1011/A1011M – Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength.

u. ASTM B26/B26M – Standard Specification for Aluminum-Alloy Sand Castings.

v. ASTM B85/B85M – Standard Specification for Aluminum-Alloy Die Castings.

w. ASTM B108/B108M – Standard Specification for Aluminum-Alloy Permanent Mold Castings.

x. ASTM B117 – Standard Practice for Operating Salt Spray (Fog) Apparatus.

y. ASTM B209 – Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.

z. ASTM B221 – Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.

aa. ASTM B308/B308M – Standard Specification for Aluminum-Alloy 6061-T6 Standard Structural Profiles.

bb. ASTM B429/B429M – Standard Specification for Aluminum-Alloy Extruded Structural Pipe and Tube.

cc. ASTM B449 – Standard Specification for Chromates on Aluminum.

dd. ASTM B912 – Standard Specification for Passivation of Stainless Steels Using Electropolishing.

ee. ASTM C509 – Standard Specification for Elastomeric Cellular Preformed Gasket and Sealing Material.

ff. ASTM C612 – Standard Specification for Mineral Fiber Block and Board Thermal Insulation.

gg. ASTM C864 – Standard Specification for Dense Elastomeric Compression Seal Gaskets, Setting Blocks, and Spacers.

hh. ASTM C1087 – Standard Test Method for Determining Compatibility of Liquid-Applied Sealants with Accessories Used in Structural Glazing Systems.

ii. ASTM C1115 – Standard Specification for Dense Elastomeric Silicone Rubber Gaskets and Accessories.

jj. ASTM C1193 – Standard Guide for Use of Joint Sealants.

kk. ASTM C1401 – Standard Guide for Structural Sealant Glazing.

ll. ASTM D523 – Standard Test Method for Specular Gloss.

mm. ASTM D1400 – Standard Test Method for Nondestructive Measurement of Dry Film Thickness of Nonconductive Coatings Applied to a Nonferrous Metal Base.

nn. ASTM D2244 – Standard Practice for Calculation of Color Tolerances and Color Differences from Instrumentally Measured Color Coordinates.

oo. ASTM D3363 – Standard Test Method for Film Hardness by Pencil Test.

pp. ASTM D4214 – Standard Test Methods for Evaluating the Degree of Chalking of Exterior Paint Films.

qq. ASTM E84 – Standard Test Method for Surface Burning Characteristics of Building Materials.

rr. ASTM E90 – Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements.

ss. ASTM E136 – Standard Test Method for Behavior of Materials in a Vertical Tube Furnace at 750°C.

tt. ASTM E283 – Standard Test Method for Determining Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen.

uu. ASTM E330 – Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference.

vv. ASTM E331 – Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference.

ww. ASTM E413 – Classification for Rating Sound Insulation.

xx. ASTM E488 – Standard Test Methods for Strength of Anchors in Concrete Elements.

yy. ASTM E754 – Standard Test Method for Pullout Resistance of Ties and Anchors Embedded in Masonry Mortar Joints.

zz. ASTM E783 – Standard Test Method for Field Measurement of Air Leakage Through Installed Exterior Windows and Doors.

aaa. ASTM E1332 – Standard Classification for Rating Outdoor-Indoor Sound Attenuation.

bbb. ASTM F593 – Standard Specification for Stainless Steel Bolts, Hex Cap Screws, and Studs.

ccc. ASTM F594 – Standard Specification for Stainless Steel Nuts.

ddd. ASTM F3125 – Standard Specification for High Strength Structural Bolts, Steel and Alloy Steel, Heat Treated, 120 ksi (830 MPa) and 150ksi (1040 MPa) Minimum Tensile Strength, Inch and Metric Dimensions.

8. American Welding Society (AWS)

a. AWS A5.10 – Specification for Bare Aluminum and Aluminum-Alloy Welding Electrodes and Rods.

b. AWS D1.1 – Structural Welding Code – Steel.

c. AWS D1.2 – Structural Welding Code – Aluminum.

d. AWS D1.3 – Structural Welding Code – Sheet Steel.

e. AWS D1.6 – Structural Welding Code – Stainless Steel.

9. Code of Federal Regulations (CFR)

a. 16 CFR Part 12 – Safety Standard for Architectural Glazing Materials.

10. Glass Association of North America (GANA)

a. GANA Glazing Manual.

11. International Organization for Standards (ISO)

a. ISO 2815 – Paints and Varnishes – Buchholz Indentation Test.

b. ISO 3231 – Paints and Varnishes – Determination of Resistance to Humid Atmospheres Containing Sulfur Dioxide.

12. National Association of Architectural Metal Manufacturers / National Ornamental & Miscellaneous Metals Association (NAAMM/NOMMA)

a. NAAMM/NOMMA 500-06 – Metal Finishes Manual for Architectural and Metal Products.

13. National Fenestration Rating Council (NFRC)

a. NFRC 100 – Procedure for Determining Fenestration Product U-Factors.

b. NFRC 200 – Procedure for Determining Fenestration Product Solar Heat Gain Coefficient and Visible Transmittance at Normal Incidence.

c. NFRC 400 – Procedure for Determining Product Air Leakage.

14. National Fire Protection Association (NFPA)

a. NFPA 259 – Standard Test Method for Potential Heat of Building Materials.

b. NFPA 268 – Standard Test Method for Determining Ignitibility of Exterior Wall Assemblies Using a Radiant Heat Energy Source.

c. NFPA 285 – Standard Fire Test Method for Evaluation of Fire Propagation Characteristics of Exterior Non-Load-Bearing Wall Assemblies Containing Combustible Components.

15. Society for Protective Coatings (SSPC)

a. SSPC-Paint 42 – Epoxy Polyamide/Polyamidoamine Primer, Performance-Based.

b. SSPC-PS Guide 12 – Guide to Zinc-Rich Systems.

c. SSPC-PS 28.01 – Two-Coat Zinc-Rich Polyurethane Primer / Aliphatic Polyurea Topcoat System, Performance-Based.

d. SSPC-PS 28.02 – Three-Coat Moisture-Cured Polyurethane Coating System, Performance-Based.

16. Safety Glazing Certification Council (SGCC).

17. Sheet Metal and Air Conditioning Contractors' National Association (SMACNA).

a. SMACNA Architectural Sheet Metal Manual.

1.4 PERFORMANCE REQUIREMENTS:

A. General Prescriptive Requirements

1. For all elements outside of the vapor barrier plane, use materials suitable for external conditions that will not deteriorate as a result of weathering:

a. Elements shall resist the deleterious effects of water, cleaning agents, temperature variations expected from the specified temperature ranges, gaseous pollutants (including ozone), weak acids deriving from gaseous pollutants dissolved in water, and ultraviolet (UV) radiation exposure during installation and in service.

b. Include separators to prevent bimetallic corrosion.

c. Use suitable grade of stainless steel for all fasteners outside of or through the vapor barrier.

1) Seal all fasteners that penetrate through air or vapor barrier with material chemically compatible with the fastener and adjacent materials.

d. Use suitable grade of stainless steel or aluminum for all brackets outside the vapor barrier.

e. Do not use different metals for significant structural connections that occur outboard of the vapor barrier plane unless:

1) The connection can incorporate dielectric separators.

2) The connection can be fully inspected after installation is complete using the Project's maintenance access system.

2. Use materials in the Work chemically compatible with adjacent materials.

a. Where flexible or sheet vapor control materials are connected together or to other systems, lap and continuously seal with chemically compatible materials and mechanically restrain.

3. Where insulation must be locally reduced in thickness, provide high-performance insulation to match the overall performance of the surrounding insulation.

4. Site-applied Sealant is not acceptable as part of the primary Waterproofing System unless shown on the Architectural Drawings or noted within this Section.

5. Engineer the air / vapor barrier system to resist the maximum design wind load.

6. Do not use Glazing to provide lateral support to framing members.

7. Provide laminated Glass where indicated and under the following conditions:

   a. Vertical Glazing with unsupported edges.

8. All external areas of the Work shall be accessible for maintenance and repair.

   a. Adjust loads imposed on the Work as necessary for the type and orientation of maintenance equipment anticipated. The Work shall sustain safely, and without damage, access and specified maintenance loads.

   b. All gaskets, shall be accessible for inspection / replacement.

B. General Performance

1. Comply with performance requirements specified herein, and as validated by pre-construction mockup testing as described in Section 01 43 39 – Facade Mockup Testing and Samples.

2. Work shall:

   a. Withstand and accommodate the stresses and movements induced by the specified cambers, estimated deflections, relative deflections, and the long-term movements associated with settlement of the foundations, or any other movements of the structure, changes in temperature, moisture content, and chemical changes.

   b. Include suitable allowances for the specified construction tolerances.

   c. Withstand the specified deleterious and degrading effects of radiation from the sun, weathering, atmospheric pollution, vermin, fungi, and other growths for the required service life without maintenance in excess of routine cleaning and minor repairs.

   d. Have resistance to combustion and fire spread appropriate to each part.

   e. Prevent casual and unlawful entry into the building.

   f. Cleaning and maintenance of the Work shall be carried out easily, without interfering the function of the building.

   g. Panels, Glazing beads, structural silicone assemblies, and decorative capping pieces shall remain securely held and gaskets shall not be displaced.

3. Failure includes the inability of the Work to meet the performance requirements set forth in this Section, in addition to the following:

   a. Noise or vibration created by wind, and thermal and structural movements.

   b. Secondary Glass damage and/or damage due to falling components of the Work.

   c. Staining of adjacent components or wetting of interior building components.

C. Detailed Engineering Principles

1. This system shall be:

a. Engineered as a manufacturer's standard, fully framed, and factory installed aluminum curtain wall system.

1) Mechanically restrained glazing and panels shall have the pressure cap separated from the face of the glazing by gaskets. Mechanically attach decorative pressure cap covers to pressure caps.

b. Pressure equalized to the back of the glazing pocket.

c. Incorporate a secondary drainage system behind the weathering seals that drains to the outside via a baffled weep path. This system shall:

1) Allow complete drainage of water from rebates to outside.

2) Prevent standing water on or around the edge of insulated glazed units, panes, and Panels.

3) Allow ventilation of the edges of the glazed units.

d. Incorporate a continuous internal air seal and vapor barrier that shall also act as second line of defense against water ingress.

1) All interfaces with adjacent systems shall accommodate the integration of the transitional waterproofing, air and vapor barrier into the Glazing pocket of the framing system. This integration shall provide for a continuous air and vapor system from the Glazing system to that of adjacent systems. Machine manufacturer's standard extrusions as required to make a continuous seal.

e. Provide the following when all tolerances are accommodated and the most onerous combination of movements occur (including wind sway):

1) Sufficient edge cover on all Glazed units and Panels to maintain weathering and structural performance around their perimeter.

2) Clearance to edges of all Glass panes or Panels of at least 1/8 in. everywhere around their perimeter.

f. Incorporate thermal isolation devices / thermal breaks to minimize thermal bridging.

g. Capable of being re-glazed from outside of the building.

h. Sealed with gaskets at joints between horizontal and vertical framing members.

D. Structural Performance

1. The Work shall transmit the design loads as specified below to the building structure via the points of attachment as engineered and built, with an adequate margin of safety appropriate to each material and product as required by 2014 New York City Building Code and the listed Reference Standards.

2. As required by 2014 New York City Building Code, the various load cases and combinations of load cases acting on structural elements shall be considered.

a. No permanent deformation or damage to any components of the Work, adjacent elements, or supporting structure shall be accepted under any of the above load cases and combinations of load cases, excluding blast and impact loads.

b. Where steel stiffeners are used, they shall be engineered for deflection control only. Aluminum framing shall be engineered for the full strength requirements of the system.

c. Consider buckling and overall structural system stability in the engineering of all elements. Engineer framing members and systems not to buckle under the design load cases and their combinations.

3. Coordinate all loads imposed on the building structure with the Commissioner.

4. Coordinate and verify access and maintenance loads with the maintenance equipment manufacturer / City of New York. Loads shall not be less than 2014 New York City Building Code or the following, whichever is greater and shall be applied to any external or internal surface of the Work which is subject to access for maintenance purposes:

a. A vertical uniformly distributed load of 12.5 lbf per square foot, and a concentrated load of 250 lbf acting on a 6 in. diameter contact area applied to any gutters, copings, or flat and near-flat surfaces with horizontal projections greater than 6 in.

b. A 115 lbf load applied horizontally through a 6 in. diameter contact area on any vertical or near-vertical building enclosure surface required to support a ladder.

c. 600 lbf in any direction at building maintenance equipment restraint points.

d. Where maintenance and safety ropes will be draped over elements of the Work, engineer those elements to support, without damage, a point load of 675 lbf or the anchorage load limits provided, applied over the length of contact of the cladding.

E. Movement Performance

1. The Work shall accommodate movements developed by the building structure without any reduction in the performance below the minimum levels required herein. This includes but is not limited to:

a. Movements due to design gravity and live loads.

b. Movements under repeated cycles of the design wind loads.

c. Movements due to seismic loads.

d. Changes in dimension and shape arising from specified building movements, including settlement, shrinkage, elastic shortening, floor beam deflections, creep, wind sway, twisting and racking, and thermal and moisture movement. These include, but are not limited to, movements due to any joint in the supporting structure or building frame.

2. Coordinate all building movement assumptions with the Commissioner and as per the Structural Drawings.

3. Applicable Testing Requirements

a. Interstory Drift Performance

1) The Work shall demonstrate compatibility with the building structure interstory drifts when tested to the procedures outlined in AAMA 501.4 at the design displacement, and for not less than ten (10) full cycles.

b. Interstory Deflection Performance

1) The Work shall demonstrate compatibility with the building structure vertical live load deflections when tested to the procedures outlined in AAMA 501.7 at the design displacement, and for not less than ten (10) full cycles.

F. Deflection Performance

1. Provide Work that accommodates the dimensional construction tolerances of building structure and other adjacent constructions.

2. Under design loads and their combinations, deflections of elements shall be less than either the requirements of 2014 New York City Building Code or as follows, whichever is lesser:

a. Normal to the face of the wall plane:

1) Elements Supporting Insulated Glazing: Less than L/175 for spans less than or equal to 13 ft-6 in., or less than L/240 +1/4 in. for spans larger than 13 ft-6 in. whereby L is the length of the supported edge of the glazing.

2) Elements Supporting Plaster, Masonry, or Brittle Items: Less than span/500.

3) Non-Glass Supporting Elements: Less than Span/175.

b. Parallel to the face of the wall plane, limited to the lesser amount of either:

1) That which reduces glazing bite to less than 75% of the design dimension.

2) That which reduces edge clearance between framing members and glazing or other fixed components to less than 25% of the design dimension or 1/8 in., whichever is greater.

c. Engineer cantilevered elements to deflect less than 2L/175, where L represents the length of the cantilevered element.

d. Engineer operable units and adjacent framing to accommodate in-service deflections with a minimum of 1/16 in. clearance between fixed and operable portions of the framing.

3. The Work shall accommodate thermal deflections and movements resulting from the following maximum change (range) in ambient and surface temperatures. Changes in dimension resulting from changes in temperature in any of its parts, its supporting framework, and brackets shall not result in any reduction in the specified performance.

4. Base engineering calculation on surface temperatures of materials due to both solar heat gain and night-time-sky heat loss. As per AAMA 501.5, all system components shall noiselessly withstand

thermal movements and shall not buckle, distort, crack, cause failure of glass and/or joint seals, or develop undue stresses on the finished surfaces, materials, fixing assemblies, or building structure.

a. Engineer Work to meet these requirements under the following conditions:

1) Total temperature range: 120°F, ambient; 180°F, material surfaces.

2) Test interior ambient air temperature: 70°F.

5. The Work shall accommodate deflections and/or movements resulting from moisture without any reduction in the specified performance. This includes, but is not limited to:

a. Changes in moisture content of Work components, including those due to wetting from rain.

b. Expansion of absorbed or retained moisture due to freezing.

6. The Contractor shall avoid in its engineering and detailing introducing locked-in stresses that may be detrimental to the performance of the Work during the service life.

a. Stresses include, but are not limited to, those that can develop in an individual Panel if the various fasteners and connections securing it in position are so rigid that they do not allow for thermal or other movement in that Panel.

7. Applicable Testing Requirements

a. Uniform Load Structural Deflection Performance

1) The Work shall demonstrate compliance with the deflection criteria listed in this Section when tested according to ASTM E330.

b. Uniform Ultimate Load Structural Deflection Performance

1) The Work shall not show evidence of material failures, structural distress, or permanent deformation exceeding 0.2% of span when tested according to ASTM E330 at 150% of the peak design load (positive or negative).

G. Weatherproofing Performance

1. The Work, including all joints between it and other elements of Work, shall prevent leakage of water into the interior of the building from the weathering line of the assembly, under the action of wind pressure, kinetic energy, gravity, surface tension, or capillary action. It shall also prevent water entering into those parts of the Work that would be adversely affected by the presence of water.

a. All joints within the Work shall maintain their watertightness under the loads and movements specified herein.

b. The weathering principles incorporated within the Work and interfacing with adjacent elements of Work shall be compatible with the weathering principles adopted by the adjacent elements.

c. Detailing and waterproofing must ensure that water from ponding or reservoirs is directed away from the Work such that water will not build up a pressure head or impose forces onto the building enclosure seals and components.

d. Detailing must ensure that water collected within Work elements is positively drained to the outside of the Work.

1) The drainage of water along edge seals of insulated glazed units is not permitted unless written confirmation is provided by the unit manufacturer stating that the design life, required service life, and warranty of the unit is unaffected.

2. Incorporate elements and details in the Work to provide a continuous vapor barrier system.

a. Engineer elements to the exterior of the vapor barrier plane so they are suitable for exterior conditions and experience weathering without any loss in performance as specified.

1) No element of the Work shall be encapsulated between two vapor barrier planes.

b. Vapor control elements shall maintain their performance and properties for the expected service life of the system.

c. Where vapor control elements will be exposed to the interior conditions during construction, select suitable materials to ensure elements are not easily damaged during the installation of the Work or adjacent constructions.

1) Easily damaged materials include, but are not limited to, foil facing attached to other products, including insulation.

3. Applicable Testing Requirements

a. Static Pressure Water Infiltration

1) The Work shall demonstrate compliance with the weatherproofing performance criteria when tested according to ASTM E331 at a minimum static air pressure differential of 20% of the peak positive wind load design pressure, but not less than 15 psf.

2) No evidence of water infiltration inboard of the weathering line plane when tested.

b. Dynamic Pressure Water Infiltration

1) The Work shall demonstrate compliance with the weatherproofing performance criteria when tested according to AAMA 501.1 at a minimum static air pressure differential of 20% of the peak positive wind-load design pressure, but not less than 15 psf.

2) No evidence of water infiltration inboard of the weathering line plane when tested.

H. Energy Performance

1. Work and components shall have certified energy performance ratings as determined by the standards referenced by 2014 New York City Building Code and 2016 New York City Energy Conservation Code.

2. Incorporate thermal breaks in the Work.

3. The design environmental conditions are:

a. Exterior extreme annual dry bulb temperature and coincident wind speed:

1) Maximum Dry Bulb: 95.6°F at 6 mph.

2) Minimum Dry Bulb: 2.3°F at 6 mph.

b. Interior design dry bulb temperature, relative humidity (RH), and interior air film coefficient:

1) 72°F ± 2°F at 25% to 50% RH and 0.7 Btu/hr - sq ft - °F.

4. Thermal Transmittance (U-Factor)

a. U-factor of the Work shall not be more than specified for each building enclosure system as specified in the Building Enclosure System Matrix.

b. Refer to and coordinate values with the final Glass and Glazing assembly specified in Exterior Glass Type Matrix.

5. Solar Heat Gain Coefficient (SHGC)

a. SHGC of the Work shall not be more than specified for each building enclosure system as specified in the Building Enclosure System Matrix, accounting for all frame effects.

b. Refer to and coordinate values with the final Glass and Glazing assembly specified in Exterior Glass Type Matrix.

6. Visible Light Transmittance (VLT)

a. VLT of the Work shall not be more than specified for each building enclosure system as specified in the Building Enclosure System Matrix, accounting for all frame effects.

b. Refer to and coordinate values with the final Glass and Glazing assembly specified in Exterior Glass Type Matrix.

7. Condensation Resistance

a. Provide systems whose internal condensation and drainage systems will prevent uncontrolled condensation inboard of the vapor barrier plane, under the most onerous environmental conditions specified in this Section.

1) Exterior: Dry bulb 13°F at 17 mph.

2) Interior

a) Dry bulb 72°F at 25% RH and 0.7 Btu/hr - sq ft - °F.

8. Static Pressure Air Infiltration

a. Maximum air leakage through the Work areas of the Project shall be the lesser of the requirements determined according to 2014 New York City Building Code and 2016 New York City Energy Conservation Code or the following:

1) For non-operable portions of the Work, the maximum air infiltration rate shall be one half of that as required and determined according to the standards referenced by 2014 New York City Building Code and 2016 New York City Energy Conservation Code.

9. Applicable Testing Requirements

a. Static Pressure Air Infiltration

1) The Work shall demonstrate compliance with the air infiltration criteria listed in this Section when tested according to ASTM E283 and to the pressure differential referenced by 2014 New York City Building Code and 2016 New York City Energy Conservation Code.

a) Integrated operable units shall individually from the rest of the system demonstrate compliance with the air infiltration criteria listed in this Section.

I. Fire Performance

1. The Work shall comply with the relevant fire resistance, smoke sealing, and fire stopping recommendations as stated in the 2014 New York City Building Code and 2016 New York City Energy Conservation Code, but not less than the following:

a. ASTM E84: Flame Spread Index must be less than 25, Smoke Developed Index must be less than 450.

b. ASTM D1929: Self-ignition temperature of 650°F or greater.

c. ASTM D635: Requires a CC1 classification.

d. Tested and comply with NFPA 285 acceptance criteria

2. Component materials shall not give off toxic fumes.

J. Lightning Protection and Grounding Performance

1. The Contractor shall coordinate as necessary with the Contractor responsible for the lightning protection and grounding systems as required by 2014 New York City Building Code for the building and shall agree on appropriate connection points with them for review by the Commissioner.

a. No external tapes or visible connections will be accepted.

b. Provide electrically continuous vertical and horizontal metallic framework elements and supporting structures of the building enclosure for the purposes of lightning protection and grounding. Provide bonding of the framework to the rest of the lightning protection and grounding system. Ensure all non-conductive thermal breaks are electrically continuous.

K. Acoustic Performance

1. The Work shall be engineered so as to form a continuous enclosure which achieves the acoustical rating specified. The acoustical rating shall apply to the entire system including all components including, but not limited to, the following:

    a. Glazing.

    b. Framing.

    c. Operable components.

2. The Contractor shall engineer, provide and install any and all upgrades to the framing members so as to achieve the acoustical rating specified. This may include, but is not limited to insulation in framing members, mass damping vinyl (Sound Seal B20 or equal), damping sheets, and supplemental steel or other material to increase the mass of framing. Any such framing upgrades shall be continuous along the entire length and perimeter of the framing and shall be directly adhered to the frame.

3. The Work shall produce no audible whistling, creaking, rattling, or noise otherwise related to movement when subject to design loading conditions. Such noises shall be limited to a maximum of 20 dBa

4. Work shall have sound insulation conforming to specified criteria. Criteria accounts for all framing effects as well as for interfaces with other systems.

5. Sound Transmission Class (STC)

    a. Work shall have a STC of not less than specified in the Building Enclosure System Matrix as determined by ASTM E413.

L. Applicable Testing Requirements

    a. Work shall have an OITC of not less than specified in the Building Enclosure System Matrix and as determined by ASTM E1332.

M. Infestation

1. Engineer materials used in the Work against attack or infestation by micro-organisms, fungi, insects, or other vermin.

N. Operable Unit Performance

1. Operable units shall be glazed into the glazing pocket of Work and shall not compromise the waterproofing, acoustical or thermal performance of the Work.

2. Operable units meeting at a minimum the performance requirements of Class AW operable units as defined by AAMA 101. Where other requirements in this Section conflict with the Class "AW" requirement, the more onerous of the conflicting requirements shall govern.

3. Operable units shall incorporate removable insect screens.

4. Engineer operable units such that all operating parts function normally under specified design loads and do not require excessive force to operate.

a. Excessive force shall be the lesser of the requirements determined by 2014 New York City Building Code or AAMA 101.

5. Applicable Testing Requirements

a. Operating Force

1) The Work shall demonstrate compliance with the operating force requirements specified via testing according to AAMA 513.

b. Life Cycle Testing

1) The Work shall demonstrate compliance with life cycle testing according to the requirements of AAMA 101 when tested to AAMA 910.

O. Door Performance

1. Doors shall be glazed into the Glazing pocket of Work and shall not compromise the waterproofing, acoustical or thermal performance of the Work.

2. Door sill shall accommodate the termination of the adjacent waterproofing system on a vertical surface within the threshold of the Door system.

3. Engineer operable units such that all operating parts function normally under specified design loads and do not require excessive force to operate.

a. Excessive force shall be the lesser of the requirements determined by Code or AAMA 101.

4. Applicable Testing Requirements

a. Operating Force

1) The Work shall demonstrate compliance with the operating force requirements specified via testing according to AAMA 513.

b. Life Cycle Testing

1) The Work shall demonstrate compliance with life cycle testing according to the requirements of AAMA 101 when tested to AAMA 910.

P. Entrance Door Unit Hardware Performance

1. Refer to Section 08 71 00 – Door Hardware and Section 08 71 01 – Door Hardware Schedule for performance requirements.

1.5 SUBMITTAL PROCEDURES:

A. Refer to DDC General Conditions.

B. Shop Drawings.

C. Calculations

1. Provide structural calculations as required.
2. Provide thermal calculations as required to describe:
    a. U-value, SHGC, and VLT performance of Work.
    b. Condensation resistance of all elements of Work.

D. Testing Reports
1. Weather Test Certificate
    a. Present certificates of weathering performance test results of a completed installation, utilizing a similar system, under similar loads and of similar size and geometry to the Project, demonstrating that performance requirements of Work can be met.

E. Product data.

F. Samples.

G. Quality control plan.

H. Welding certificates.

I. Energy Performance Certificates
1. For Work provide labeled and certified performance from the manufacturer according to the requirements of 2014 New York City Building Code and 2016 New York City Energy Conservation Code and by reference ASHRAE 90.1.
    a. U-value performance shall be certified and labeled per NFRC 100 requirements.
    b. SHGC performance shall be certified and labeled per NFRC 200 requirements.
    c. Static pressure air infiltration performance shall be certified and labeled per NFRC 400 requirements.
2. Indicate whether certification is based on actual test of assembled components or on calculation.
    a. Provide fenestration products with NFRC certified performance values.

J. Product Test Reports
1. Indicating compliance with performance requirements.

K. Quality Control Reports
1. Fabricator reports.
2. Field reports.

L. Completion of Work: Upon completion of installation of the Work, submit written certification that the manufacturer's representative has supervised the work of this Section and that all materials are correctly installed.

1.6 QUALITY ASSURANCE

A. Refer to DDC General Conditions Section 01 40 00 – Quality Requirements.

B. Installer Qualifications: The Contractor must be licensed or approved by the manufacturer.

1.7 WARRANTY:

A. Unless stated otherwise in these Specifications, Warranty shall state that the Work is free from defects in materials and workmanship and weathertight for a period of 1 yr from the date of Substantial Completion. Contractor shall agree to promptly repair or replace defective materials and workmanship to "like new condition," including such exploratory work, required to determine the cause, during the Guarantee period, at no additional cost to the City of New York.

B. In addition to Contractor's Guarantee, the paint finish manufacturer shall guarantee the finish for a period of 20 yrs from the date of substantial completion of the Work against defects, including full labor and material.

C. The Contractor shall be responsible for repairing damage to the building and furnishings occasioned by defective materials or workmanship or damage as part of repairs to the Work.

1.8 PROJECT CONDITIONS:

A. Adjacent Trade Shop Drawing Review and Field Measurements: Verify actual locations of structural supports for Work by review of supporting structure Shop Drawings or field measurements before fabrication and indicate measurements on Shop Drawings.

PART II – PRODUCTS

2.1 MANUFACTURERS:

A. Manufacturers are subject to compliance with requirements documented herein.

1. Oldcastle BuildingEnvelope.
2. Wausau Window and Wall Systems.
3. YKK.
4. Or approved equal.

B. Products

1. Subject to compliance with requirements, provide product by one of the following:
   a. Oldcastle BuildingEnvelope Reliance HTC Curtain Wall.
   b. Wausau Window and Wall Systems HP Wall.

c. YKK YCW 750XT.

d. Or approved equal.

2.2 MATERIALS:

A. Aluminum Components

1. Manufacturer's recommended alloy and temper, meeting the requirements and standards listed herein for type of use and finish indicated in accordance with:

a. Sheet and Plate: ASTM B209.

b. Extruded Bars, Rods, Profiles, and Tubes: ASTM B221.

c. Extruded Structural Pipe and Tubes: ASTM B429.

d. Structural Profiles: ASTM B308/B308M.

e. Welding Rods and Bare Electrodes: AWS A5.10 / A5.10M.

B. Steel Components

1. Manufacturer's recommended alloy and temper, meeting the requirements and standards listed herein for type of use and finish indicated in accordance with:

a. Structural Shapes, Plates, and Bars: ASTM A36/A36M/A572.

b. Cold-Rolled Sheet and Strip: ASTM A1008/A1008M.

c. Hot-Rolled Sheet and Strip: ASTM A1011/A1011M.

d. Galvanized Sheet: ASTM A653/A653M.

C. Stainless Steel

1. Manufacturer's recommended alloy and temper, meeting the requirements and standards listed herein for type of use and finish indicated in accordance with:

a. Plate, Sheet and Strip: ASTM A240/A240M.

2. With a Pitting Resistance Equivalence Number (PREN) greater than 24.5 calculated using the formula 'PREN = %Cr + 3.3 x %Mo + 16 x %N' based on the minimum compositions for Chromium, Molybdenum, and Nitrogen given in ASTM A240 or equivalent.

3. In areas where stainless steel may be used in proximity to sea spray or salts, the alloy chosen will not corrode or exhibit any surface pitting in its installed condition, or require regular maintenance to prevent corrosion.

a. Use non-austenitic alloys including the following:

1) Duplex stainless steel Type 2205 (UNS S32205).

2) 317L stainless steel (UNS S31703).

2.3 FINISHES:

A. Refer to Building Enclosure System Matrix for finish selection for each system.

B. Aluminum Components

1. Anodized Finish

a. Carry out anodizing under conditions of acceptable good practice for architectural applications. Hold processing conditions constant for the period required for completion of the Work. Keep records of these conditions and make available for inspection in the event of a dispute as to the quality of the finished anodic coating.

b. Clear Anodic Finish: AA-M12C22A41, Class I, 0.71 mil or thicker, as complying with AAMA 611.

c. Color Anodic Finish: AA-M12C22A42/A44, Class I, 0.71 mil or thicker, as complying with AAMA 611.

1) Color: Refer to Building Enclosure System Matrix.

2. High-Performance Organic Finish

a. Three-coat fluoropolymer finish complying with AAMA 2605 and containing not less than 70% PVDF resin by weight in color coat and clear topcoat.

b. Prepare, pretreat, and apply coating to exposed metal surfaces complying with coating and resin manufacturers' written instructions.

c. Color and Gloss: Refer to Building Enclosure System Matrix.

d. Manufacturers are subject to compliance with requirements, provide products by one of the following:

1) PPG Industries Inc., Duranar XL Extrusion Coating

2) Akzo Nobel Coatings Inc., Trinar Ultra TEC/TMC

3) The Valspar Corporation, Fluropon Premiere

4) Or approved equal.

3. Powdercoat Finish

a. Shop-applied Superior Performance powder coating finish for architectural aluminum extrusions complying with AAMA 2605.

b. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.

c. Color and Gloss: Refer to Building Enclosure System Matrix.

1) One-coat dry system with 70% fluoropolymer resin, meeting performance requirements of AAMA 2605 and the following:

a) Dry Film Thickness, ASTM D1400: Not less than thickness applied to tested specimens meeting specified performance requirements, and as recommended by manufacturer for application.

b) Specular Gloss, ASTM D523 at 60°: To be coordinated with the Commissioner.

c) Dry Film Hardness, ASTM D3363: Pass.

d) Sulphur Dioxide, ISO 3231 (Kesternich): Pass; no blistering, loss of gloss, or discoloration.

d. Manufacturers: Subject to compliance with requirements provide products by one of the following:

1) Akzo Nobel Coatings Inc., Interpon D3000 Series Fluoromax Powder Coating.

2) PPG Industries Inc., Duranar Powder Coatings.

3) The Jotun Group, Jotun Durasol.

4) Or approved equal.

4. Concealed Components

a. Provide either High-Performance Organic Finish, Powdercoat Finish, or Clear Anodic Finish.

C. Steel Components

1. Zinc coated by hot-dip process according to ASTM A123/A123M, ASTM A653/A653M or ASTM A153/A153M, after fabrication as applicable.

a. Galvanized sheet shall have a minimum coating designation of G90 according to ASTM A653/A653M.

b. Following pickling operations, hold steel at more than 212°F to ensure a uniform temperature, either prior to, or after fluxing.

2. Exposed Components

a. Provide a High-Performance Organic or Powdercoat Finish meeting the requirements specified for Aluminum Components and in accordance with the finish manufacturer's procedures.

3. Concealed Components

a. Use a zinc-rich, corrosion-resistant primer, complying with SSPC-PS Guide applied immediately after surface preparation and pretreatment.

b. Select surface preparation methods according to recommendations in SSPC-PS and prepare surfaces according to applicable SSPC standard.

D. Stainless Steel Components

1. Surface Preparation

a. Remove tool and die marks and stretch lines, or blend into finish.

2. Polished Finishes

a. Grind and polish surfaces to produce uniform finish, free of cross scratches.

b. Run grain of directional finishes with long dimension of each piece.

c. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.

3. Finish: Refer to Building Enclosure System Matrix.

E. General

1. Choose finishes such that touch-up finishes match factory finish.

2. Discoloration, fading, chalking, excessive non-uniformity, pitting, cracking, peeling, corrosion, or crazing of finish is not allowed.

3. The terms below used in conjunction with finish Guarantee are defined as follows:

a. "Excessive Fading": Means a change in appearance that is perceptible and objectionable as determined by the Commissioner when viewed visually in comparison with the original color range standards.

b. "Excessive Non-Uniformity": Means non-uniform fading during the Guarantee period to the extent that adjacent parts have a color difference greater than the original acceptable color range.

c. "Will Not Pit or Otherwise Corrode": Means no pitting or other type of corrosion of finish discernible from a distance of 10 ft, resulting from the natural elements in the atmosphere at the Project site.

4. Deterioration includes, but is not limited to, the following:

a. Color fading more than 5 Hunter units when tested according to ASTM D2244.

b. Chalking in excess of a No. 8 rating when tested according to ASTM D4214.

c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.

2.4 FRAMING:

A. Framing members shall comply with the profiles and angles shown in the Architectural Drawings and comply with the performance requirements set forth in these Specifications.

B. Aluminum Framing shall follow the recommendations of the following:

1. AA – Aluminum Design Manual, Aluminum Standards and Data

2. AAMA – Aluminum Curtain Wall Design Guide Manual, Care and Handling of Architectural Aluminum from Shop to Site.

C. Framing shall incorporate profiles to accommodate waterproofing integration at interfaces with adjacent building enclosure systems.

2.5 BRACKETS, FASTENERS AND ANCHORAGE:

A. Fasteners

1. Fastener engineering shall be no less than the most stringent standards as required by 2014 New York City Building Code and its reference standards, or the following requirements:

a. Fastener engineering for aluminum components shall be as per the Aluminum Association Aluminum Design Manual (AA-ADM1).

1) Allowable loads for fasteners shall be the lesser of the fastener manufacturers' requirements or per AAMA TIR-A9 with the most recent amendments.

b. Steel and stainless steel bolts:

1) Carbon Steel Bolts, Studs, and Threaded Rod 60,000 psi Tensile Strength: ASTM A307.

2) Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength: ASTM A3125.

3) Stainless Steel Bolts, Hex Cap Screws, and Studs: ASTM F593.

4) Stainless Steel Nuts: ASTM F594.

c. Fasteners Used in Cast-in-Place Concrete and Concrete Masonry Unit (CMU) Backup Construction

1) Fastener selection and sizing shall be based on applicable ICC-ES Evaluation Reports.

2) Fastener selection and sizing shall be based on testing according to ASTM E488 and ASTM E754 (for CMU construction) with the same backup wall construction used on the Project.

3) Post installed anchors shall be subject to Special Inspections as required by 2014 New York City Building Code.

d. When utilizing a fastener that is not included in any of the above references, available standards or design guides, use a minimum factor of safety of 4 for permissible load engineering of anchoring assemblies.

2. Fastener engineering shall account for any reduction in safe working loads due to their spacing, location in areas of tension, near edges, or proximity to cast in inserts/existing fasteners, or thickness of shims. Fastener engineering shall also consider condition, thickness, and material properties of substrate. Adhesive anchoring systems shall not be used for fasteners supporting loads in tension.

3. Unless shown in the Architectural Drawings, no visible exposed fasteners.

a. Where exposed fasteners are shown and required, use countersunk security heads.

4. All exterior fasteners or fasteners in wet areas shall be of a suitable grade of stainless steel. Use weather coatings for corrosion resistance only with Commissioner's approval.

5. Select and coordinate with the weatherproofing system manufacturer all exterior fasteners required to penetrate a self-sealing weatherproofing system to ensure self-sealing occurs.

6. Where post drilled or site-drilled fasteners are used for connections to the external structural steel frame, do not compromise integrity of the steel corrosion protection system.

7. Highlight the general requirement for torqueing of bolts in the Shop Drawings and clearly state tightening torque values.

8. The Contractor shall provide for Commissioner's review, documentation demonstrating that the use of all installed fasteners have been reviewed and approved by the fastener manufacturer and shall, prior to installation, submit manufacturer's written certification that details proposed by the Contractor are appropriate for their intended use.

B. Brackets and Anchorage

1. Engineer brackets and anchorage to allow for adjustments by 1 in. in small increments in and out, up and down, and side to side in the position of the Work supports relative to other constructions, to accommodate the full variations in the underlying construction and fabrication tolerances.

2. Shimming required to accommodate local variations in construction tolerances only. State the maximum allowable shim dimension in the Shop Drawings.

3. Concrete and masonry inserts shall be hot-dip galvanized cast-iron, malleable-iron, or steel inserts as required by ASTM A123/A123M or ASTM A153/A153M.

C. General

1. Engineer all brackets and fasteners so there is no risk of loosening due to the effects of vibrations, or to the cyclic effects of load, deflections, and thermal movements.

2. Engineer brackets for site-drilled fasteners to allow for the possibility of reinforcement or other obstructions being encountered and the fixing position being moved as a result thereof.

3. Do not cut reinforcement or other obstructions without the approval of the Commissioner.

2.6 FLASHING:

A. Refer to Section 07 62 01 – Facade Sheet Metal Flashings for performance requirements.

B. Provide corrosion-resistant, nonstaining, nonbleeding flashing compatible with adjacent materials constructed with one of the following waterproof materials:

1. Stainless steel, ASTM A240/A240M of thickness recommended by manufacturer.

2. One of the following membrane materials:

a. Silicone sheet.

C. Flashings shall maintain their performance and properties for the expected service life of the Contract Work.

D. Flashings shall have the necessary mechanical properties to withstand installation and specified design loads.

E. Flashings and smoke barriers visible externally or internally shall be aluminum sheet with finish to match Work.

2.7 WEATHER RESISTIVE BARRIER:

A. Refer to Section 07 27 01 – Weather Resistive Barriers for performance requirements.

2.8 GASKETS:

A. General

1. Do not install gaskets/dry weather seals in a pre-stretched condition.

2. Gaskets shall be accessible for inspection/replacement.

3. Select gaskets and seals used to achieve the required weather and airtightness in accordance with ASTM C716 to fully accommodate the range of dimensional tolerances associated with fabrication and installation of the Work. Form with materials capable of maintaining their elastic qualities, dimensions, and resistance to physical and chemical attack sufficient to maintain the full performance during the design life. Gaskets shall be free from contact and migration stain and shall be compatible with all substrate, sealant and finishes with which they are likely to come in contact.

4. Gaskets shall maintain their performance and properties for the expected service life of the product.

5. Gaskets shall be free of mold flash.

B. Extruded rubber gaskets shall comply with ASTM C509.

1. Dense compression gaskets shall be molded or extruded, of profile and hardness required to maintain watertight seal, made from silicone complying with ASTM C1115.

a. Use where soft compression gaskets will be compressed by inserting dense compression gaskets on opposite side of glazing or pressure applied by means of pressure-glazing stops on opposite side of glazing.

2. Soft compression gaskets shall be extruded or molded, closed-cell, integral-skinned silicone gaskets complying with ASTM C509, Type II, black; of profile and hardness required to maintain watertight seal.

2.9 GLAZING:

A. Refer to Building Enclosure System Matrix for glazing types and Section 08 80 00 – Exterior Glazing for performance requirements.

2.10 PANELS:

A. Refer to Building Enclosure System Matrix for Panel types and Section 07 42 14 – Metal Panels for performance requirements.

2.11 SEALANTS:

A. Refer to Section 07 92 01 – Exterior Joint Sealants for performance requirements.

2.12 PERIMETER FIRESAFING AND SMOKE SEALANTS:

A. Refer to Section 07 84 13 – Firestops and Smokeseals for performance requirements.

2.13 SEMI-RIGID INSULATION:

A. Unfaced, Mineral-Wool Board Insulation

1. Manufacturers: Subject to compliance with requirements provide products by one of the following:

a. Rockwool, Inc.

b. Thermafiber, Inc.

c. Johns Manville.

d. Or approved equal.

B. Basis of Design Product: Rockwool, Inc. Cavityrock with the following properties:

1. Complying with ASTM C612; with maximum flame-spread and smoke-developed indexes of fifteen (15) and zero (0), respectively, per ASTM E84.

2. Shall pass ASTM E136 for combustion characteristics.

3. Nominal density of 6 lb per cubic foot, Type II, with a minimum thermal resistivity of 4.2°F x h x sq ft/Btu x in. at 75°F.

4. Recycled Content: Postconsumer recycled content plus one-half of pre-consumer recycled content not less than 10%.

5. Fiber Color: Darkened, where indicated.

C. Insulation Fasteners

1. Engineer fasteners to fully restrain insulation against all design loads.
2. Provide fastener materials suitable for the environmental conditions the insulation will be exposed to.
3. Adhesively attached, spindle-type anchors utilizing plate welded to projecting spindle and capable of holding insulation of specified thickness securely in position indicated with self-locking washer in place.
4. Anchor adhesive shall demonstrate capability to bond insulation anchors securely to substrates indicated without damaging insulation, fasteners, and substrates.

D. Thermal insulation shall be inert, durable, not water soluble, rot and vermin proof, CFC and HCFC free, shall be inorganic and not support mold fungal or bacteria growth and shall provide the specified performance for the service life of the Work. Account for the reduced performance of insulation due to the effects of moisture and aging.

E. Thermal insulation shall be sufficiently robust and cohesive to allow removal and replacement in service without loss of material or performance. It shall not be injurious to human health properly installed, in service, or during removal and replacement.

2.14 OPERABLE UNITS:

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Oldcastle BuildingEnvelope.
2. Wausau Window and Wall Systems.
3. YKK AP Inc.
4. Or approved equal.

B. Products: Subject to compliance with requirements, provide products buy one of the following:

1. Oldcastle BuildingEnvelope Zero Sightline 30P.
2. Wausau Invent.
3. YKK YOW 350 XT.
4. Or approved equal.

2.15 DOORS:

A. Manufacturers: Subject to compliance with requirements provide products by one of the following:

1. Oldcastle BuildingEnvelope.
2. Wausau Window and Wall Systems.
3. YKK AP America Inc.Or approved equal.

B. Products: Subject to compliance with requirements provide products by one of the following:

1. Oldcastle BuildingEnvelope AD-375 Thermal Entrance Door.
2. Wausaw Window and Wall Systems Therml=Block Entrance Door.
3. YKK AP Series 35XT MegaTherm® Entrance. Or approved equal.

C. Outswing Door.

1. Include required framing hardware to mount into glazing pocket of surrounding Work framing.
2. Coordinate door hardware with the Commissioner.
3. Incorporate thermally broken, ADA compliant and integrally gasketed threshold.
4. Incorporate door hardware into Work. Refer to Section 08 71 00 – Door Hardware and Section 08 71 01 Door Hardware Schedule for detailed requirements.

2.16 BIRD DETERRENTS:

A. Provide bird deterrents on all horizontal or near-horizontal surfaces. The Contractor shall provide details and product data of the bird deterrent in accordance with the submittal requirements as well as Section 05 12 00 – Structural Steel and Section 05 50 00 – Miscellaneous Metals.

2.17 ACCESSORY MATERIALS:

A. Bituminous Paint: Cold-applied asphalt-mastic paint complying with SSPC-Paint 12 requirements except containing no asbestos, formulated for 30 mil thickness per coat.

B. Galvanizing Repair Paint: ASTM A780.

C. Shims: Load-bearing, high-density multimonomer plastic, non-leaching.

D. Separating / Isolating Materials

1. The Contractor shall select, provide, and install each material so it is, and will remain, compatible with other materials around it within its range of influence. Contractor shall ensure adequate measures are taken to prevent bimetallic corrosion between dissimilar metals. Where different metallic materials are used, fit separators to eliminate the risk of corrosion.

E. Weep Baffles: PVC-coated reticulated foam, 30 to 40 ppi.

F. Butyl Tape: Preformed butyl-based elastomeric tape with 100% solids content. Nonstaining, with or without spacer rod (as approved by Commissioner), with release paper backing.

G. Aluminum or Foil-Faced Tape: Provide where shown on the Drawings and with various widths as required.

PART III – EXECUTION

3.1 EXECUTION REQUIREMENTS

A. Refer to DDC General Conditions for execution requirements.

3.2 FABRICATION:

A. General

1. Profiles shall be sharp, straight, and free of defects or deformations.

2. Fabricate all formed or extruded shapes prior to finishing.

3. Accurately form joints without lipping or offsets in visible surfaces unless engineered otherwise. Rigidly secure other joints to prevent all but designed movement, unless engineered otherwise.

4. Accurately fitted joints with ends coped or mitered.

B. Cutting

1. Grind, cut, and shape metals using tools which will not contaminate them with particles which could stain or corrode them.

2. Steel Components

a. Minimize use of arc cutting and acetylene gas cutting as much as feasible. If required, Contractor shall submit full welding procedures to demonstrate hardness remains within the required limits.

b. Mild steel cut or shaped by either flame cutting or Plasma cutting shall be to procedures agreed by the Commissioner. Procedures shall demonstrate that the surface hardness is less than 270 Hv 10. Require random inspection of the steel to ensure hardness level is not exceeded. Alternatively, surface dress all cut edges to remove hardened material.

c. All punched holes shall be undersized by 40 mil and be reamed to the finished size.

C. Welding

1. Weld in concealed locations to greatest extent possible to minimize distortion or discoloration of finish. Remove weld spatter and welding oxides from exposed surfaces by descaling or grinding.

2. Weld metals in accordance with the relevant standards using methods to avoid distortion. The type, size and spacing of welds shall be shown on Drawings for Commissioner's review, prior to fabrication.

3. Fully bond welds throughout their length without holes, inclusions, cracks, or porosity so as not to compromise the long-term performance and the welds are strong enough for the engineered requirements.

4. Grind all welds smooth and flush with the adjoining surfaces where visible or impinging on other work.

5. Do not site weld except where approved by the Commissioner.

6. Finish completed welded construction to prevent corrosion. Clean all welds as necessary to ensure the durability of the connections.

7. All radius edges used in changes of section shall be typically two times the maximum wall thickness.

8. All welding procedures and welding procedure specifications shall limit the hardness in the weld, parent metal, or heat-affected zone to less than 270 Hv 10.

D. Pressing and Folding

1. Fold and form aluminum sheets over dies or mandrels with the minimum radii recommended by the Aluminum Association in publications as Aluminum Design Manual. Make trial bends on scrap material of the alloy, temper, and thickness being used to ensure that it is not cracked, torn, unevenly stretched, or separated at grain membranes.

2. Perform pressing and folding of Metal Panels according to manufacturers' recommendations.

E. Sealants and Adhesives

1. Prepare surfaces that will contact Sealants and/or adhesives according to the manufacturer's written instructions to ensure compatibility and adhesion.

2. Preparation includes, but is not limited to, cleaning and priming surfaces.

F. Gaskets

1. Gaskets jointed by bonding with adhesive are not accepted as a substitute for molded frame gaskets. In the event that forming adhesive bonded joints are required, bring to the Commissioner's attention for review before proceeding with work.

2. All gasket frames should be normally manufactured to a small but predetermined oversize tolerance, to ensure that when seated into position, the lineal lengths and corners of the gaskets are in slight compression.

3. Install gaskets in accordance with the manufacturer's recommendations and utilizing the correct tools.

G. Fabrication Tolerances

1. Metal cutting tolerances for framework shall be:

a. ± 1/16 in. on length of vertical members.

b. ± 1/32 in. on length of horizontal members.

c. ± 1/64 in. on the length and width of spandrel panels, back pans, and aluminum sheets.

d. ± 1/32 in. on length of diagonal of spandrel panels, back pans, and aluminum sheets, and not more than ± 1/16 in, difference in the length between the two diagonals.

e. Space individual framing members no more than plus or minus 1/8 in. from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.

3.3 INSTALLATION:

A. Comply with all requirements and product manufacturer's recommended guidelines.

B. Do not install damaged components.

C. Fit joints to produce joints free of burrs and distortion.

D. Rigidly secure all non-moving elements.

E. Install anchors with separators and isolators to prevent metal corrosion and electrolytic deterioration and to prevent impeding movement of moving joints.

F. Metal Protection

1. Where aluminum will contact dissimilar metals, protect against galvanic action by painting contact surfaces with primer or by applying sealant or tape or installing nonconductive spacers as recommended by manufacturer for this purpose.

2. Where aluminum will contact concrete or masonry, protect against corrosion by painting contact surfaces with bituminous paint.

G. Set continuous sill members and flashing in full sealant bed to produce watertight installation.

H. Operable Units and Doors

1. Install operable units level and plumb, securely anchored, and without distortion.

2. Adjust weather-stripping contact and hardware movement to produce proper operation.

3.4 ADJUSTMENTS:

A. Adjust Doors and entrance Door hardware to produce smooth operation and tight fit at contact points and gaskets.

1. Adjust Door operators, controls, and hardware for smooth and safe operation and for weathertight closure; comply with requirements in Section 08 71 00 – Door Hardware and Section 08 71 01 – Door Hardware Schedule.

B. Lubricate operating hardware and other moving parts as recommended by manufacturer.

C. Readjust Door operators and controls after repeated operation of completed installation equivalent to three days' use by normal traffic (100 to 300 cycles). Lubricate hardware, operating equipment, and other moving parts.

D. Occupancy Adjustments: When requested within 12 months of date of Substantial Completion, provide on-site assistance in adjusting system to suit actual occupied conditions. Provide up to two visits to Project during other-than-normal occupancy hours for this purpose.

3.5 INSTALLATION TOLERANCES:

A. Install Work to comply with the following maximum tolerances:

1. Plumb: 1/8 in. in 10 ft; non-cumulative.

2. Level: 1/8 in. in 20 ft; non-cumulative.

3. Alignment: End-to-end or edge-to-edge offset of adjoining consecutive element to 1/16 in.

4. Location and Plane: Limit variation from plane to 1/8 in. in 12 ft; 1/2 in. over total length.

5. Diagonal Measurements: Limit difference between diagonal measurements to 1/8 in.

3.6 FIELD QUALITY CONTROL:

A. Test and inspect representative areas of the Work as installation proceeds to determine compliance of installed assemblies with specified requirements.

B. Testing shall be performed by a qualified Independent Testing and Inspection Agency.

1. The Independent Testing and Inspection Agency shall prepare and submit an inspection and test report.

C. Work is considered defective if it does not pass tests and inspections.

1. There shall be no evidence of water penetration as per the weatherproofing requirements specified.

   a. No increase in the allowable rate of air infiltration or increase in the volume of water leakage, nor any decrease in the specified test pressures will be permitted in the evaluation of field testing. This requirement is more restrictive than AAMA standards.

2. Repair or remove work where test results and inspections indicate that it does not comply with specified requirements.

3. For each failure condition discovered, make remedial and corrective action approved by the Commissioner. All failures shall be considered systemic failures requiring corrective work at all similar conditions and locations. Remedial measures shall maintain standards of quality and durability and are subject to approval by the Commissioner.

4. Additional testing and inspecting shall be at Contractor's expense, and will be performed to determine compliance of replaced or additional work with specified requirements.

D. Water Nozzle Spray Test

1. After completing Work installation and before interior finish installation begins, carry hose testing on 10% of the Work as designated by Commissioner for water penetration according to AAMA 501.2 requirements.

2. Minimum area of test area shall be 120 sq ft.

3. Provide a minimum of two (2) weeks' notice to all parties to allow them to attend all hose testing.

4. Repair or remove and replace Work not meeting requirements or damaged by testing; replace to conform to specified requirements.

   a. For every leak located on the Work, hose test an additional 5% of the tested area.

E. Field Testing Support

1. An Independent Testing Agency shall perform field testing of the Work and prepare test reports. Testing will include those performed to ASTM E1105, ASTM E283, AAMA 501.2, and AAMA 502 standards. The Contractor shall assist the independent Testing and Inspection Agency with testing, including providing safe access, water, power, constructing interior test chambers, etc.

   a. Assume four (4) days of field air and water infiltration testing at multiple locations selected by the Commissioner.

   b. If failures occur, provide additional test assistance as needed to obtain Commissioner's approval at no additional cost.

2. Testing Services: Testing and inspecting of representative areas to determine compliance of installed system with specified requirements shall take place as follows and in successive stages as indicated by the Commissioner. The Commissioner will perform some of this testing during the early stages of Work installation. Complete all related installation work, in areas selected by the Commissioner, as needed to allow air and water testing to be performed during the early stages of the work (including installation of glazing, framing, gaskets, etc.). Do not proceed with the installation of the next area until test results for previously completed areas show compliance with requirements.

   a. Air Infiltration: Areas shall be tested for air leakage of 1.5 times the rate specified under Static Pressure Air Infiltration Article, but not more than 0.09 cfm per square foot of fixed wall area when tested according to ASTM E 783 at a minimum static-air-pressure differential of 6.24 lbf per square foot.

   b. Water Penetration: Areas shall be tested according to ASTM E1105 at minimum uniform static-air-pressure difference (Procedure A) equal to the pressure specified under Static Pressure Water Infiltration Article and shall not evidence water penetration.

   c. Water Spray Test: After the installation of minimum area of 75-ft-by-2-story Work has been completed but before installation of interior finishes has begun, a two-bay area of system designated by Commissioner shall be tested according to AAMA 501.2 and shall not evidence water penetration.

   d. Occasionally test Glazing pockets (and other horizontal cavities that may collect water) by temporarily plugging weep holes and filling with water in accordance with AAMA 511. After minimum of 15 min., inspect for water leakage or drop in water level. Correct deficiencies and retest until successful tests are achieved. Remove weep holes plugs and drain system at conclusion of test. Perform tests at start of the work and periodically throughout the construction process (minimum once every two weeks).

END OF SECTION 08 40 01

Department of Design and Construction

SECTION 08 45 19
Polycarbonate Wall System

PART I - GENERAL

1.1 RELATED DOCUMENTS

A. The following documents apply to all required work for the Project: (1) the Contract Drawings, (2) the Specifications, (3) the General Conditions, (4) the Addendum and (5) the Contract (City of New York Standard Construction Contract).

B. LEED General Requirements:

1. Refer to DDC General Conditions

a. Section 01 33 00 "Submittal Procedures"
b. Section 01 74 19 "Construction Waste Management and Disposal"
c. Section 01 81 13.04 "Sustainable Design Requirements for LEED v4 Buildings"

1.2 SUMMARY

A. Section includes:

1. The engineering, manufacture and installation of an aluminum and polycarbonate insulating translucent system. A complete assembly of extruded cellular UV resistant polycarbonate glazing panels incorporated into a complete aluminum framing system, tested and warranted by the manufacturer.

2. All anchors, brackets, and hardware attachments necessary to complete the specified structural assembly, when included within project scope.

3. Weatherability and water-tightness performance requirements.

4. All flashings and sealants up to adjoining work are also required as part of the system and shall be included, unless specifically noted as being supplied by others.

5. Experienced labor with supervision to complete the entire system installation.

B. Related Sections

1. Structural Steel - Section 05 12 00.

2. Interior Joint Sealants - Section 07 92 00.

3. Exterior Joint Sealants - Section 07 92 01.

4. Signage - Section 10 14 00.

1.3 SUBMITTAL PROCEDURES

A. Refer to DDC General Conditions Section 01 33 00 "Submittal Procedures".

1.4 SUBMITTALS

A. Shop Drawings

1. Shop drawings shall include plans, elevations, sections and details of the system. Flashings, sealants and anchorage details shall be clearly indicated.
2. Note gauges of brake metals, finishes of frames and hardware. Also note dimensions (if known) of the work to be performed by other trades.
3. Label fastening devices as to type and spacing.

B. Product Data: Submit proposed manufacturer's catalog cuts and specifications to clearly illustrate and describe the submitted system.

C. Samples

1. Each aluminum frame section, 6" long.
2. Samples of aluminum illustrating the specified finish.
3. Glazing gaskets, 6" long, each type.
4. Samples of glazing, each minimum 6" x 6", in specified color.

D. Engineering Data

1. Submit Engineering Data drawings to the Commissioner for review. The Contractor must show his proposed system and how the Performance Criteria noted in this section is accommodated on these drawings.
2. These drawings must show all load conditions and design calculations relative to connections, fastening devices and anchorage, as well as size and gauge of members. Calculations and drawings must be prepared by a Professional Structural Engineer licensed in the State of New York and shall be signed and sealed by this Engineer.

1.5 QUALITY ASSURANCE

A. Refer to DDC General Conditions Section 01 40 00 "Quality Requirements".

B. Manufacturer Qualifications: A firm experienced in manufacturing polycarbonate wall systems similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.

C. Erection shall be by an installer experienced in erection of systems of the type specified.

1.6 WARRANTY

A. Provide warranty from window system for 5 years from the date of Substantial Completion.

PART II - PRODUCTS

2.1 POLYCARBONATE WALL SYSTEM

Basis of Design: Subjec to complinace with requirements, provide Series 3440, interlocking translucent polycarbonate wall system by EXTECH/Exterior Technologies, Inc. or comparable product by one fo the following:

1). Wasco
2). Gallina USA
3). Or approved equal

2.2 MATERIALS

A. The aluminum members of the framing system shall conform to the following:

1. The extrusions shall be 6063-T5, 6005-T5 or 6105-T5 alloy and temper. All sections shall be formed true to detail and free from defects impairing appearance, strength, or durability.

2. The rabbet depth at the edges of the framing shall (at an absolute minimum) be based on 1/8" minimum engagement plus 1/8" for cutting tolerance plus .005 x that glazing dimension (in inches) which affects that rabbet. For example, a 100" long glazing will require a minimum of 1/8" + 1/8" + (.005 x 100) = 1.475". Under no circumstances, even in the coldest possible weather, should panel engagement be less than 1/8".

3. Gasketing shall be elastomeric, incorporating a low friction coating on the surfaces that contact the glazing. Gasketing shall be tested for chemical compatibility with the glazing, and test reports evidencing same shall be presented to the Commissioner.

4. Fasteners, where exposed, shall be stainless steel, 300 Series, with stainless backed neoprene washers. Where not exposed, they may be stainless or zinc-plated steel in accordance with ASTM A 165 or A 164.

5. Exposed surfaces of the aluminum-framing members shall be finished as follows:

   a. Clear Anodic Finish: AAMA 611, AA-M12C22A41, Class I, 0.018 mm or thicker.

6. Aluminum and/or galvanized steel flashings and other brake metal components shall be minimum 0.040" thick (if aluminum) or 24 ga. thick (if steel) (thicker where so specified on the drawings). The finish on this metal shall match as closely as possible that which is on the extruded aluminum framing members.

7. Attachment of glazing sheets to the transverse structural elements (i.e. purlins or girts) or to structural members parallel to the translucent panels shall be achieved by means of:

   a. Two-piece sliding clips, consisting of an aluminum base portion and a stainless steel upper portion which constrains the polycarbonate sheets. The base shall be designed so as to hold the polycarbonate panels safely above the substrate as well as above the heads of the fasteners which

attach it to the substrate. In addition, this base will incorporate elastomeric cushions on which the panels can rest and/or move.

OR

b. Three-piece articulated clips, each consisting of an aluminum base portion, an aluminum secondary portion and a sliding stainless steel upper portion. The latter shall hook constrain the polycarbonate sheets. This articulated clip assembly will be hinged to compensate for misaligned substrate members and will also allow for widthwise-incremental movement of the polycarbonate panels. Rotational freedom of the secondary portion allows the clip assembly to be functional even if the assembly was installed in a skewed fashion (up to 5 degrees of misalignment). Further, the base portion will hold the polycarbonate panels safely above the substrate and above the heads of the fasteners which hold the clip assembly. The clip secondary portions will incorporate low friction elastomeric cushions on which the panels can rest and/or move.

B. The polycarbonate glazing panels for the system shall conform to the following:

1. Appearance:

a. The extruded panels shall be uniform in color with an integral extruded multi-cell core. The panel's exterior skins shall be interconnected and spaced apart by supporting continuous ribs, perpendicular to the skins.
b. Panels shall consist of a polycarbonate resin with permanent, co-extruded, ultraviolet protective layers on the exterior sides of the panels. This protective layer shall be co-extruded by the manufacturer during the original extrusion of the panel. Post-applied coating or films of dissimilar materials are unacceptable.
c. The panels shall be formed using resin which contains small glass beads. These beads provide diffusion of the light as it passes through the panels.
d. Panel thickness shall be a minimum 1-9/16".
e. Panel weight shall be nominally 0.71 lbs. per sq. ft.
f. Panel Width and Height: See Drawings.
g. Panels shall be designed and formed with interlocking sides so that multiple panel installlations can be achieved without the need to introduce independent mullion framing members.

2. Translucent Panel System

a. Panel shall be extruded in one single length. Transverse connections are not acceptable.
b. Perimeter framing and mullions are to be dry glazed profiles, using no welding or adhesives.
c. Perimeter framing members, exclusive of cover caps, shall incorporate an integral structural polyurethane thermal break.
d. Concealed fasteners are to be used for all aluminum framing. In system construction, the use of adhesives, plastic welding, or sealants is not allowed.
e. Free thermal movement of the panels shall be allowed to occur without compromising the weathertightness of the completed system.

3. Air Infiltration: Per ASTM D 283 at a test pressure of 6.24 PSF, maximum air infiltration shall be 0.003 CFM/sq. ft. of glazing area.

4. Water Penetration: There shall be no water penetration when tested vertically per ASTM E 331 at test pressure of 20 PSF.

5. System shall require no scheduled re-coating to maintain its weathering or structural performance or for UV protection.

6. Thermal Performance

   a. Insulation Value ("U-Value"): 0.37 BTU/hr. – sq. ft. degree F.
   b. Light Transmission: Varies with color selected.

7. Flammability: The system shall incorporate approved light-transmitting panels, with a CC1 fire rating classification as tested per ASTM D 635 or equivalent.

8. Loading

   a. The panel system shall be capable of meeting the design load for this project based on relevant code requirements and laboratory testing per ASTM E 330 shall evidence this fact.
   b. The interior cells of the cellular polycarbonate sheets shall be blown clean prior to being sealed. The top and bottom of each sheet shall be sealed with an air permeable filter tape.
   c. The open end of each panel shall rest on a continuous metal setting fin which is designed to allow atmospheric air to reach the air permeable tape at the bottoms of the panels.

9. Glazing shall be installed in accordance with panel and system manufacturer's guidelines.

10. Color of Panels: Translucent Ian.

C. Fasteners

1. Bolts, anchors and other fastening devices shall be as required for the strength of the connections and shall be suitable for conditions encountered. Washers shall be of the same metals as fasteners.

2. Fasteners exposed to the weather shall be 300 Series stainless steel and shall utilize stainless steel washers with neoprene seals.

3. Concealed fasteners shall be stainless steel or zinc plated steel as per ASTM A 165.

2.3 WORKMANSHIP

A. Carefully and accurately engineer, fabricate and assemble work with proper provision for thermal contraction and expansion. Work shall conform to profiles and sections noted on the shop drawings. Work shall be assembled with joints in a neat and finished manner.

B. Fasteners: Of a strength and spacing sufficient to meet the testing requirements and to resist the specified load requirements or 2014 New York City Building Code requirements.

C. Protect contact points between unprotected dissimilar metals (except stainless steel) using continuous separators of FRP or PVC tape (or approved equal).

PART III - EXECUTION

3.1 EXECUTION REQUIREMENTS

A. Refer to DDC General Conditions for execution requirements.

3.2 INSTALLATION

A. Install components in strict accordance with manufacturer's instructions and approved shop drawings. Use proper fasteners and hardware for material attachments as specified.

B. Use methods of attachment to structure which include provisions for thermal movement.

END OF SECTION 08 45 19

SECTION 08 49 00
Fire Rated Glass and Framing Systems

PART I - GENERAL

1.1 RELATED DOCUMENTS

A. The following documents apply to all required work for the Project: (1) the Contract Drawings, (2) the Specifications, (3) the General Conditions, (4) the Addendum and (5) the Contract (City of New York Standard Construction Contract).

B. LEED General Requirements:

1. Refer to DDC General Conditions

   a. Section 01 33 00 "Submittal Procedures"
   b. Section 01 81 13.04 "Sustainable Design Requirements for LEED v4 Buildings"

1.2 SUMMARY

A. Section includes fire rated glass and framing systems for interior fire rated glass partitions.

B. Related Sections

1. Miscellaneous Metals - Section 05 50 00,
2. Firestops and Smokeseals - Section 07 84 13.
3. Interior Joint Sealants - Section 07 92 00.
4. Door Hardware - Section 08 71 00.

1.3 REFERENCES

A. American Society for Testing and Materials (ASTM):

1. ASTM E119: Methods for Fire Tests of Building Construction and Materials.
2. ASTM E152: Methods for Fire Tests of Door Assemblies.
3. ASTM E163: Methods for Fire Tests of Window Assemblies.

B. National Fire Protection Association (NFPA):

1. NFPA 80: Fire Doors and Windows.
2. NFPA 251: Fire Tests of Building Construction & Materials
3. NFPA 252: Fire Tests of Door Assemblies
4. NFPA 257: Fire Test of Window Assemblies

C. Underwriters Laboratories, Inc. (UL):

1. UL 9: Fire Tests of Window Assemblies
2. UL 10 B: Fire Tests of Door Assemblies
3. UL 263: Fire Tests of Building Construction and Materials
4. UL 10 C: Positive Pressure Fire Tests of Window & Door Assemblies

D. American National Standards Institute (ANSI):

1. ANSI Z97.1: Standard for Safety Glazing Materials Used in Buildings

E. Consumer Product Safety Commission (CPSC):

1. CPSC 16 CFR 1201: Safety Standard for Architectural Glazing Materials

1.4 SUBMITTAL PROCEDURES

A. Refer to DDC General Conditions Section 01 33 00 "Submittal Procedures".

1.5 SUBMITTALS

A. Product Data: Submit latest edition of manufacturer's product data providing product descriptions, technical data and installation guidelines.

B. Shop Drawings: Include plans, elevations and details of product showing component dimensions; framed opening requirements, dimensions, tolerances, and attachment to structure.

C. Samples: Submit in the form of 12-inch square samples for glass and of 12-inch long samples for framing and sealants. Install sealant samples between two strips of material representative in color of the adjoining framing system.

D. Glazing Schedule: Use same designations indicated on drawings for glazed openings in preparing a schedule listing glass types and thicknesses for each size opening and location.

E. Provide signed and sealed calculations and shop drawings by a Professional Engineer licensed in the State of New York demonstrating that partitions comply with lateral load and deflection criteria.

1.6 QUALITY ASSURANCE

A. Refer to DDC General Conditions Section 01 40 00 "Quality Requirements".

B. The contractor or subcontractor performing the work of this Section must, within the last three (3) consecutive years, have successfully completed in a timely fashion at least three (3) projects similar in scope, size and type to the required work. In addition, the contractor or subcontractor must be licensed or approved by the manufacturer.

C. Fire-Rated Assemblies: Assemblies complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to the Commissioner, for fire ratings indicated, based on testing according to NFPA 252 and 257.

D. Certification - Fire-Rated Assemblies: Signed by manufacturers of glass and glazing products certifying that products furnished comply with requirements.

1. An approved independent testing laboratory equal to UL shall conduct fire test.

E. Listings and Labels - Fire Rated Assemblies: Under current follow-up service by an approved independent agency maintaining a current listing or certification. Label assemblies in accordance with limits of manufacturer's listing.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store and handle under provisions specified by manufacturer.

B. Deliver materials to specified destination in manufacturer or distributor's packaging undamaged, complete with installation guidelines.

C. Store off ground, under cover, protected from weather and construction activities.

1.8 WARRANTY

A. Provide manufacturer's limited three year warranty.

PART II - PRODUCTS

2.1 MANUFACTURERS

Basis of Design: Subject to compliance with requirements, provide Pilkington (NSG Group) Pyrostop 60-101, 7/8" thick with TGP Fireframes Aluminum Series, and Fireframes Designer Series fire rated steel door or comparable product by one of the following:

1). Safti First (O'Keefe's Inc.) Superlite II-XL 60 with GPX Architectural Series Framing and door
2). Vetrotech Saint-Gobain SGC Contraflam 60-N2 with Aluflam Curtain Wall CW-EI120 and door
3). Or approved equal

2.2 PERFORMANCE REQUIREMENTS

A. System Description: Steel fire-rated glazed wall system, dual aluminum cover cap format.

B. Duration of Fire Rating - System: Capable of providing a fire rating for 60 minutes unless noted otherwise.

C. Provide enclosure systems for elevators designed and tested by manufacturer to withstand a lateral loading (air pressure) of 10 lbs. per sq. ft. for the maximum wall height required, and with deflection limited to L/240 of partition height.

2.3 MATERIALS - GLASS

A. Fire Rated Glazing: Composed of multiple sheets of high visible light transmission glass laminated with an intumescent interlayer.

B. Impact Safety Resistance: ANSI Z97.1 and CPSC 16CFR1201 (Cat. I and II).

C. Fire Rating: 60 minutes.

D. Glazing Type: Manufacturer's standard IGU for interior glazing application with fire rating indicated.

E. Thickness: 7/8" unless otherwise noted.

F. Glazing Accessories: Manufacturer's standard compression gaskets, spacers, setting blocks and other accessories necessary for a complete installation.

2.4 MATERIALS - ALUMINUM FRAMING

A. Aluminum Framing System: Manufacturer's 60-minute interior framing system specified.

1. Steel Frame: Steel framing members made of two halves, nom. 1.9" wide with a nom. minimum depth of 1.38" with lengths cut according to glazing size.

2. Aluminum Trim: Supplied with the steel framing members. Nom. 2" wide with a nom. depth of 1.54" with lengths cut according to glazing size.

3. Stainless Steel Standoffs: Supplied with the steel framing members. Nom 5/16" diameter with a nom. minimum depth of 1-1/8" with depth adjusted to match glazing panel thickness.

4. Stainless Steel Moment and Connecting Braces: Supplied with the steel framing members. Nom. 3/8" thick with a nom. minimum depth of 1-1/8" with depth adjusted to match glazing panel thickness.

5. Framing Member Fasteners: Supplied with the steel framing members. Screws are M6 x16mm Button Head Socket Cap Screws for frame assembly and #6 x 1" Pan Head Sheet Metal Screws for door installation.

6. Glazing Gasket: Supplied with the steel framing members. Nom. ¾" by 3/16" black applied to the steel framing members to cushion and seal the glazing material when installed.

B. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated.

1. Extruded Bars, Rods, Shapes, and Tubes: ASTM B 221 (ASTM B 221M).

C. Steel Reinforcement: With manufacturer's standard corrosion-resistant primer complying with SSPC-PS Guide No. 12.00 applied immediately after surface preparation and pretreatment. Select surface preparation methods according to recommendations in SSPC-SP COM and prepare surfaces according to applicable SSPC standard.

1. Structural Shapes, Plates, and Bars: ASTM A 36/A 36M.

2. Cold-Rolled Sheet and Strip: ASTM A 611.

3. Hot-Rolled Sheet and Strip: ASTM A 570/A 570M.

D. Fasteners and Accessories: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding fasteners and accessories compatible with adjacent materials.

1. Where fasteners are subject to loosening or turn out from thermal and structural movements, wind loads, or vibration, use self-locking devices.

2. Reinforce members as required to receive fastener threads.

2.5 MATERIALS - STEEL FRAMES AND DOORS

A. Steel Framing System for 60 minute rated doors.

1. Frame: Steel profiled formed tubing.

2. Fasteners: As recommended by manufacturer.

3. Glazing Accessories: As recommended by manufacturer

4. Glazing Gaskets, Compounds and Tapes: As recommended by manufacturer

B. Coordinate hardware with cylinder specified in Section 08 71 00 Door Hardware.

2.6 ACCESSORIES

A. Fasteners: Use fasteners fabricated from Type 304 or Type 316 stainless steel.

B. Glazing Gaskets for interior applications: ASTM C 864 (extruded EPDM rubber that provides for silicone adhesion) or ASTM C1115 Standard Specification for Dense Elastomeric Silicone Rubber Gaskets and Accessories (extruded silicone).

C. Intumescent Tape: As supplied by frame manufacturer.

D. Setting Blocks: ¼" Calcium silicate.

E. Perimeter Anchors: Steel.

F. Flashings: As recommended by manufacturer; same material and finish as cover caps.

G. Silicone Sealant: One-Part Low Modulus, neutral cure High Movement-Capable Sealant: Type S; Grade NS; Class 25 with additional movement capability of 100 percent in extension and 50 percent in compression (total 150 percent); Use (Exposure) NT; Uses (Substrates) M, G, A, and O as applicable. (Use-O joint substrates include: Metal factory-coated with a high-performance coating; galvanized steel; ceramic tile.)

1. Manufacturers: Subject to compliance with requirements, provide products by one fo the following:
   a. Dow Corning 790, 795 - Dow Corning Corp.
   b. Momentive
   c. Tremco
   d. Or approved equal

H. Intumescent Caulk: Single component, latex-based, intumescent caulk designed to stop passage of fire, smoke, and fumes through fire-rated separations; permanently flexible after cure; will not support mold growth; flame spread/smoke developed 10/10.

2.7 SLAG-WOOL-FIBER/ROCK-WOOL-FIBER INSULATION

A. Manufacturers: Subject to compliance with requirements, provide products by one fo the following:
   1. Fibrex Insulations Inc
   2. Owens Corning
   3. Thermafiber
   4. Rockwool
   5. Or approved equal

B. Unfaced, Slag-Wool-Fiber/Rock-Wool-Fiber Board Insulation: ASTM C 612, maximum flame-spread and smoke-developed indexes of 15 and 0, respectively; passing ASTM E 136 for combustion characteristics; and of the following nominal density and thermal resistivity:

   1. Nominal density of 4 lb/cu. ft. (64 kg/cu. m), Types IA and IB, thermal resistivity of 4 deg F x h x sq. ft./Btu x in. at 75 deg F (27.7 K x m/W at 24 deg C).

   2. Fiber Color: Regular color, unless otherwise indicated.

2.8 FABRICATION

A. Obtain reviewed shop drawings prior to fabrication.

B. Fabrication Dimensions: Fabricate fire-rated assembly to field dimensions.

C. Field glaze door and frame assemblies.

2.9 FINISHES

A. Finish after fabrication.

B. Interior Steel and Aluminum Finishes:

   1. Powder-Coat Finish: Polyester Super Durable powder coating which meets AAMA 2604 for chalking and fading. Apply manufacturer's standard powder coating finish system applied to factory-assembled frames before shipping, complying with manufacturer's recommendations for surface preparation including pretreatment, application, and minimum dry film thickness.

   2. Color and Gloss: See Finish Schedule.

PART III - EXECUTION

3.1 EXECUTION REQUIREMENTS

A. Refer to DDC General Conditions for execution requirements.

3.2 INSTALLATION

A. Install systems by a specialty subcontractor with appropriate experience qualifications; and in strict accordance with the approved shop drawings. Employ experienced mechanics familiar with this type of specialized work.

B. Install fire safing/firestopping at edges of system.

C. Install glazing in strict accordance with respective glazing material manufacturer's specifications. Field cutting or tampering is not permissible.

3.3 PROTECTION AND CLEANING

A. Protect glass from damage immediately after installation by attaching crossed streamers to framing held away from glass. Do not apply markers to glass surface. Remove nonpermanent labels, and clean surfaces.

B. Protect glass from contact with contaminating substances resulting from construction operations, including weld splatter. If, despite such protection, contaminating substances do come into contact with glass, remove them immediately as recommended by glass manufacturer.

C. Remove and replace glass that is broken, chipped, cracked, abraded, or damaged in any way, including natural causes, accidents, and vandalism, during construction period.

D. Wash glass on both exposed surfaces in each area of Project not more than four days before date scheduled for inspections that establish date of Substantial Completion. Wash glass as recommended by glass manufacturer.

END OF SECTION 08 49 00

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SECTION 08 63 01
Aluminum-Framed Skylight System

PART I – GENERAL

1.1 RELATED DOCUMENTS:

A. The following documents apply to all required work for the Project: (1) the Contract Drawings, (2) the Specifications, (3) the General Conditions, (4) the addendum, (5) the Contract (City of New York Standard Construction Contract).

B. LEED General Requirements

1. Refer to DDC General Conditions.

a. Section 01 33 00 – Submittal Procedures.

b. Section 01 81 13.04 – Sustainable Requirements for LEED v4 Buildings.

1.2 SUMMARY:

A. Refer to Building Enclosure System Matrix for a description of the systems included in this Section as well as the requirements listed there.

B. For all Work described, supply and install the following components and their subcomponents of the work required to provide a complete system, including but not limited to the following:

1. Glass and glazing.
2. Framing systems (as applicable) which may include:

a. Extruded aluminum framing with steel stiffeners.

b. Integral closures and trim.

3. Perimeter insulation.
4. Sealants and gaskets.
5. Fixings and fastenings.
6. Flashings.
7. Finishes, coatings, and surface treatments.
8. Anchors and inserts used to attach to building structure.

a. Supply anchors and/or inserts to be cast or fabricated into/onto the building structure by others.

9. Samples, and testing.
10. Field testing.

C. This Section requires Engineering Services.

D. The work in this Section incorporates the work of the following Sections. Requirements specified in this Section are in addition to those in the following Sections:

1. Section 07 92 01 – Exterior Joint Sealants.

2. Section 08 80 00 – Exterior Glazing.

E. The following Sections describe systems that are adjacent to that of this Section, and will require coordinated interfaces:

1. Section 07 20 00 – Thermoplastic Membrane Roofing.

F. Reference Documents

1. Building Enclosure System Matrix: Refer to Drawing EN1-003.

2. Exterior Glass Type Matrix: Refer to Drawing EN1-003.

1.3 DEFINITIONS:

A. The work described in this Section is referred to as the "Work."

1.4 REFERENCE STANDARDS AND REGULATIONS:

A. Refer to DDC General Conditions

B. The Contractor's engineering, materials, and workmanship shall comply 2014 New York City Building Code and 2016 New York City Energy Conservation Code. Where their recommendations or requirements are to a lower standard than required by this Contract Document, the Contract Documents shall take precedence.

C. Comply with the applicable provisions and recommendations of the standards listed below. Where standards conflict with each other or conflict with the provisions of these Specifications, the more stringent shall apply. Unless otherwise noted, the latest editions of the standards shall apply:

1. American Architectural Manufacturers Association (AAMA)

a. AAMA CW-DG-1 – Aluminum Curtain Wall Design Guide Manual.

b. AAMA CW-10 – Care and Handling of Architectural Aluminum from Shop to Site.

c. AAMA MCW-1 – Metal Curtain Wall Manual.

d. AAMA TIA-A7 – Sloped Glazing Guidelines.

e. AAMA TIR-A9 with amendments – Design Guide for Metal Cladding Fasteners.

f. AAMA 501.1 – Standard Test Method for Water Penetration of Windows, Curtain Walls and Doors Using Dynamic Pressure.

g. AAMA 501.2 – Quality Assurance and Diagnostic Water Leakage Field Check of Installed Storefronts, Curtain Walls, and Sloped Glazing Systems.

h. AAMA 501.5 – Test Method for Thermal Cycling of Exterior Walls.

i. AAMA 501.6 – Recommended Dynamic Test Method for Determining Seismic Drift Causing Glass Fallout from a Wall System.

j. AAMA 503 – Voluntary Specification for Field Testing of Newly Installed Storefronts, Curtain Walls, and Sloped Glazing Systems.

k. AAMA 611 – Voluntary Specification for Anodized Architectural Aluminum.

l. AAMA 2605 – Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels.

2. Aluminum Association (AA)

a. AA Aluminum Standards and Data.

b. AA-ADM1 – The Aluminum Design Manual.

3. American Institute of Steel Construction (AISC)

a. AISC Steel Construction Manual.

4. American Society of Civil Engineers (ASCE)

a. ASCE 7 – Minimum Design Loads for Buildings and Other Structures.

5. American National Standards Institute (ANSI)

a. ANSI Z97.1 – Safety Glazing Materials Used in Buildings – Safety Performance Specifications and Methods of Test.

6. American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE)

a. ASHRAE 90.1 – Energy Standards for Buildings Except Low-Rise Residential Buildings.

b. ASHRAE Fundamentals Handbook.

7. ASTM International (ASTM)

a. ASTM A36/A36M – Standard Specification for Carbon Structural Steel.

b. ASTM A108 – Standard Specification for Steel Bar, Carbon and Alloy, Cold-Finished.

c. ASTM A123/A123M – Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.

d. ASTM A153/A153M – Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.

e. ASTM A240/A240M – Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications.

f. ASTM A276 – Standard Specification for Stainless Steel Bars and Shapes.

g. ASTM A307 – Standard Specification for Carbon Steel Bolts and Studs, and Threaded Rod 60 000 PSI Tensile Strength.

h. ASTM A325 – Standard Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength.

i. ASTM A370 – Standard Test Methods and Definitions for Mechanical Testing of Steel Products.

j. ASTM A380 – Standard Practice for Cleaning, Descaling, and Passivation of Stainless Steel Parts, Equipment, and Systems.

k. ASTM A572/A572M – Standard Specification for High-Strength Low-Alloy Columbium-Vanadium Structural Steel.

l. ASTM A582 – Specification for Free-Machining Stainless and Heat-Resisting Steel Bars.

m. ASTM A653/A653M – Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

n. ASTM A780/A780M – Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings.

o. ASTM A923 – Standard Test Methods for Detecting Detrimental Intermetallic Phase in Duplex Austenitic/Ferritic Stainless Steels.

p. ASTM A967 – Standard Specification for Chemical Passivation Treatments for Stainless Steel Parts.

q. ASTM A1008/A1008M – Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Solution Hardened, and Bake Hardenable.

r. ASTM A1011/A1011M – Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength.

s. ASTM B209 – Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.

t. ASTM B221 – Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.

u. ASTM B308/B308M – Standard Specification for Aluminum-Alloy 6061-T6 Standard Structural Profiles.

v. ASTM B429/B429M – Standard Specification for Aluminum-Alloy Extruded Structural Pipe and Tube.

w. ASTM B449 – Standard Specification for Chromates on Aluminum.

x. ASTM B912 – Standard Specification for Passivation of Stainless Steels Using Electropolishing.

y. ASTM C509 – Standard Specification for Elastomeric Cellular Preformed Gasket and Sealing Material.

z. ASTM C612 – Standard Specification for Mineral Fiber Block and Board Thermal Insulation.

aa. ASTM C864 – Standard Specification for Dense Elastomeric Compression Seal Gaskets, Setting Blocks, and Spacers.

bb. ASTM C1087 – Standard Test Method for Determining Compatibility of Liquid-Applied Sealants with Accessories Used in Structural Glazing Systems.

cc. ASTM C1115 – Standard Specification for Dense Elastomeric Silicone Rubber Gaskets and Accessories.

dd. ASTM C1193 – Standard Guide for Use of Joint Sealants.

ee. ASTM C1401, Rev. A – Standard Guide for Structural Sealant Glazing.

ff. ASTM D2244 – Standard Practice for Calculation of Color Tolerances and Color Differences from Instrumentally Measured Color Coordinates.

gg. ASTM D3363 – Standard Test Method for Film Hardness by Pencil Test.

hh. ASTM D4214 – Standard Test Methods for Evaluating the Degree of Chalking of Exterior Paint Films.

ii. ASTM D6100 – Standard Specification for Extruded, Compression Molded and Injection Molded Polyoxymethylene Shapes (POM).

jj. ASTM E84 – Standard Test Method for Surface Burning Characteristics of Building Materials.

kk. ASTM E136 – Standard Test Method for Behavior of Materials in a Vertical Tube Furnace at 750°C.

ll. ASTM E283 – Standard Test Method for Determining Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen.

mm. ASTM E330 – Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference.

nn. ASTM E331 – Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference.

oo. ASTM E413 – Classification for Rating Sound Insulation.

pp. ASTM E488 – Standard Test Methods for Strength of Anchors in Concrete Elements.

qq. ASTM E754 – Standard Test Method for Pullout Resistance of Ties and Anchors Embedded in Masonry Mortar Joints.

rr. ASTM E1332 – Standard Classification for Rating Outdoor-Indoor Sound Attenuation.

ss. ASTM F593 – Standard Specification for Stainless Steel Bolts, Hex Cap Screws, and Studs.

tt. ASTM F594 – Standard Specification for Stainless Steel Nuts.

uu. ASTM F3125 – Standard Specification for High Strength Structural Bolts, Steel and Alloy Steel, Heat Treated, 120 ksi (830 MPa) and 150ksi (1040 MPa) Minimum Tensile Strength, Inch and Metric Dimensions.

8. American Welding Society (AWS)

   a. AWS A5.10 – Specification for Bare Aluminum and Aluminum-Alloy Welding Electrodes and Rods.

   b. AWS D1.1 – Structural Welding Code – Steel.

   c. AWS D1.2 – Structural Welding Code – Aluminum.

   d. AWS D1.3 – Structural Welding Code – Sheet Steel.

   e. AWS D1.6 – Structural Welding Code – Stainless Steel.

9. Code of Federal Regulations (CFR)

   a. 16 CFR Part 12 – Safety Standard for Architectural Glazing Materials.

10. Glass Association of North America (GANA)

    a. GANA Glazing Manual.

11. International Organization for Standards (ISO)

    a. ISO 2815 – Paints and Varnishes – Buchholz Indentation Test.

    b. ISO 3231 – Paints and Varnishes – Determination of Resistance to Humid Atmospheres Containing Sulfur Dioxide.

12. National Association of Architectural Metal Manufacturers / National Ornamental & Miscellaneous Metals Association (NAAMM/NOMMA)

    a. NAAMM/NOMMA 500-06 – Metal Finishes Manual for Architectural and Metal Products.

13. National Fenestration Rating Council (NFRC)

    a. NFRC 100 – Procedure for Determining Fenestration Product U-Factors.

    b. NFRC 200 – Procedure for Determining Fenestration Product Solar Heat Gain Coefficient and Visible Transmittance at Normal Incidence.

c. NFRC 400 – Procedure for Determining Product Air Leakage.

14. National Fire Protection Association (NFPA)

a. NFPA 285 – Standard Fire Test Method for Evaluation of Fire Propagation Characteristics of Exterior Non-Load-Bearing Wall Assemblies Containing Combustible Components.

b. NFPA 268 – Standard Test Method for Determining Ignitibility of Exterior Wall Assemblies Using a Radiant Heat Energy Source.

15. Society for Protective Coatings (SSPC)

a. SSPC-Paint 42 – Epoxy Polyamide/Polyamidoamine Primer, Performance-Based.

b. SSPC-PS Guide 12 – Guide to Zinc-Rich Systems.

c. SSPC-PS 28.01 – Two-Coat Zinc-Rich Polyurethane Primer / Aliphatic Polyurea Topcoat System, Performance-Based.

d. SSPC-PS 28.02 – Three-Coat Moisture-Cured Polyurethane Coating System, Performance-Based.

16. Safety Glazing Certification Council (SGCC).

1.5 PERFORMANCE REQUIREMENTS:

A. General Prescriptive Requirements

1. For all elements outside of the vapor barrier plane, use materials suitable for external conditions that will not deteriorate as a result of weathering:

a. Elements shall resist the deleterious effects of water, cleaning agents, temperature variations expected from the specified temperature ranges, gaseous pollutants (including ozone), weak acids deriving from gaseous pollutants dissolved in water, and ultraviolet (UV) radiation exposure during installation and in service.

b. Include separators to prevent bimetallic corrosion.

c. Use suitable grade of stainless steel for all fasteners outside or through the vapor barrier.

1) Seal all fasteners that penetrate through air or vapor barrier with material chemically compatible with the fastener and adjacent materials.

d. Use suitable grade of stainless steel or aluminum for all brackets outside the vapor barrier.

e. Do not use different metals for significant structural connections that occur outboard of the vapor barrier plane unless:

1) The connection can incorporate dielectric separators.

2) The connection can be fully inspected after installation is complete using the Project's maintenance access system.

2. Use materials in the Work chemically compatible with adjacent materials.

   a. Where flexible or sheet vapor control materials are connected together or to other systems, lap and continuously seal with chemically compatible materials and mechanically restrain.

3. Where insulation must be locally reduced in thickness, provide high-performance insulation to match the overall performance of the surrounding insulation.

4. Site-applied Sealant is not acceptable as part of the primary Waterproofing System unless shown on the Architectural Drawings or noted within this Section.

5. Engineer the air / vapor barrier system to resist the maximum design wind load.

6. Do not use Glazing to provide lateral support to framing members.

7. Provide laminated Glass where indicated and under the following conditions:

   a. Horizontal Glazing.

   b. Sloped Glazing greater than 15° from vertical.

8. All external areas of the Work shall be accessible for maintenance and repair.

   a. Adjust loads imposed on the Work as necessary for the type and orientation of maintenance equipment anticipated. The Work shall sustain safely, and without damage, access and specified maintenance loads.

   b. All gaskets, where possible, shall be accessible for inspection / replacement.

B. General Performance

1. Comply with performance requirements specified herein, and as validated by pre-construction mockup testing as described in Section 01 43 39 – Facade Mockup Testing and Samples.

2. Work shall:

   a. Withstand and accommodate the stresses and movements induced by the specified cambers, estimated deflections, relative deflections, and the long-term movements associated with settlement of the foundations, or any other movements of the structure, changes in temperature, moisture content, and chemical changes.

   b. Include suitable allowances for the specified construction tolerances.

   c. Withstand the specified deleterious and degrading effects of radiation from the sun, weathering, atmospheric pollution, vermin, fungi, and other growths for the required service life without maintenance in excess of routine cleaning and minor repairs.

   d. Have resistance to combustion and fire spread appropriate to each part.

   e. Prevent casual and unlawful entry into the building.

f. Cleaning and maintenance of the Work shall be carried out easily, without interfering the function of the building.

g. Panels, Glazing beads, structural silicone assemblies, and decorative capping pieces shall remain securely held and gaskets shall not be displaced.

3. Failure includes the inability of the Work to meet the performance requirements set forth in this Section in addition to the following:

a. Noise or vibration created by wind, and thermal and structural movements.

b. Secondary Glass damage and/or damage due to falling components of the Work.

c. Staining of adjacent components or wetting of interior building components.

d. Loosening or weakening of fasteners, attachments, and other components.

C. Detailed Engineering Principles

1. The Work adopts a fully framed and mechanically pressure capped and structurally glazed standard aluminum-framed skylight system.

2. This system shall be:

a. Engineered as dry glazed and factory installed onto an off the shelf skylight system.

1) Mechanically restrained glazing and panels will have pressure cap separated from the face of the glazing by gaskets. Mechanically attach decorative pressure cap covers to pressure caps.

b. Pressure equalized to the back of the glazing pocket.

c. Incorporate a secondary drainage system behind the weathering seals that drains to the outside via a baffled weep path. This system shall:

1) Allow complete drainage of water from rebates to outside.

2) Prevent standing water on or around the edge of insulated glazed units, panes, and Panels.

3) Allow ventilation of the edges of the glazed units.

4) Framing members shall drain water from one member to another without the reliance on sealant joints to maintain watertightness. Framing members shall be notched and lapped to allow for the complete drainage of water to the exterior.

5) Framing members shall have condensation gutters as a portion of the extrusion. Condensation gutters shall drain water from one member to another without reliance on sealant joints to maintain watertightness. Framing members shall be notched and lapped to allow for the complete drainage of water to the exterior.

d. Locate weep holes to positively drain condensation to exterior of the skylight as required to meet performance requirements documented herein.

e. Incorporate a continuous internal air seal and vapor barrier that shall also act as second line of defense against water ingress.

1) All interfaces with adjacent systems shall accommodate the integration of the transitional waterproofing, air and vapor barrier into the Glazing pocket of the framing system. This integration shall provide for a continuous air and vapor system from the Glazing system to that of adjacent systems.

f. Provide the following when all tolerances are accommodated and the most onerous combination of movements occur (including wind sway):

1) Sufficient edge cover on all Glazed units and Panels to maintain weathering and structural performance around their perimeter.

2) Clearance to edges of all Glass panes or Panels of at least 1/8 in. everywhere around their perimeter.

g. Incorporate thermal isolation devices / thermal breaks wherever possible to minimize thermal bridging.

h. Capable of being re-glazed from outside of the building.

i. Sealed with gaskets and sealant at joints between horizontal and vertical framing members. Incorporate an interconnected condensation gutter system that drains to the outside via a baffled weep path.

j. Provide continuous sill pan with closure flashing with fully soldered or welded joints and corners.

D. Structural Performance

1. The Work shall transmit the design loads as specified below to the building structure via the points of attachment as engineered and built, with an adequate margin of safety appropriate to each material and product as required by 2014 New York City Building Code and the listed Reference Standards.

2. As required by 2014 New York City Building Code, the various load cases and combinations of load cases acting on structural elements shall be considered.

a. No permanent deformation or damage to any components of the Work, adjacent elements, or supporting structure shall be accepted under any of the above load cases and combinations of load cases, excluding blast and impact loads.

b. Where steel stiffeners are used, they shall be engineered for deflection control only. Aluminum framing shall be engineered for the full strength requirements of the system.

c. Consider buckling and overall structural system stability in the engineering of all elements. Engineer framing members and systems not to buckle under the design load cases and their combinations.

d. Consider wind reinforced vibrations in the engineering of the Work. The Work shall not resonate at or under the design load conditions.

e. Consider the effects of ice accumulation, including the impact on gravity and wind loads, in the engineering of the Work. Derive load combinations and methodology of developing Atmospheric Ice Loads from the latest edition of ASCE-7.

3. Coordinate all loads imposed on the building structure with the Commissioner.

4. Coordinate and verify access and maintenance loads with the maintenance equipment manufacturer and the Commissioner. Loads shall not be less than 2014 New York City Building Code or the following, whichever is greater and shall be applied to any external or internal surface of the Work which is subject to access for maintenance purposes:

a. A vertical uniformly distributed load of 12.5 lbf per square foot, and a concentrated load of 250 lbf acting on a 6 in. diameter contact area applied to any gutters, copings, or flat and near-flat surfaces with horizontal projections greater than 6 in.

b. A 115 lbf load applied horizontally through a 6 in. diameter contact area on any vertical or near-vertical building enclosure surface required to support a ladder.

c. 600 lbf in any direction at building maintenance equipment restraint points.

d. Where maintenance and safety ropes will be draped over elements of the Work, engineer those elements to support, without damage, a point load of 675 lbf or the anchorage load limits provided, applied over the length of contact of the cladding.

E. Movement Performance

1. The Work shall accommodate movements developed by the building structure without any reduction in the performance below the minimum levels required herein. This includes but is not limited to:

a. Movements due to design gravity and live loads.

b. Movements under repeated cycles of the design wind loads.

c. Movements due to seismic loads.

d. Movements due to snow loads.

e. Changes in dimension and shape arising from specified building movements, including settlement, shrinkage, elastic shortening, floor beam deflections, creep, wind sway, twisting and racking, and thermal and moisture movement. These include, but are not limited to, movements due to any joint in the supporting structure or building frame.

2. Coordinate all building movement assumptions with the Commissioner and as per the Structural Drawings.

F. Deflection Performance

1. Provide Work that accommodates the dimensional construction tolerances of building structure and other adjacent constructions.

2. Under design loads and their combinations, deflections of elements shall be less than either the requirements of 2014 New York City Building Code or as follows, whichever is lesser:

   a. Normal to the face of the Work plane:

      1) Elements Supporting Insulated Glazing: Less than L/175 but no greater than 1/8 in. whereby L is the length of the supported edge of the glazing.

      2) Elements Supporting Plaster, Masonry, or Brittle Items: Less than span/500.

      3) Non-Glass Spandrel Elements: Span/175.

      4) For spans 20 ft or greater, the maximum allowable deflection shall not exceed L/240 but no greater than 1/8 in.

      5) Deflections shall be limited to not allow the ponding of water.

   b. Parallel to the face of the wall plane, limited to the lesser amount of either:

      1) That which reduces glazing bite to less than 75% of the design dimension.

      2) That which reduces edge clearance between framing members and glazing or other fixed components to less than 25% of the design dimension or 1/8 in., whichever is greater.

   c. Engineer cantilevered elements to deflect less than 2L/175, where L represents the length of the cantilevered element.

3. The Work shall accommodate thermal deflections and movements resulting from the following maximum change (range) in ambient and surface temperatures. Changes in dimension resulting from changes in temperature in any of its parts, its supporting framework, and brackets shall not result in any reduction in the specified performance.

4. Base engineering calculation on surface temperatures of materials due to both solar heat gain and night-time-sky heat loss. As per AAMA 501.5, all system components shall noiselessly withstand thermal movements and shall not buckle, distort, crack, cause failure of glass and/or joint seals, or develop undue stresses on the finished surfaces, materials, fixing assemblies, or building structure.

   a. Engineer Work to meet these requirements under the following conditions:

      1) Total Temperature Range: 120°F, ambient; 180°F, material surfaces.

      2) Test Interior Ambient Air Temperature: 75°F.

5. The Work shall accommodate deflections and/or movements resulting from moisture without any reduction in the specified performance. This includes, but is not limited to:

   a. Changes in moisture content of Work components, including those due to wetting from rain.

   b. Expansion of absorbed or retained moisture due to freezing.

6. The Contractor shall avoid in its engineering and detailing introducing locked-in stresses that may be detrimental to the performance of the Work during the service life.

   a. Stresses include, but are not limited to, those that can develop in an individual Panel if the various fasteners and connections securing it in position are so rigid that they do not allow for thermal or other movement in that Panel.

7. Applicable Testing Requirements

   a. Uniform Load Structural Deflection Performance

      1) The Work shall demonstrate compliance with the deflection criteria listed in this Section when tested according to ASTM E330.

   b. Uniform Ultimate Load Structural Deflection Performance

      1) The Work shall not show evidence of material failures, structural distress, or permanent deformation exceeding 0.2% of span when tested according to ASTM E330 at 150% of the peak design load (positive or negative).

G. Weatherproofing Performance

1. The Work, including all joints between it and other elements of Work, shall prevent leakage of water into the interior of the building from the weathering line of the assembly, under the action of wind pressure, kinetic energy, gravity, surface tension, or capillary action. It shall also prevent water entering into those parts of the Work that would be adversely affected by the presence of water.

   a. All joints within the Work shall maintain their watertightness under the loads and movements specified herein.

   b. The weathering principles incorporated within the Work and interfacing with adjacent elements of Work shall be compatible with the weathering principles adopted by the adjacent elements.

   c. Detailing and waterproofing must ensure that water from ponding or reservoirs is directed away from the Work such that water will not build up a pressure head or impose forces onto the building enclosure seals and components.

   d. Detailing must ensure that water collected within Work elements is positively drained to the outside of the Work.

      1) The drainage of water along edge seals of insulated glazed units is not permitted unless written confirmation is provided by the unit manufacturer stating that the design life, required service life, and warranty of the unit is unaffected.

2. Incorporate elements and details in the Work to provide a continuous vapor barrier system.

   a. Engineer elements to the exterior of the vapor barrier plane so they are suitable for exterior conditions and experience weathering without any loss in performance as specified.

      1) No element of the Work shall be encapsulated between two vapor barrier planes.

b. Vapor control elements shall maintain their performance and properties for the expected service life of the system.

c. Where vapor control elements will be exposed to the interior conditions during construction, select suitable materials to ensure elements are not easily damaged during the installation of the Work or adjacent constructions.

1) Easily damaged materials include, but are not limited to, foil facing attached to other products, including insulation.

3. Applicable Testing Requirements

a. Static Pressure Water Infiltration

1) Work shall demonstrate compliance with the weatherproofing performance criteria when tested according to ASTM E331 at a minimum static air pressure differential of 20% of the peak positive wind load design pressure, but not less than 15 psf.

2) No evidence of water infiltration inboard of the weathering line plane when tested.

b. Dynamic Pressure Water Infiltration

1) The Work shall demonstrate compliance with the weatherproofing performance criteria when tested according to AAMA 501.1 at a minimum static air pressure differential of 20% of the peak positive wind-load design pressure, but not less than 15 psf.

2) No evidence of water infiltration inboard of the weathering line plane when tested.

c. Primary and Condensation Gutter Continuity Testing

1) Work shall demonstrate that the condensation gutters provide a continuous path for water to drain from any high point of the system to the exterior without any evidence of water inboard of the weathering line of the system with the exception of each respective gutter.

H. Energy Performance

1. Work and components shall have certified energy performance ratings as determined by the standards referenced by 2014 New York City Building Code and 2016 New York City Energy Conservation Code.

2. Incorporate thermal breaks wherever possible in the Work.

3. The design environmental conditions are:

a. Exterior extreme annual heating and cooling design dry bulb temperature and coincident wind speed:

1) Maximum Dry Bulb: 98.9°F at 6 mph.

2) Minimum Dry Bulb: 5°F at 10 mph.

b. Interior design dry bulb temperature, relative humidity (RH), and interior air film coefficient:

1) 75°F at 50% RH and 0.7 Btu/hr - sq ft - °F.

4. Thermal Transmittance (U-Factor)

a. U-factor of the Work shall not be more than specified in the Building Enclosure System Matrix, accounting for all frame effects.

b. Refer to and coordinate values with the final Glass and Glazing assembly specified in Exterior Glass Type Matrix.

5. Solar Heat Gain Coefficient (SHGC)

a. SHGC of the Work shall not be more than specified for each building enclosure system as specified in the Building Enclosure System Matrix, accounting for all frame effects.

b. Refer to and coordinate values with the final Glass and Glazing assembly specified in Exterior Glass Type Matrix.

6. Visible Light Transmittance (VLT)

a. VLT of the Work shall not be more than specified for each building enclosure system as specified in the Building Enclosure System Matrix accounting for all frame effects.

b. Refer to and coordinate values with the final Glass and Glazing assembly specified in Exterior Glass Type Matrix.

7. Condensation Resistance

a. Provide systems whose internal condensation and drainage systems will prevent uncontrolled condensation inboard of the vapor barrier plane, under the most onerous environmental conditions specified in this Section.

8. Static Pressure Air Infiltration

a. Maximum air leakage through the Work areas of the Project shall be the lesser of the requirements determined according to 2014 New York City Building Code and 2016 New York City Energy Conservation Code or the following:

1) For non-operable portions of the Work, the maximum air infiltration rate shall be one half of that as required and determined according to the standards referenced by 2014 New York City Building Code and 2016 New York City Energy Conservation Code.

9. Applicable Testing Requirements

a. Static Pressure Air Infiltration

1) The Work shall demonstrate compliance with the air infiltration criteria listed in this Section when tested according to ASTM E283 and to the pressure differential referenced by 2014 New York City Building Code and 2016 New York Energy Conservation Code.

I. Fire Performance

1. The Work shall comply with the relevant fire resistance, smoke sealing, and fire stopping recommendations as stated in the 2014 New York City Building Code and 2016 New York City Energy Conservation Code, but not less than the following:

   a. ASTM E84: Flame Spread Index must be less than 25, Smoke Developed Index must be less than 450.

   b. ASTM D1929: Self-ignition temperature of 650°F or greater.

   c. ASTM D635: Requires a CC1 classification

   d. Tested and comply with NFPA 285 acceptance criteria.

2. Component materials shall not give off toxic fumes.

J. Lightning Protection and Grounding Performance

1. Coordinate as necessary with the trade responsible for the lightning protection and grounding systems as required by 2014 New York City Building Code for the building and shall agree on appropriate connection points with them for review by the Commissioner.

   a. No external tapes or visible connections will be accepted.

   b. Provide electrically continuous vertical and horizontal metallic framework elements and supporting structures of the building enclosure for the purposes of lightning protection and grounding. Provide bonding of the framework to the rest of the lightning protection and grounding system. Ensure all non-conductive thermal breaks are electrically continuous.

K. Infestation

1. Engineer materials used in the Work against attack or infestation by micro-organisms, fungi, insects, or other vermin.

1.6 SUBMITTAL PROCEDURES:

A. Refer to DDC General Conditions.

1.7 SUBMITTALS:

A. Shop Drawings

B. Calculations

1. Provide structural calculations. Include calculation of all loads and their combinations.

2. Provide thermal calculations as required to describe:

   a. U-value, SHGC, and VLT performance of Work.

   b. Condensation resistance of all elements of Work.

C. Testing Reports

1. Weather Test Certificate

a. Present certificates of weathering performance test results of a completed installation, utilizing a similar system, under similar loads and of similar size and geometry to the Project, demonstrating that performance requirements of Work can be met.

D. Product Data

E. Samples

1. Refer to Samples Matrix.

F. Quality Control Plan

G. Welding Certificates

H. Energy Performance Certificates

1. For Work, provide labeled and certified performance from the manufacturer according to the requirements of 2014 New York City Building Code and 2016 New York City Energy Conservation Code and by reference ASHRAE 90.1.

a. U-value performance shall be certified and labeled per NFRC 100 requirements.

b. SHGC performance shall be certified and labeled per NFRC 200 requirements.

c. Static pressure air infiltration performance shall be certified and labeled per NFRC 400 requirements.

2. Indicate whether certification is based on actual test of assembled components or on calculation.

a. Provide fenestration products with NFRC certified performance values.

I. Product Test Reports

1. Indicating compliance with performance requirements.

J. Quality Control Reports

1. Fabricator reports.

2. Field reports.

K. Completion of Work: Upon completion of installation of the Work, submit written certification that the manufacturer's representative has supervised the work of this Section and that all materials are correctly installed.

1.8 QUALITY ASSURANCE

A. Refer to DDC General Conditions Section 01 40 00 – Quality Requirements.

B. General for Installers:

1. The Contractor must be licensed or approved by the manufacturer.

1.9 WARRANTY:

A. Warranty shall state that the Work is free from defects in materials and workmanship and weathertight for a period of 1 yr from the date of Substantial Completion. Contractor shall agree to promptly repair or replace defective materials and workmanship to "like new condition," including such exploratory work, required to determine the cause, during the Guarantee period, at no additional cost to the City of New York.

B. In addition to Contractor's Warranty, the paint finish manufacturer shall guarantee the finish for a period of 20 yrs from the date of substantial completion of the Work against defects, including full labor and material.

C. The Contractor shall be responsible for repairing damage to the building and furnishings occasioned by defective materials or workmanship or damage as part of repairs to the Work.

1.10 PROJECT CONDITIONS:

A. Adjacent Trade Shop Drawing Review and Field Measurements: Verify actual locations of structural supports for Work by review of supporting structure Shop Drawings or field measurements before fabrication and indicate measurements on Shop Drawings.

PART II – PRODUCTS

2.1 MANUFACTURERS:

A. Manufacturers: Subject to compliance with requirements provide products by one of the following:

1. Acurlite Structural Skylights, Inc.
2. Velux Skylight.
3. Super Sky Products Enterprises, LLC.
4. Or approved equal

B. Products

1. Subject to compliance with requirements, provide products by one of the following:
   a. Acurlite Structural Skylights; Single Pitch Skylight and Round.
   b. Velux Longlight.
   c. Super Sky Glass System Skylight.
   d. Or approved equal.

2.2 MATERIALS:

A. Aluminum Components

1. Manufacturer's recommended alloy and temper meeting the requirements and standards listed herein for type of use and finish indicated in accordance with:

   a. Sheet and Plate: ASTM B209.

   b. Extruded Bars, Rods, Profiles, and Tubes: ASTM B221.

   c. Extruded Structural Pipe and Tubes: ASTM B429.

   d. Structural Profiles: ASTM B308/B308M.

   e. Welding Rods and Bare Electrodes: AWS A5.10 / A5.10M.

B. Steel Components

1. Manufacturer's recommended alloy and temper meeting the requirements and standards listed herein for type of use and finish indicated in accordance with:

   a. Structural Shapes, Plates, and Bars: ASTM A36/A36M/A572.

   b. Cold-Rolled Sheet and Strip: ASTM A1008/A1008M.

   c. Hot-Rolled Sheet and Strip: ASTM A1011/A1011M.

   d. Galvanized Sheet: ASTM A653/A653M.

C. Stainless Steel

1. Manufacturer's recommended alloy and temper meeting the requirements and standards listed herein for type of use and finish indicated in accordance with:

   a. Plate, Sheet and Strip: ASTM A240/A240M.

2. With a Pitting Resistance Equivalence Number (PREN) greater than 24.5 calculated using the formula 'PREN = %Cr + 3.3 x %Mo + 16 x %N' based on the minimum compositions for Chromium, Molybdenum, and Nitrogen given in ASTM A240 or equivalent.

3. In areas where stainless steel may be used in proximity to a water feature, sea spray, or salts, the alloy chosen will not corrode or exhibit any surface pitting in its installed condition, or require regular maintenance to prevent corrosion.

   a. Use non-austenitic alloys including the following:

      1) Duplex stainless steel Type 2205 (UNS S32205).

      2) 317L.

2.3 FINISHES:

A. Refer to Building Enclosure System Matrix for finish selection for each system.

B. Aluminum Components

1. Anodized Finish

   a. Carry out anodizing under conditions of acceptable good practice for architectural applications. Hold processing conditions constant for the period required for completion of the Work. Keep records of these conditions and make available for inspection in the event of a dispute as to the quality of the finished anodic coating.

   b. Clear Anodic Finish: AA-M12C22A41, Class I, 0.71 mil or thicker, as complying with AAMA 611.

   c. Color Anodic Finish: AA-M12C22A42/A44, Class I, 0.71 mil or thicker, as complying with AAMA 611.

      1) Color: Refer to Building Enclosure System Matrix.

2. High-Performance Organic Finish

   a. Three-coat fluoropolymer finish complying with AAMA 2605 and containing not less than 70% PVDF resin by weight in color coat and clear topcoat.

   b. Prepare, pretreat, and apply coating to exposed metal surfaces complying with coating and resin manufacturers' written instructions.

   c. Color and Gloss: Refer to Building Enclosure System Matrix.

   d. Manufacturers are subject to compliance with requirements documented herein. Manufacturers offering products that may be incorporated into the Work include the following:

      1) PPG Industries Inc., Duranar XL Extrusion Coating.

      2) Akzo Nobel Coatings Inc., Trinar Ultra TEC/TMC.

      3) The Valspar Corporation, Fluropon Premiere.

      4) Or approved equal.

3. Powdercoat Finish

   a. Shop-applied Superior Performance powder coating finish for architectural aluminum extrusions complying with AAMA 2605.

   b. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.

   c. Color and Gloss: Refer to Building Enclosure System Matrix.

      1) One-coat dry system with 70% fluoropolymer resin, meeting performance requirements of AAMA 2605 and the following:

         a) Dry Film Thickness, ASTM D1400: Not less than thickness applied to tested specimens meeting specified performance requirements, and as recommended by manufacturer for application.

b) Specular Gloss, ASTM D523 at 60°: To be coordinated with the Commissioner.
c) Dry Film Hardness, ASTM D3363: Pass.
d) Sulphur Dioxide, ISO 3231 (Kesternich): Pass; no blistering, loss of gloss, or discoloration.

d. Manufacturers are subject to compliance with requirements documented herein.

1) Akzo Nobel Coatings Inc., Interpon D3000 Series Fluoromax Powder Coating.

2) PPG Industries Inc., Duranar Powder Coatings.

3) The Jotun Group, Jotun Durasol.

4) Or approved equal.

4. Concealed Components

a. Provide either High-Performance Organic Finish, Powdercoat Finish, or Clear Anodic Finish.

C. Steel Components

1. Zinc coated by hot-dip process according to ASTM A123/A123M, ASTM A653/A653M or ASTM A153/A153M, after fabrication as applicable.

a. Galvanized sheet shall have a minimum coating designation of G90 according to ASTM A653/A653M.

b. Following pickling operations, hold steel at more than 212°F to ensure a uniform temperature, either prior to, or after fluxing.

2. Exposed Components

a. Provide a High-Performance Organic or Powdercoat Finish meeting the requirements specified for Aluminum Components and in accordance with the finish manufacturer's procedures.

3. Concealed Components

a. Use a zinc-rich, corrosion-resistant primer, complying with SSPC-PS Guide applied immediately after surface preparation and pretreatment.

b. Select surface preparation methods according to recommendations in SSPC-PS and prepare surfaces according to applicable SSPC standard.

D. Stainless Steel Components

1. Exposed Components

a. Surface Preparation

1) Remove tool and die marks and stretch lines, or blend into finish.

2) Polished Finishes

a) Grind and polish surfaces to produce uniform finish, free of cross scratches.
b) Run grain of directional finishes with long dimension of each piece.
c) When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.

3) Finish: Refer to Building Enclosure System Matrix.

E. General

1. Choose finishes such that touch-up finishes match factory finish.

2. Discoloration, fading, chalking, excessive non-uniformity, pitting, cracking, peeling, corrosion, or crazing of finish is not allowed.

3. The terms below used in conjunction with finish Warranty are defined as follows:

a. "Excessive Fading": Means a change in appearance that is perceptible and objectionable as determined by the Commissioner when viewed visually in comparison with the original color range standards.

b. "Excessive Non-Uniformity": Means non-uniform fading during the Warranty period to the extent that adjacent parts have a color difference greater than the original acceptable color range.

c. "Will Not Pit or Otherwise Corrode": Means no pitting or other type of corrosion of finish discernible from a distance of 10 ft, resulting from the natural elements in the atmosphere at the Project site.

4. Deterioration includes, but is not limited to, the following:

a. Color fading more than 5 Hunter units when tested according to ASTM D2244.

b. Chalking in excess of a No. 8 rating when tested according to ASTM D4214.

c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.

2.4 FRAMING:

A. Framing members shall comply with the profiles and angles shown in the Architectural Drawings and comply with the performance requirements set forth in these Specifications.

B. Aluminum Framing shall follow the recommendations of the following:

1. AA – Aluminum Design Manual, Aluminum Standards and Data

2. AAMA – Aluminum Curtain Wall Design Guide Manual, Care and Handling of Architectural Aluminum from Shop to Site.

C. Framing shall incorporate profiles to accommodate waterproofing integration at interfaces with adjacent building enclosure systems.

2.5 BRACKETS, FASTENERS AND ANCHORAGE:

A. Fasteners

1. Fastener engineering shall be no less than the most stringent standards as required by 2014 New York City Building Code and its reference standards, or the following requirements:

   a. Fastener engineering for aluminum components shall be as per the Aluminum Association Aluminum Design Manual (AA-ADM1).

      1) Allowable loads for fasteners shall be the lesser of the fastener manufacturers' requirements or per AAMA TIR-A9 with the most recent amendments.

   b. Steel and Stainless Steel Bolts

      1) Carbon Steel Bolts, Studs, and Threaded Rod 60,000 psi Tensile Strength: ASTM A307.

      2) Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength: ASTM A3125.

      3) Stainless Steel Bolts, Hex Cap Screws, and Studs: ASTM F593.

      4) Stainless Steel Nuts: ASTM F594.

   c. When utilizing a fastener that is not included in any of the above references, available standards or design guides, use a minimum factor of safety of 4 for permissible load engineering of anchoring assemblies.

2. Fastener engineering shall account for any reduction in safe working loads due to their spacing, location in areas of tension, near edges, or proximity to cast in inserts/existing fasteners, or thickness of shims. Fastener engineering shall also consider condition, thickness, and material properties of substrate. Adhesive anchoring systems shall not be used for fasteners supporting loads in tension.

3. Unless shown in the Architectural Drawings, no visible exposed fasteners.

   a. Where exposed fasteners are shown and required, use countersunk security heads.

4. All exterior fasteners or fasteners in wet areas shall be of a suitable grade of stainless steel. Use weather coatings for corrosion resistance only with Commissioner's approval.

5. Select and coordinate with the weatherproofing system manufacturer all exterior fasteners required to penetrate a self-sealing weatherproofing system to ensure self-sealing occurs.

6. Where post drilled or site-drilled fasteners are used for connections to the external structural steel frame, do not compromise integrity of the steel corrosion protection system.

7. Highlight the general requirement for torqueing of bolts in the Shop Drawings and clearly state tightening torque values.

8. The Contractor shall provide for the Commissioner's review, documentation demonstrating that the use of all installed fasteners have been reviewed and approved by the fastener manufacturer and shall,

prior to installation, submit manufacturer's written certification that details proposed by the Contractor are appropriate for their intended use.

B. Brackets and Anchorage

1. Engineer brackets and anchorage to allow for adjustments by 1 in. in small increments in and out, up and down, and side to side in the position of the Work supports relative to other constructions, to accommodate the full variations in the underlying construction and fabrication tolerances.

2. Shimming required to accommodate local variations in construction tolerances only. State the maximum allowable shim dimension in the Shop Drawings.

3. Concrete and masonry inserts shall be hot-dip galvanized cast-iron, malleable-iron, or steel inserts as required by ASTM A123/A123M or ASTM A153/A153M.

C. General

1. Engineer all brackets and fasteners so there is no risk of loosening due to the effects of vibrations or due to the cyclic effects of load, deflections, and thermal movements.

2. Engineer brackets for site-drilled fasteners to allow for the possibility of reinforcement or other obstructions being encountered and the fixing position being moved as a result thereof.

3. Do not cut reinforcement or other obstructions without the approval of the Commissioner.

2.6 FLASHING:

A. Refer to Section 07 62 01 – Facade Sheet Metal Flashings for performance requirements.

B. Provide corrosion-resistant, nonstaining, nonbleeding flashing compatible with adjacent materials constructed with one of the following waterproof materials:

1. Stainless steel, ASTM A240/A240M of manufacturer's recommended thickness.

2. One of the following membrane materials:

a. Silicone sheet.

C. Flashings shall maintain their performance and properties for the expected service life of the Contract Work.

D. Flashings shall have the necessary mechanical properties to withstand installation and specified design loads.

E. Flashings and smoke barriers visible externally or internally shall be aluminum sheet with finish to match Work.

2.7 WEATHER RESISTIVE BARRIER:

A. Refer to Section 07 27 01 – Weather Resistive Barriers for performance requirements.

2.8 GASKETS:

A. General

1. Do not install gaskets/dry weather seals in a pre-stretched condition.

2. Gaskets shall be accessible for inspection/replacement.

3. Select gaskets and seals used to achieve the required weather and airtightness in accordance with ASTM C716 to fully accommodate the range of dimensional tolerances associated with fabrication and installation of the Work. Form with materials capable of maintaining their elastic qualities, dimensions, and resistance to physical and chemical attack sufficient to maintain the full performance during the design life. Gaskets shall be free from contact and migration stain and shall be compatible with all substrate, Sealant and finishes with which they may come in contact.

4. Gaskets shall maintain their performance and properties for the expected service life of the product.

5. Gaskets shall be free of mold flash.

B. Extruded rubber gaskets shall comply with ASTM C509.

1. Dense compression gaskets shall be molded or extruded, of profile and hardness required to maintain watertight seal, made from silicone complying with ASTM C1115.

   a. Use where soft compression gaskets will be compressed by inserting dense compression gaskets on opposite side of glazing or pressure applied by means of pressure-glazing stops on opposite side of glazing.

2. Soft compression gaskets shall be extruded or molded, closed-cell, integral-skinned silicone gaskets complying with ASTM C509, Type II, black; of profile and hardness required to maintain watertight seal.

2.9 GLAZING:

A. Refer to Building Enclosure System Matrix for glazing types and Section 08 80 00 – Exterior Glazing for performance requirements.

2.10 SEALANTS:

A. Refer to Section 07 92 01 – Exterior Joint Sealants for performance requirements.

2.11 SEMI-RIGID INSULATION:

A. Unfaced, Mineral-Wool Board Insulation

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. Rockwool, Inc.

   b. Thermafiber, Inc.

   c. Johns Manville.

d. Or approved equal.

B. Product Properties

1. Complying with ASTM C612; with maximum flame-spread and smoke-developed indexes of fifteen (15) and zero (0), respectively, per ASTM E84.

2. Shall pass ASTM E136 for combustion characteristics.

3. Nominal density of 6 lb per cubic foot, Type II, with a minimum thermal resistivity of 4.2°F x h x sq ft/Btu x in. at 75°F.

4. Recycled Content: Postconsumer recycled content plus one-half of pre-consumer recycled content not less than 10%.

C. Insulation Fasteners

1. Engineer fasteners to fully restrain insulation against all design loads.

2. Provide fastener materials suitable for the environmental conditions the insulation will be exposed to.

3. Adhesively attached, spindle-type anchors utilizing plate welded to projecting spindle and capable of holding insulation of specified thickness securely in position indicated with self-locking washer in place.

4. Anchor adhesive shall demonstrate capability to bond insulation anchors securely to substrates indicated without damaging insulation, fasteners, and substrates.

D. Thermal insulation shall be inert, durable, not water soluble, rot and vermin proof, CFC and HCFC free, shall be inorganic and not support mold fungal or bacteria growth and shall provide the specified performance for the service life of the Work. Make due allowance for the reduced performance of insulation due to the effects of moisture and aging.

E. Thermal insulation shall be sufficiently robust and cohesive to allow removal and replacement in service without loss of material or performance. It shall not be injurious to human health properly installed, in service, or during removal and replacement.

2.12 ACCESSORY MATERIALS:

A. Bituminous Paint: Cold-applied asphalt-mastic paint complying with SSPC-Paint 12 requirements except containing no asbestos, formulated for 30 mil thickness per coat.

B. Galvanizing Repair Paint: ASTM A780.

C. Shims: Load-bearing, high-density multimonomer plastic, non-leaching.

D. Separating / Isolating Materials

1. The Contractor shall select, provide, and install each material so it is, and will remain, compatible with other materials around it within its range of influence. Contractor shall ensure adequate measures are taken to prevent bimetallic corrosion between dissimilar metals. Where different metallic materials are used, fit separators to eliminate the risk of corrosion.

E. Weep Baffles: PVC-coated reticulated foam, 30 to 40 ppi.

F. Butyl Tape: Preformed butyl-based elastomeric tape with 100% solids content. Nonstaining, with or without spacer rod (as approved by Commissioner), with release paper backing.

PART III – EXECUTION

3.1 REQUIREMENTS:

A. Refer to DDC General Conditions for execution requirements.

3.2 FABRICATION:

A. General

1. Profiles shall be sharp, straight, and free of defects or deformations.
2. Fabricate all formed or extruded shapes prior to finishing.
3. Accurately form joints without lipping or offsets in visible surfaces unless engineered otherwise. Rigidly secure other joints to prevent all but designed movement, unless engineered otherwise.
4. Accurately fitted joints with ends coped or mitered.

B. Cutting

1. Grind, cut, and shape metals using tools which will not contaminate them with particles which could stain or corrode them.
2. Steel Components
   a. Minimize use of arc cutting and acetylene gas cutting as much as feasible. If required, Contractor shall submit full welding procedures to demonstrate hardness remains within the required limits.
   b. Mild steel cut or shaped by either flame cutting or Plasma cutting shall be to procedures agreed by the Commissioner. Procedures shall demonstrate that the surface hardness is less than 270 Hv 10. Require random inspection of the steel to ensure hardness level is not exceeded. Alternatively, surface dress all cut edges to remove hardened material.
   c. All punched holes shall be undersized by 40 mil and be reamed to the finished size.

C. Welding

1. Weld in concealed locations to greatest extent possible to minimize distortion or discoloration of finish. Remove weld spatter and welding oxides from exposed surfaces by descaling or grinding.
2. Weld metals in accordance with the relevant standards using methods to avoid distortion. Show the type, size and spacing of welds on Drawings for Commissioner's review, prior to fabrication.
3. Fully bond welds throughout their length without holes, inclusions, cracks, or porosity so as not to compromise the long-term performance and welds are strong enough for the design requirements.

4. Grind all welds smooth and flush with the adjoining surfaces where visible or impinging on other work.

5. Do not site weld except where approved by the Commissioner.

6. Finish completed welded construction to prevent corrosion. Clean all welds as necessary to ensure the durability of the connections.

7. All radius edges used in changes of section shall be typically two times the maximum wall thickness.

8. All welding procedures and welding procedure specifications shall limit the hardness in the weld, parent metal, or heat-affected zone to less than 270 Hv 10.

D. Pressing and Folding

1. Fold and form aluminum sheets over dies or mandrels with the minimum radii recommended by the Aluminum Association in publications as Aluminum Design Manual. Make trial bends on scrap material of the alloy, temper, and thickness being used to ensure that it is not cracked, torn, unevenly stretched, or separated at grain membranes.

E. Sealants and Adhesives

1. Prepare surfaces that will contact Sealants and/or adhesives according to the manufacturer's written instructions to ensure compatibility and adhesion.

2. Preparation includes, but is not limited to, cleaning and priming surfaces.

F. Gaskets

1. Gaskets jointed by bonding with adhesive are not accepted as a substitute for molded frame gaskets. If adhesive-bonded joints are required, bring to the Commissioner's attention for review before proceeding with work.

2. All gasket frames should be normally manufactured to a small but predetermined oversize tolerance, to ensure that when seated into position, the lineal lengths and corners of the gaskets are in slight compression.

3. Install gaskets in accordance with the manufacturer's recommendations and utilizing the correct tools.

G. Fabrication Tolerances

1. Metal cutting tolerances for framework shall be:

a. ± 1/16 in. on length of vertical members.

b. ± 1/32 in. on length of horizontal members.

c. ± 1/64 in. on the length and width of spandrel panels, back pans, and aluminum sheets.

d. ± 1/32 in. on length of diagonal of spandrel panels, back pans, and aluminum sheets, and not more than ± 1/16 in. in difference in the length between the two diagonals.

e. Space individual framing members no more than plus or minus 1/8 in. from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.

2. Structural Steel Fabrication Tolerances

a. Fabricate structural steel in accordance with AISC 303-16 – Code of Standard Practice for Steel Buildings and Bridges, architecturally exposed structural steel requirements Category AESS 1, with the exception that fabrication tolerances shall be one-quarter (1/4) of standard fabrication tolerances.

3.3 INSTALLATION:

A. Comply with requirements and product manufacturer's recommended guidelines.

B. Do not install damaged components.

C. Fit joints to produce joints free of burrs and distortion.

D. Rigidly secure all non-moving elements.

E. Install anchors with separators and isolators to prevent metal corrosion and electrolytic deterioration and to prevent impeding movement of moving joints.

F. Metal Protection

1. Where aluminum will contact dissimilar metals, protect against galvanic action by painting contact surfaces with primer or by applying sealant or tape or installing nonconductive spacers as recommended by manufacturer for this purpose.

2. Where aluminum will contact concrete or masonry, protect against corrosion by painting contact surfaces with bituminous paint.

G. Set continuous perimeter members and flashing in full sealant bed to produce watertight installation.

3.4 INSTALLATION TOLERANCES:

A. Install Work to comply with the following maximum tolerances:

1. Plumb: 1/8 in. in 10 ft; non-cumulative.

2. Level: 1/8 in. in 20 ft; non-cumulative.

3. Alignment: End-to-end or edge-to-edge offset of adjoining consecutive element to 1/16 in.

a. Where surfaces abut in line and at corners and where surfaces are separated by less than 3 in., limit offset from true alignment to less than 1/32 in.

4. Location and Plane: Limit variation from plane to 1/8 in. in 10 ft; 1/4 in. over total length.

5. Diagonal Measurements: Limit difference between diagonal measurements to 1/8 in.

3.5 FIELD QUALITY CONTROL:

A. Test and inspect representative areas of the Work as installation proceeds to determine compliance of installed assemblies with specified requirements.

B. Testing shall be performed by a qualified Independent Testing and Inspection Agency.

1. The Independent Testing and Inspection Agency shall prepare and submit an inspection and test report.

C. Work is considered defective if it does not pass tests and inspections.

1. There shall be no evidence of water penetration as per the weatherproofing requirements specified.

a. No increase in the allowable rate of air infiltration or increase in the volume of water leakage, nor any decrease in the specified test pressures will be permitted in the evaluation of field testing. This requirement is more restrictive than AAMA standards.

2. Repair or remove work where test results and inspections indicate that it does not comply with specified requirements.

3. For each failure condition discovered, make remedial and corrective action approved by the City of New York. All failures shall be considered systemic failures requiring corrective work at all similar conditions and locations. Remedial measures shall maintain standards of quality and durability and are subject to approval by the Commissioner.

4. Additional testing and inspecting shall be at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

D. Gutter Continuity Testing

1. Prior to glazing Glass or Panels into framing, but after all frame gaskets and seals are installed and cured, test the condensation gutter system.

2. To test system, pour water at the high point of each drainage channel of the system and observe that the water drains out of the baffled weep path of the system to the exterior. Test all drainage channels such that every drainage channel connection is determined to be leak free.

3. There shall be no evidence of water penetration as per the weatherproofing requirements specified with the exception of water in each respective drainage channel.

4. Provide a minimum of two (2) weeks' notice to all parties to allow them to attend all hose testing.

E. Water Nozzle Spray Test

1. After completing Work installation and before interior finish installation begins, carry hose testing on 100% of the Work as designated by Commissioner for water penetration according to AAMA 501.2 requirements.

2. Minimum area of test area shall be 50 sq ft.

3. Provide a minimum of two (2) weeks' notice to all parties to allow them to attend all hose testing.

4. Repair or remove and replace Work not meeting requirements or damaged by testing; replace to conform to specified requirements.

F. Field Testing Support

1. The City of New York will engage an Independent Testing Agency to perform field testing of the Work and prepare test reports. Testing will include those performed to ASTM E1105, ASTM E283, AAMA 501.2, and AAMA 502 standards. The Contractor shall assist the independent Testing and Inspection Agency with testing, including providing safe access, water, power, constructing interior test chambers, etc.

   a. Assume two (2) days of field air and water infiltration testing at multiple locations selected by the Commissioner.

   b. If failures occur, provide additional test assistance as needed to obtain Commissioner's approval at no additional cost.

2. Testing Services: Testing and inspecting of representative areas to determine compliance of installed system with specified requirements shall take place as follows and in successive stages as indicated by the Commissioner. The Commissioner will perform some of this testing during the early stages of Work installation. Complete all related installation work, in areas selected by the Commissioner, as needed to allow air and water testing to be performed during the early stages of the work (including installation of glazing, framing, gaskets, etc.). Do not proceed with the installation of the next area until test results for previously completed areas show compliance with requirements.

   a. Air Infiltration: Areas shall be tested for air leakage of the rate specified under Static Pressure Air Infiltration Article, but not more than 0.06 cfm per square foot of fixed wall area when tested according to ASTM E 783 at a minimum static-air-pressure differential of 6.24 lbf per square foot.

   b. Water Penetration: Areas shall be tested according to ASTM E1105 at minimum uniform static-air-pressure difference (Procedure A) equal to the pressure specified under Static Pressure Water Infiltration Article and shall not evidence water penetration.

   c. Water Spray Test: After the installation of minimum area of 100 sq ft of Work has been completed but before installation of interior finishes has begun, a two-bay area of system designated by Commissioner shall be tested according to AAMA 501.2 and shall not evidence water penetration.

   d. Occasionally test Glazing pockets (and other horizontal cavities that may collect water) by temporarily plugging weep holes and filling with water in accordance with AAMA 511. After minimum of 15 min., inspect for water leakage or drop in water level. Correct deficiencies and retest until successful tests are achieved. Remove weep holes plugs and drain system at conclusion of test. Perform tests at start of the work and periodically throughout the construction process (minimum once every two weeks).

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SECTION 08 71 00
Door Hardware

PART I - GENERAL

1.1 RELATED DOCUMENTS:

A. The following documents apply to all required work for the Project: (1) the Contract Drawings, (2) the Specifications, (3) the General Conditions, (4) the Addendum and (5) the Contract (City of New York Standard Construction Contract).

B. LEED / Environmentally Preferable Purchase (EPP) General Requirements:
   a. Refer to DDC General Conditions and the Addendum to the General Conditions
   b. LEED requirements apply to all Phase II work with the exception of the Existing Building scope. EPP requirements apply to the project's Existing Building scope only.

1.2 SUMMARY:

A. Section includes:

1. Mechanical and electrified door hardware for:
   a. Swinging doors.
   b. Gates.
2. Electronic access control system components, including:
   a. Electronic access control devices.
3. Field verification, preparation and modification of existing doors and frames to receive new door hardware.

B. Exclusions: Unless specifically listed in hardware sets, hardware is not specified in this section for:

1. Windows
2. Cabinets (casework), including locks in cabinets
3. Signage
4. Toilet accessories
5. Overhead doors

C. Related sections:

1. Section 042000 "Unit Masonry" for touchup finishing or refinishing of openings modified by this section.
2. Section 079200 "Interior Joint Sealants" for sealant requirements applicable to threshold installation specified in this section.
3. Section 079201 "Exterior Joint Sealants" for sealant requirements applicable to threshold installation specified in this section.
4. Section 092900 "Gypsum Drywall" for touchup finishing or refinishing of openings modified by this section.

5. Section 093013 "Ceramic Tiling" for touchup finishing or refinishing of openings modified by this section.
6. Section 099000 "Painting and Finishing" for touchup finishing or refinishing of openings modified by this section.
7. Division 26 sections for connections to electrical power system and for low-voltage wiring.
8. Division 28 sections for coordination with other components of electronic access control system.

1.3 REFERENCES:

A. UL – Underwriters Laboratories:

a. UL 10B - Fire Test of Door Assemblies
b. UL 10C - Positive Pressure Test of Fire Door Assemblies
c. UL 1784 - Air Leakage Tests of Door Assemblies
d. UL 305 - Panic Hardware

B. DHI – Door and Hardware Institute:

1. Sequence and Format for the Hardware Schedule
   a. Recommended Locations for Builders Hardware
   b. Key Systems and Nomenclature

C. ANSI – American National Standards Institute:

1. ANSI/BHMA A156.1 - A156.29, and ANSI/BHMA A156.31 - Standards for Hardware and Specialties
   a. ANSI/ICC A117.1 Accessible and Usable Buildings and Facilities

D. 2014 NYC Building Code.

1.4 SUBMITTAL PROCEDURES:

A. Refer to DDC General Conditions Section 01 33 00 "Submittal Procedures".
B. General:

1. Highlight, encircle, or otherwise specifically identify on submittals deviations from Contract Documents, issues of incompatibility or other issues which may detrimentally affect the Work.
   a. Prior to forwarding submittal, comply with procedures for verifying existing door and frame compatibility for new hardware, as specified in PART 3, "EXAMINATION" article, herein.

C. Action Submittals:

1. Product Data: Product data including manufacturers' technical product data for each item of door hardware, installation instructions, maintenance of operating parts and finish, and other information necessary to show compliance with requirements.
2. Riser and Wiring Diagrams: After final approval of hardware schedule, submit details of electrified door hardware, indicating:

   a. Wiring Diagrams: For power, signal, and control wiring and including:

i. Details of interface of electrified door hardware and building safety and security systems.
ii. Schematic diagram of systems that interface with electrified door hardware.
iii. Point-to-point wiring.
iv. Risers.

3. Samples for Verification: Submit production sample or sample installations of each type of exposed hardware unit in finish indicated, and tagged with full description for coordination with schedule.

    a. Samples will be returned to supplier in like-new condition upon acceptance of work. Units that are acceptable to the Commissioner may, after final check of operations, be incorporated into Work, within limitations of key coordination requirements.

4. Door Hardware Schedule: Submit schedule with hardware sets in vertical format as illustrated by Sequence of Format for the Hardware Schedule as published by the Door and Hardware Institute. Indicate complete designations of each item required for each door or opening, include:

    a. Door Index; include door number, heading number, and the Commissioner's hardware set number.
    b. Opening Lock Function Spreadsheet: List locking device and function for each opening.
    c. Type, style, function, size, and finish of each hardware item.
    d. Name and manufacturer of each item.
    e. Fastenings and other pertinent information.
    f. Location of each hardware set cross-referenced to indications on Drawings.
    g. Explanation of all abbreviations, symbols, and codes contained in schedule.
    h. Mounting locations for hardware.
    i. Door and frame sizes and materials.
    j. Name and phone number for local manufacturer's representative for each product.
    k. Operational Description of openings with any electrified hardware (locks, exits, electromagnetic locks, electric strikes, automatic operators, door position switches, magnetic holders or closer/holder units, and access control components). Operational description should include how door will operate on egress, ingress, and fire and smoke alarm connection.

        i. Submittal Sequence: Submit door hardware schedule concurrent with submissions of Product Data, Samples, and Shop Drawings. Coordinate submission of door hardware schedule with scheduling requirements of other work to facilitate fabrication of other work that is critical in Project construction schedule.

5. Key Schedule:

    a. After Keying Conference, provide keying schedule listing levels of keying as well as explanation of key system's function, key symbols used and door numbers controlled.
    b. Use ANSI/BHMA A156.28 "Recommended Practices for Keying Systems" as guideline for nomenclature, definitions, and approach for selecting optimal keying system.
    c. Provide 3 copies of keying schedule for review prepared and detailed in accordance with referenced DHI publication. Include schematic keying diagram and index each key to unique door designations.
    d. Index keying schedule by door number, keyset, hardware heading number, cross keying instructions, and special key stamping instructions.
    e. Provide one complete bitting list of key cuts and one key system schematic illustrating system usage and expansion.

        i. Forward bitting list, key cuts and key system schematic directly to The Commissioner

    f. Prepare key schedule by or under supervision of supplier, detailing the Commissioner's final keying instructions for locks.

6. Templates: After final approval of hardware schedule, provide templates for doors, frames and other work specified to be factory prepared for door hardware installation.

D. Informational Submittals:

1. Refer to DDC General Conditions.
2. Qualification Data: For Supplier, Installer and Architectural Hardware Consultant.

    a. Product Certificates for electrified door hardware, signed by manufacturer:
    b. Certify that door hardware approved for use on types and sizes of labeled fire-rated doors complies with listed fire-rated door assemblies.

3. Certificates of Compliance:

    a. Certificates of compliance for fire-rated hardware and installation instructions if requested by the Commissioner.
    b. Installer Instruction Meeting Certification: Letter of compliance, signed by Contractor, attesting to completion of installer instruction meeting specified in "QUALITY ASSURANCE" article, herein.
    c. Electrified Hardware Coordination Conference Certification: Letter of compliance, signed by Contractor, attesting to completion of electrified hardware coordination conference, specified in "QUALITY ASSURANCE" article, herein.

4. Product Test Reports: For compliance with accessibility requirements, based on evaluation of comprehensive tests performed by manufacturer and witnessed by qualified testing agency, for door hardware on doors located in accessible routes.
5. Warranty: Special warranty specified in this Section.

E. Closeout Submittals:

1. Refer to DDC General Conditions.
2. Operations and Maintenance Data: Provide in accordance with DDC General Conditions and include:

    a. Complete information on care, maintenance, and adjustment; data on repair and replacement parts, and information on preservation of finishes.
    b. Catalog pages for each product.
    c. Name, address, and phone number of local representative for each manufacturer.
    d. Parts list for each product.
    e. Final approved hardware schedule, edited to reflect conditions as-installed.
    f. Final keying schedule
    g. Copies of floor plans with keying nomenclature
    h. As-installed wiring diagrams for each opening connected to power, both low voltage and 110 volts.
    i. Copy of warranties including appropriate reference numbers for manufacturers to identify project.

1.5 QUALITY ASSURANCE:

A. Refer to DDC General Conditions Section 01 40 00 "Quality Requirements".

B. Supplier Qualifications and Responsibilities: Recognized architectural hardware supplier with record of successful in-service performance for supplying door hardware similar in quantity, type, and quality to that indicated for this Project and that provides certified Architectural Hardware Consultant (AHC) available to The City of New York and The Commissioner, at reasonable times during the Work for consultation.

1. Warehousing Facilities: In Project's vicinity.
2. Scheduling Responsibility: Preparation of door hardware and keying schedules.
3. Engineering Responsibility: Preparation of data for electrified door hardware, including Shop Drawings, based on testing and engineering analysis of manufacturer's standard units in assemblies similar to those indicated for this Project.
4. Coordination Responsibility: Coordinate installation of electronic security hardware with the Commissioner and provide installation and technical data to the Commissioner and related subcontractors.

    a. Upon completion of electronic security hardware installation, inspect and verify that all components are working properly.

C. Installer Qualifications: Qualified tradesmen, skilled in application of commercial grade hardware with record of successful in-service performance for installing door hardware similar in quantity, type, and quality to that indicated for this Project.

D. Architectural Hardware Consultant Qualifications: Experienced in providing consulting services for door hardware installations that are comparable in material, design, and extent to that indicated for this Project and meets these requirements:

1. For door hardware, Architectural Hardware Consultant (AHC).
2. Can provide installation and technical data to the Commissioner and related subcontractors.
3. Can inspect and verify components are in working order upon completion of installation.

4. Capable of producing wiring diagrams.
5. Capable of coordinating installation of electrified hardware with the Commissioner.

E. Single Source Responsibility: Obtain each type of door hardware from single manufacturer.

1. Provide electrified door hardware from same manufacturer as mechanical door hardware, unless otherwise indicated.
2. Manufacturers that perform electrical modifications and that are listed by testing and inspecting agency.

F. Fire-Rated Door Openings: Provide door hardware for fire-rated openings that complies with NFPA 80. Provide only items of door hardware that are listed and are identical to products tested by Underwriters Laboratories, for use on types and sizes of doors indicated, based on testing at positive pressure and according to NFPA 252 or UL 10C and in compliance with requirements of fire-rated door and door frame labels.

G. Air Infiltration at Door Assemblies: At all door assemblies between "L1 Personnel Level" and the exterior, and all door assemblies between "L1 Personnel Level" and the "Garage Level", provide door hardware that meets the requirements of the project Deep Energy Conservation Measure (DECM) #7 for reduced exterior air infiltration.

1. Air Leakage Rate: Maximum air leakage of 0.25 cfm/sq. ft. at tested pressure differential of 0.3-inch wg (75 Pa) of water.
2. Enclosure Testing:

    a. Perform testing before installation of interior finishes unless otherwise indicated or recommended for testing application.
    b. Testing Agency: Engage a qualified testing agency to perform tests and inspections.
    c. Whole Door Assembly Air Tightness Using an Orifice Blower Door: ASTM E 1827, Maximum Air Leakage Rate as indicated above.
    d. Applicable Doors: S1-1, S2-1, S4-1, S5-1, 106A, 106B, 113A, 113B, 130, 130.1.

H. Smoke- and Draft-Control Door Assemblies: Where smoke- and draft-control door assemblies are required, provide door hardware that meets requirements of assemblies tested according to UL 1784 and installed in compliance with NFPA 105.

1. Air Leakage Rate: Maximum air leakage of 0.3 cfm/sq. ft. (3 cu. m per minute/sq. m) at tested pressure differential of 0.3-inch wg (75 Pa) of water unless otherwise required to meet Air Leakage Rate noted above to meet DECM #7.

I. Electrified Door Hardware: Listed and labeled as defined in NFPA 70, Article 100, by acceptable testing agency.

J. Means of Egress Doors: Latches do not require more than 15 lbf (67 N) to release latch. Locks do not require use of key, tool, or special knowledge for operation.

K. Accessibility Requirements: For door hardware on doors in an accessible route, comply with governing accessibility regulations cited in "REFERENCES" article, herein.

1. Provide operating devices that do not require tight grasping, pinching, or twisting of wrist and that operate with force of not more than 5 lbf (22.2 N).
2. Maximum opening-force requirements:

    a. Interior, Non-Fire-Rated Hinged Doors: 5 lbf (22.2 N) applied perpendicular to door.
    b. Sliding or Folding Doors: 5 lbf (22.2 N) applied parallel to door at latch.
    c. Fire Doors: Minimum opening force allowable.

3. Bevel raised thresholds with slope of not more than 1:2. Provide thresholds not more than 1/2 inch (13 mm) high.
4. Adjust door closer sweep periods so that, from open position of 70 degrees, door will take at least 3 seconds to move to 3 inches (75 mm) from latch, measured to leading edge of door.

L. Keying Conference: Conduct conference at Project site to comply with requirements in DDC General Conditions.

1. Attendees: The Commissioner, Installer, and Supplier's Architectural Hardware Consultant.
2. Incorporate keying conference decisions into final keying schedule after reviewing door hardware keying system including:

    a. Function of building, flow of traffic, purpose of each area, degree of security required, and plans for future expansion.
    b. Preliminary key system schematic diagram.
    c. Requirements for key control system.
    d. Requirements for access control.
    e. Address for delivery of keys.

M. Pre-installation Conference: Conduct conference at Project site.

1. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
2. Inspect and discuss preparatory work performed by other trades.
3. Inspect and discuss electrical roughing-in for electrified door hardware.
4. Review sequence of operation for each type of electrified door hardware.
5. Review required testing, inspecting, and certifying procedures.

N. Coordination Conferences:

1. Installation Coordination Conference: Prior to hardware installation, schedule and hold meeting to review questions or concerns related to proper installation and adjustment of door hardware.

    a. Attendees: Door hardware supplier, door hardware installer, Contractor.
    b. After meeting, provide letter of compliance to the Commissioner, indicating when meeting was held and who was in attendance.

2. Electrified Hardware Coordination Conference: Prior to ordering electrified hardware, schedule and hold meeting to coordinate door hardware with security, electrical, doors and frames, and other related suppliers.

    a. Attendees: electrified door hardware supplier, doors and frames supplier, electrified door hardware installer, electrical subcontractor, the Commissioner and Contractor.
    b. After meeting, provide letter of compliance to the Commissioner, indicating when coordination conference was held and who was in attendance.

1.6 DELIVERY, STORAGE, AND HANDLING:

A. Inventory door hardware on receipt and provide secure lock-up for hardware delivered to Project site.

B. Tag each item or package separately with identification coordinated with final door hardware schedule, and include installation instructions, templates, and necessary fasteners with each item or package.

1. Deliver each article of hardware in manufacturer's original packaging.

C. Project Conditions:

1. Maintain manufacturer-recommended environmental conditions throughout storage and installation periods.
2. Provide secure lock-up for door hardware delivered to Project, but not yet installed. Control handling and installation of hardware items so that completion of Work will not be delayed by hardware losses both before and after installation.

D. Protection and Damage:

1. Promptly replace products damaged during shipping.
2. Handle hardware in manner to avoid damage, marring, or scratching. Correct, replace or repair products damaged during Work.
3. Protect products against malfunction due to paint, solvent, cleanser, or any chemical agent.

E. Deliver keys to manufacturer of key control system for subsequent delivery to the Commissioner.
F. Deliver keys and permanent cores to the Commissioner by registered mail or overnight package service.

1.7 COORDINATION:

A. Coordinate layout and installation of floor-recessed door hardware with floor construction. Cast anchoring inserts into concrete. Concrete, reinforcement, and formwork requirements are specified in Division 03.
B. Installation Templates: Distribute for doors, frames, and other work specified to be factory prepared. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing door hardware to comply with indicated requirements.
C. Security: Coordinate installation of door hardware, keying, and access control with the Commissioner.
D. Electrical System Roughing-In: Coordinate layout and installation of electrified door hardware with connections to power supplies and building safety and security systems.
E. Existing Openings: Where hardware components are scheduled for application to existing construction or where modifications to existing door hardware are required, field verify existing conditions and coordinate installation of door hardware to suit opening conditions and to provide proper door operation.

F. Direct shipments not permitted, unless approved by Commissioner.

1.8 WARRANTY:

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of door hardware that fail in materials or workmanship within specified warranty period.

1. Warranty Period: Years from date of Substantial Completion, for durations indicated.

a. Closers:
i. Mechanical: 30 years
ii. Mechanical: 15 years Concealed

b. Automatic Operators: 2 years
c. Exit Devices:
i. Mechanical: 3 years.
ii. Electrified: 1 year.

d. Locksets:
i. Mechanical Mortise Locks: 3 years.
ii. Electrified: 1 year.

e. Continuous Hinges: Lifetime warranty
f. Key Blanks: Lifetime

1.9 REQUIRED TOOLS:

A. Furnish complete set of special tools required for adjustment of hardware, including changing of cylinders.

1.10 REGULATORY REQUIREMENTS:

A. Locate latching hardware between 34 inches to 44 inches above the finished floor.

1. Panic Hardware: Locate between 36 inches to 44 inches above the finished floor.
2. Refer to Drawings for more information.

B. Handles, pull, latches, locks, other operating devices:

1. Readily openable from egress side without tight grasping, tight pinching, or twisting of the wrist to operate.
2. Force required to activate the operable parts: 5.0 pounds maximum.

C. Adjust doors to open with not more than 5.0-pounds pressure to open at exterior doors and 5.0-pounds at interior doors. Local authority may increase the allowable pressure for fire doors to achieve positive latching, but not to exceed 15-pounds.

1. Exception: Exterior doors' pressure-to-open may be increased to 8.5-pounds if: at a single location, and one of a bank of eight leafs or fraction of eight, and one leaf of this bank is fitted with a low- or high-energy operator.

D. Low-energy powered doors: comply with ANSI/BHMA A156.19.

1. Where powered door serves an occupancy of 150 or more, provide back-up battery power or stand-by generator power, capable of supporting a minimum of 150 cycles.
2. Actuators, vertical bar type: minimum 2-inches wide, 30-inches high, bottom located minimum 5-inches above floor or ground, top located minimum 35-inches above floor or ground. Displays International Symbol of Accessibility.
3. Actuators, plate type: use two at each side of the opening. Minimum 4-inches diameter or 4-inches square. Displays International Symbol of Accessibility. Locate centerline of lower plate between 7- and 8-inches above floor or ground, and upper plate between 30- and 44-inches above floor or ground.
4. Actuator location: conspicuously located, clear and level floor/ground space for forward or parallel approach.

E. Adjust door closer sweep periods so that from an open position of 90 degrees, the door will take at least 5 seconds to move to a point 12 degrees from the latch, measured to the landing side of the door.

1. Spring hinges: adjust for 1.5 seconds minimum for 70 degrees to fully-closed.

F. Smooth surfaces at bottom 10 inches of push sides of doors, facilitating push-open with wheelchair footrests.

G. Door opening clear width no less than 32 inches, measured from face of frame stop, or edge of inactive leaf of pair of doors, to door face with door opened to 90 degrees. Hardware projection not a factor in clear width if located above 30 inches and below 80 inches, and the hardware projects no more than 4 inches.

1. Exception: Doors not requiring full passage through the opening, that is, to spaces less than 24 inches in depth, may have the clear opening width reduced to 20 inches. Example: Shallow closets.
2. Door closers and overhead stops: Not less than 78 inches above the finished floor or ground.

H. Thresholds: Floor or landing no more than 0.50 inches below the top of the threshold of the doorway. Vertical rise no more than 0.25 inches, change in level between 0.25 inches and 0.50 inches: beveled to slope no greater than 1:2 (50 percent slope).

I. Floor stops: Do not locate in path of travel. Locate no more than 4 inches from walls.

J. Pairs of doors: Limit swing of inactive leaf to 90 degrees to protect persons reading wall-mounted tactile signage.

K. Pairs of doors with independently-activated hardware both leafs: Limit swing of right-hand or right-hand-reverse leaf to 90 degrees to protect persons reading wall-mounted tactile signage.

L. Door and door hardware encroachment: When door is swung fully-open into means-of-egress path, the door, including the hardware, may not encroach/project more than 7 inches into the required exit width.

PART II – PRODUCTS

2.1 MANUFACTURERS:

A. Hand of Door: Drawings show direction of slide, swing, or hand of each door leaf. Furnish each item of hardware for proper installation and operation of door movement as shown.

B. Where specified hardware is not adaptable to finished shape or size of members requiring hardware, furnish suitable types having same operation and quality as type specified, subject to the Commissioner 's approval.

2.2 MATERIALS:

A. Fasteners

1. Provide hardware manufactured to conform to published templates, generally prepared for machine screw installation.
2. Furnish screws for installation with each hardware item. Finish exposed (exposed under any condition) screws to match hardware finish, or, if exposed in surfaces of other work, to match finish of this other work including prepared for paint surfaces to receive painted finish.
3. Provide concealed fasteners for hardware units exposed when door is closed except when no standard units of type specified are available with concealed fasteners. Do not use thru-bolts for installation where bolt head or nut on opposite face is exposed in other work unless thru-bolts are required to fasten hardware securely. Review door specification and advise the Commissioner if thru-bolts are required.
4. Install hardware with fasteners provided by hardware manufacturer.

B. Modification and Preparation of Existing Doors: Where existing door hardware is indicated to be removed and reinstalled.

1. Provide necessary fillers, Dutchmen, reinforcements, and fasteners, compatible with existing materials, as required for mounting new opening hardware and to cover existing door and frame preparations.
2. Use materials which match materials of adjacent modified areas.
3. When modifying existing fire-rated openings, provide materials permitted by NFPA 80 as required to maintain fire-rating.

C. Provide screws, bolts, expansion shields, drop plates and other devices necessary for hardware installation.

1. Where fasteners are exposed to view: Finish to match adjacent door hardware material.

D. Cable and Connectors: Hardwired Electronic Access Control Lockset and Exit Device Trim:

1. Data: 24AWG, 4 conductor shielded, Belden 9843, 9841 or comparable product by Alpha Wire, General Cable or approved equal.
2. DC Power: 18 AWG, 2 conductor, Belden 8760 or comparable product by Alpha Wire, General Cable or approved equal.
3. Provide type of data and DC power cabling required by access control device manufacturer for this installation.
4. Where scheduled in the hardware sets, provide each item of electrified hardware and wire harnesses with sufficient number and wire gauge with standardized 'Molex' plug connectors by Molex, Mill Max, TE Connectivity or approved equal to accommodate electric function of specified hardware. Provide 'Molex' connectors by Molex, Mill Max, TE Connectivity or approved equal that plug directly into connectors from harnesses, electric locking and power transfer devices. Provide through-door wire harness for each electrified locking device

installed in a door and wire harness for each electrified hinge, electrified continuous hinge, electrified pivot, and electric power transfer for connection to power supplies.

2.3 FINISHES:

A. Finish: BHMA 626/652 (US26D); except:

1. Hinges at Exterior Doors: BHMA 630 (US32D)
2. Continuous Hinges: BHMA 630 (US32D)
3. Push Plates, Pulls, and Push Bars: BHMA 630 (US32D)
4. Protection Plates: BHMA 630 (US32D)
5. Overhead Stops and Holders: BHMA 630 (US32D)
6. Door Closers: Powder Coat to Match
7. Wall Stops: BHMA 630 (US32D)
8. Latch Protectors: BHMA 630 (US32D)
9. Weather-stripping: Clear Anodized Aluminum
10. Thresholds: Mill Finish Aluminum

2.4 HINGES:

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Ives 5BB series
2. Hager BB series
3. McKinney TA/T4A series
4. Stanley FBB Series
5. Or approved equal

B. Requirements:

1. Provide five-knuckle ball bearing hinges conforming to ANSI/BHMA A156.1.
2. 1-3/4 inch (44 mm) thick doors, up to and including 36 inches (914 mm) wide:
    a. Exterior: Standard weight, stainless steel, 4-1/2 inches (114 mm) high.
    b. Interior: Standard weight, steel, 4-1/2 inches (114 mm) high.
3. 1-3/4 inch (44 mm) thick doors over 36 inches (914 mm) wide:
    a. Exterior: Heavy weight, bronze/stainless steel, 5 inches (127 mm) high.
    b. Interior: Heavy weight, steel, 5 inches (127 mm) high.
4. 2 inches or thicker doors:
    a. Exterior: Heavy weight, bronze or stainless steel, 5 inches (127 mm) high.
    b. Interior: Heavy weight, steel, 5 inches (127 mm) high.
5. Provide three hinges per door leaf for doors 90 inches (2286 mm) or less in height, and one additional hinge for each 30 inches (762 mm) of additional door height.
6. Where new hinges are specified for existing doors or existing frames, provide new hinges of identical size to hinge preparation present in existing door or existing frame.
7. Hinge Pins: Except as otherwise indicated, provide hinge pins as follows:

a. Steel Hinges: Steel pins.
b. Non-Ferrous Hinges: Stainless steel pins.
c. Out-Swinging Exterior Doors: Non-removable pins.
d. Out-Swinging Interior Lockable Doors: Non-removable pins.
e. Interior Non-lockable Doors: Non-rising pins.

8. Width of hinges: 4-1/2 inches (114 mm) at 1-3/4 inch (44 mm) thick doors, and 5 inches (127 mm) at 2 inches (51 mm) or thicker doors. Adjust hinge width as required for door, frame, and wall conditions to allow proper degree of opening.
9. Doors 36 inches (914 mm) wide or less furnish hinges 4-1/2 inches (114 mm) high; doors greater than 36 inches (914 mm) wide furnish hinges 5 inches (127 mm) high, heavy weight or standard weight as specified.
10. Provide hinges with electrified options as scheduled in the hardware sets. Provide with sufficient number and wire gage to accommodate electric function of specified hardware. Locate electric hinge at second hinge from bottom or nearest to electrified locking component.
11. Provide mortar guard for each electrified hinge specified.
12. Provide spring hinges where specified. Provide two spring hinges and one bearing hinge per door leaf for doors 90 inches (2286 mm) or less in height. Provide one additional bearing hinge for each 30 inches (762 mm) of additional door height.

2.5 CONTINUOUS HINGES:

A. Stainless Steel:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Ives
b. Markar
c. Stanley
d. Or approved equal

2. Requirements:

a. Provide pin and barrel continuous hinges conforming to ANSI/BHMA A156.26, Grade 2.
b. Provide pin and barrel continuous hinges fabricated from 14 gauge, type 304 stainless steel.
c. Provide twin self-lubricated nylon bearings at each hinge knuckle, with 0.25-inch (6 mm) diameter stainless steel pin.
d. Provide hinges capable of supporting door weights up to 600 pounds, and successfully tested for 1,500,000 cycles.
e. On fire-rated doors, provide pin and barrel continuous hinges that are classified for use on rated doors by acceptable testing agency.
f. Provide pin and barrel continuous hinges with electrified options as scheduled in the hardware sets. Provide with sufficient number and wire gage to accommodate electric function of specified hardware.
g. Install hinges with fasteners supplied by manufacturer.

h. Provide hinges 1 inch (25 mm) shorter in length than nominal height of door, unless otherwise noted or door details require shorter length and with symmetrical hole pattern.

B. Cold-Rolled Steel:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Ives
b. Markar
c. Stanley
d. Or approved equal

2. Requirements:

a. Provide pin and barrel continuous hinges conforming to ANSI/BHMA A156.26, Grade 2.
b. Provide pin and barrel continuous hinges fabricated from type 1012 cold rolled steel.
c. Provide twin self-lubricated nylon bearings at each hinge knuckle, with 0.25-inch (6 mm) diameter stainless steel pin.
d. Provide hinges capable of supporting door weights up to 600 pounds, and successfully tested for 1,500,000 cycles.
e. On fire-rated doors, provide pin and barrel continuous hinges that are classified for use on rated doors by acceptable testing agency.
f. Provide pin and barrel continuous hinges with electrified options as scheduled in the hardware sets. Provide with sufficient number and wire gage to accommodate electric function of specified hardware.
g. Install hinges with fasteners supplied by manufacturer.
h. Provide hinges 1 inch (25 mm) shorter in length than nominal height of door, unless otherwise noted or door details require shorter length and with symmetrical hole pattern.

C. Aluminum Geared:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Ives.
b. Select
c. Stanley
d. Or approved equal

2. Requirements:

a. Provide aluminum geared continuous hinges conforming to ANSI/BHMA A156.26, Grade 1.
b. Provide aluminum geared continuous hinges, where specified in the hardware sets, fabricated from 6063-T6 aluminum, with 0.25-inch (6 mm) diameter Teflon coated stainless steel hinge pin.

c. Provide split nylon bearings at each hinge knuckle for quiet, smooth, self-lubricating operation.
d. Provide hinges capable of supporting door weights up to 450 pounds, and successfully tested for 1,500,000 cycles.
e. On fire-rated doors, provide aluminum geared continuous hinges that are classified for use on rated doors by acceptable testing agency.
f. Provide aluminum geared continuous hinges with electrified option scheduled in the hardware sets. Provide with sufficient number and wire gage to accommodate electric function of specified hardware.
g. Install hinges with fasteners supplied by manufacturer.
h. Provide hinges 1 inch (25 mm) shorter in length than nominal height of door, unless otherwise noted or door details require shorter length and with symmetrical hole pattern.

2.6 ELECTRIC POWER TRANSFER:

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Von Duprin EPT-10
2. ABH PT1000
3. Securitron CEPT-10
4. Or approved equal

B. Provide power transfer with electrified options as scheduled in the hardware sets. Provide with number and gage of wires sufficient to accommodate electric function of specified hardware.

C. Locate electric power transfer per manufacturer's template and UL requirements, unless interference with operation of door or other hardware items.

2.7 OFFSET FLOOR CLOSERS AND INTERMEDIATE PIVOTS:

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Dorma
2. Jackson / CR Lawrence
3. Rixson
4. Or approved equal

B. Requirements:

1. Provide single-acting floor closers complete with ball-bearing top pivot, floor plates, intermediate pivots and cement boxes unless indicated otherwise.
2. Provide one intermediate pivot for doors less than 91 inches (2311 mm) high and one additional intermediate pivot per leaf for each additional 30 inches (762 mm) in height or fraction thereof. Intermediate pivots spaced equally not less than 25 inches (635 mm) or not more than 35 inches (889 mm) on center, for doors over 121 inches (3073 mm) high.
3. Provide floor closers with adjustable swing speed, latch speed, back-check, and hold open features, with built in positive stop at specified degree of opening.
4. Spring Power: Continuously adjustable over full range of closer sizes, with reduced opening force for physically handicapped.
5. Hydraulic Regulation: By tamper-proof, non-critical valves. Provide separate adjustment for latch speed, general speed, and backcheck.

6. Provide appropriate model where floor closers are specified at fire rated openings.
7. Provide lead-lined model where floor closers are specified at lead-lined doors.
8. Provide pivots with electrified options as scheduled in the hardware sets. Provide with sufficient number and wire gage to accommodate electric function of specified hardware. Locate electrified pivot nearest to electrified locking component. If manufacturer of electrified locking component requires another device for power transfer then provide recommended power transfer device and appropriate quantity of pivots.
9. Provide mortar guard for each electric pivot specified, unless specified in hollow metal frame specification.

2.8 CENTER HUNG FLOOR CLOSERS – DOUBLE ACTING:

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Dorma
2. Jackson / CR Lawrence
3. Rixson
4. Or approved equal

B. Requirements:

1. Provide double-acting center hung floor closers complete with ball-bearing top pivot, floor plates, and cement boxes unless indicated otherwise.
2. Provide floor closers with adjustable spring tension and closing speed, and automatic hold-open features.
3. Provide separate concealed overhead stop.
4. Spring Power: Continuously adjustable over full range of closer sizes, with reduced opening force for physically handicapped.
5. Hydraulic Regulation: By tamper-proof, non-critical valves. Provide separate adjustment for latch speed, general speed, and backcheck.
6. Provide appropriate model for wood doors.

2.9 PIVOT SETS:

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Ives.
2. Dorma.
3. Rixson.
4. Or approved equal

B. Requirements:

1. Provide pivot sets complete with oil-impregnated top pivot, unless indicated otherwise.
2. Where offset pivots are specified, Provide one intermediate pivot for doors less than 91 inches (2311 mm) high and one additional intermediate pivot per leaf for each additional 30 inches (762 mm) in height or fraction thereof. Intermediate pivots spaced equally not less than 25 inches (635 mm) or not more than 35 inches (889 mm) on center, for doors over 121 inches (3073 mm) high.
3. Provide appropriate model where pivot sets are scheduled at fire rated openings.
4. Provide lead-lined model where pivot sets are specified at lead-lined doors.

5. Provide pivots with electrified options as scheduled in the hardware sets. Provide with sufficient number and wire gage to accommodate electric function of specified hardware. Locate electrified pivot nearest to electrified locking component. If manufacturer of electrified locking component requires another device for power transfer then provide recommended power transfer device and appropriate quantity of pivots.
6. Provide mortar guard for each electric pivot specified, unless specified in hollow metal frame specification.

2.10 FLUSH BOLTS:

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Ives
2. Burns
3. Rockwood
4. Or approved equal

B. Requirements:

1. Provide automatic, constant latching, and manual flush bolts with stainless steel face plates, stainless steel levers, and with stainless/steel guides and strikes. Provide 12 inch (305 mm) steel rods at doors up to 90 inches (2286 mm) in height. For doors over 90 inches (2286 mm) in height increase top rods by 6 inches (152 mm) for each additional 6 inches (152 mm) of door height. Provide dust-proof strikes at each bottom flush bolt.

2.11 COORDINATORS:

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Ives
2. Burns
3. Rockwood
4. Or approved equal

B. Requirements:

1. Where pairs of doors are equipped with automatic flush bolts, an astragal, or other hardware that requires synchronized closing of the doors, provide bar-type coordinating device, surface applied to underside of stop at frame head.
2. Provide filler bar of correct length for unit to span entire width of opening, and appropriate brackets for parallel arm door closers and surface vertical rod exit device strikes. Factory-prep coordinators for vertical rod devices if required/

2.12 MORTISE LOCKS:

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Schlage LV9000 series
2. Corbin-Russwin ML2000 series
3. Best 45H series
4. Sargent 8200 series

5. Or approved equal

B. Requirements:

1. Provide mortise locks conforming to ANSI/BHMA A156.13 Series 1000, Grade 1 Operational, Grade 1 Security, and manufactured from heavy gauge steel, containing components of steel with a zinc dichromate plating for corrosion resistance. Provide lock case that is multi-function and field reversible for handing without opening case. Cylinders: Refer to "KEYING" article, herein.
2. Indicators: Where specified, provide indicator window measuring a minimum 2 inch x 1/2 inch with 180 degree visibility. Provide messages color-coded with full text and/or symbols, as scheduled, for easy visibility.
    a. Inside Security Indicator: Provide indicator above cylinder for visibility during lockdown that identifies the trim as locked/unlocked status of the door. Indicator in unlocked state has a white background with black text and icon. Indicator in the locked state has a red background with white text and icon.
    b. Outside Status Indicator: Provide indicator above cylinder for visibility that identifies the trim as locked/unlocked status of the door. Indicator in unlocked state has a white background with black text and icon. Indicator in the locked state has a red background with white text and icon.
    c. Inside Security Indicator: Provide indicator above cylinder for visibility during lockdown that identifies the trim as locked/unlocked status of the door. Indicator in unlocked state has a white background with black icon. Indicator in the locked state has a red background with white icon.
    d. Outside Status Indicator: Provide indicator above cylinder for visibility that identifies the trim as locked/unlocked status of the door. Indicator in unlocked state has a white background with black icon. Indicator in the locked state has a red background with white icon.
    e. Occupied Indicator: Provide indicator above cylinder for visibility while operating the lock that identifies the trim as occupied/unoccupied status of the door. Indicator in unoccupied state has a white background with black text and icon. Indicator in the occupied state has a red background with white text and icon.
    f. Do Not Disturb Indicator: Provide indicator above cylinder for visibility while operating the lock that identifies the trims as do not disturb/blank status of the door. Indicator in blank (or unoccupied) state has a white background with black text and icon. Indicator in the do not disturb state has a red background with white text and icon.
3. Provide locks with standard 2-3/4 inches (70 mm) backset with full 3/4 inch (19 mm) throw stainless steel mechanical anti-friction latch bolt. Provide deadbolt with full 1 inch (25 mm) throw, constructed of stainless steel.
4. Provide standard ASA strikes unless extended lip strikes are necessary to protect trim.
5. Provide electrified options as scheduled in the hardware sets. Where scheduled, provide a request to exit (RX) switch that is actuated with rotation of inside lever.
6. Provide motor based electrified locksets with electrified options as scheduled in the hardware sets and comply with the following requirements:

a. Universal input voltage – single chassis accepts 12 or 24V DC to allow for changes in the field without changing lock chassis.
b. Fail Safe/Fail Secure – changing mode between electrically locked (fail safe) and electrically unlocked (fail secure) is field selectable without opening the lock case.
c. Low maximum current draw – maximum 0.4 amps to allow for multiple locks on a single power supply.
d. Low holding current – maximum 0.01 amps to produce minimal heat, eliminate "hot levers" in electrically locked applications, and to provide reliable operation in wood doors that provide minimal ventilation and air flow.
e. Request to Exit Switch (RX) –
    i. Modular Design – provide electrified locks capable of using, adding, or changing a modular RX switch without opening the lock case.
    ii. Monitoring – where scheduled, provide a request to exit (RX) switch that detects rotation of the inside lever.
f. Connections – provide standard quick-connect system.
g. UL Listed – 3 hour fire door

7. Lever Trim: Solid stainless steel, cast or forged in design specified, with wrought roses and external lever spring cages. Provide thru-bolted levers with 2-piece spindles.
    a. Lever Design: Schlage LV9000 02A
    b. Corbin-Russwin ML2000 series
    c. Best 45H series
    d. Or approved equal

8. Tactile Warning (Knurling): Where required, provide on levers on exterior (secure side) of doors serving rooms considered to be hazardous.

2.13 AUXILIARY LOCKS:

A. Deadlocks:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Schlage L400 series
    b. Arrow D series
    c. Best 38H series
    d. Falcon MA series
    e. Or approved equal

2. Requirements:

    a. Provide mortise deadlock series conforming to ANSI/BHMA A156 and function as specified. Cylinders: Refer to "KEYING" article, herein.
    b. Provide deadlocks with standard 2-3/4 inches (70 mm) backset. Provide deadbolt with full 1 inch (25 mm) throw, constructed of stainless steel.
    c. Provide manufacturer's standard strike.

2.14 EXIT DEVICES:

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Von Duprin 98/35A series
2. Sargent 19-43-GL-80 series
3. Precision Apex series
4. Or approved equal

B. Requirements:

1. Provide exit devices tested to ANSI/BHMA A156.3 Grade 1, and UL listed for Panic Exit or Fire Exit Hardware. Cylinders: Refer to "KEYING" article, herein.
2. Provide touchpad type exit devices, fabricated of stainless steel, or aluminum, plated to standard architectural finishes to match balance of door hardware.
3. Touchpad: Extend minimum of one half of door width. Match exit device finish, stainless steel for US26, US26D, US28, US32, and US32D finishes; and for all other finishes, provide compatible finish to exit device. No plastic inserts are allowed in touchpads.
4. Provide exit devices with dead latching feature for security and for future addition of alarm kits and/or other electrified requirements.
5. Provide flush end caps for exit devices.
6. Provide exit devices with manufacturer's approved strikes.
7. Provide exit devices cut to door width and height. Install exit devices at height recommended by exit device manufacturer, and approved by the Commissioner.
8. Mount mechanism case flush on face of doors, or provide spacers to fill gaps behind devices. Where glass trim or molding projects off face of door, provide glass bead kits.
9. Provide cylinder dogging at non-fire-rated exit devices.
10. Removable Mullions: 2 inches (51 mm) x 3 inches (76 mm) steel tube. Where scheduled as keyed removable mullion, provide type that can be removed by use of a keyed cylinder, which is self-locking when re-installed.
11. Where lever handles are specified as outside trim for exit devices, provide heavy-duty lever trims with forged or cast escutcheon plates. Provide vandal-resistant levers that will travel to 90-degree down position when more than 35 pounds of torque are applied, and which can easily be re-set.
    a. Lever Style: Match lever style of locksets.
    b. Tactile Warning (Knurling): Where required, provide on levers on exterior (secure side) of doors serving rooms considered to be hazardous.
12. Provide UL labeled fire exit hardware for fire rated openings.
13. Provide factory drilled weep holes for exit devices used in full exterior application, highly corrosive areas, and where noted in hardware sets.
14. Provide electrified options as scheduled.

2.15 ELECTRIC STRIKES:

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Von Duprin 6400 series
2. Folger Adam 300 series
3. HES 1006 series
4. Or approved equal

B. Requirements:

1. Provide electric strikes designed for use with type of locks shown at each opening.
2. Provide electric strikes UL Listed as burglary-resistant.
3. Where required, provide electric strikes UL Listed for fire doors and frames.
4. Provide fail-secure type electric strikes, unless specified otherwise.
5. Coordinate voltage and provide transformers and rectifiers for each strike as required.

2.16 POWER SUPPLIES:

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Schlage or Von Duprin PS900 series
2. Precision ELR series
3. Sargent 3500 series
4. Dynalock 5000 series
5. Securitron BPS series
6. Security Door Controls 600 series
7. Or approved equal

B. Requirements:

1. Provide power supplies, recommended and approved by manufacturer of electrified locking component, for operation of electrified locks, electrified exit devices, magnetic locks, electric strikes, and other components requiring power supply.
2. Provide appropriate quantity of power supplies necessary for proper operation of electrified locking components as recommended by manufacturer of electrified locking components with consideration for each electrified component using power supply, location of power supply, and approved wiring diagrams. Locate power supplies as directed by the Commissioner.
    a. Provide regulated and filtered 24 VDC power supply, and UL class 2 listed.
    b. Options:

    a. Provide power supply, where specified, with internal capability of charging sealed backup batteries 24 VDC, in addition to operating DC load.
    b. Provide sealed batteries for battery back-up at each power supply where specified.
    c. Provide keyed power supply cabinet.

3. Provide power supply in an enclosure, complete, and requiring 120VAC to fused input.
4. Provide power supply with emergency release terminals, where specified, that allow release of all devices upon activation of fire alarm system complete with fire alarm input for initiating "no delay" exiting mode.

2.17 CYLINDERS:

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Schlage
2. Stanley
3. Yale
4. Dorma Kaba

5. Or approved equal

B. Requirements:

1. Provide cylinders/cores, compliant with ANSI/BHMA A156.5; latest revision, Section 12, Grade 1; permanent cylinders; cylinder face finished to match lockset, manufacturer's series as indicated. Refer to "KEYING" article, herein.
2. Provide cylinders in the below-listed configuration(s), distributed throughout the Project as indicated.

    a. Conventional Patented Restricted: cylinder with interchangeable core with patented, restricted keyway.

3. Nickel silver bottom pins.
4. Replaceable Construction Cores.

    a. Provide temporary construction cores replaceable by permanent cores, furnished in accordance with the following requirements.

        i. 3 construction control keys.
        ii. 12 construction change (day) keys.

    b. The Commissioner will replace temporary construction cores with permanent cores.

2.18 KEYING:

A. Provide a factory registered keying system, complying with guidelines in ANSI/BHMA A156.28, incorporating decisions made at keying conference.
B. Requirements:

1. Provide permanent cylinders/cores keyed by the manufacturer according to the following key system.

    a. Master Keying system as directed by the Commissioner.

2. Forward bitting list and keys separately from cylinders, by means as directed by The Commissioner. Failure to comply with forwarding requirements shall be cause for replacement of cylinders/cores involved at no additional cost to The City of New York.
3. Provide keys with the following features:

    a. Material: Nickel silver; minimum thickness of .107-inch (2.3mm).

4. Identification:

    a. Provide concealed key control stamping on cylinder cores.
    b. Provide visual stamping on cut keys.
    c. Identification stamping provisions must be approved by the Commissioner
    d. Failure to comply with stamping requirements shall be cause for replacement of keys involved at no additional cost to the City of New York.

e. Forward permanent cylinders/cores separately from keys, by means as directed by the Commissioner.

5. Quantity: Furnish in the following quantities.

a. Change (Day) Keys: 3 per cylinder/core.
b. Permanent Control Keys: 3.
c. Master Keys: 6.

2.19 DOOR CLOSERS:

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. LCN 4010/4110/4020 series
2. Sargent 281/281P10/281TJ series factory assembled (without PRV)
3. Norton 7500
4. Or approved equal

B. Requirements:

1. Provide door closers conforming to ANSI/BHMA A156.4 Grade 1 requirements by BHMA certified independent testing laboratory. Stamp units with date of manufacture code.
   a. Provide door closers with fully hydraulic, full rack and pinion action with high strength cast iron cylinder, and full complement bearings at shaft.
   b. Cylinder Body: 1-1/2 inch (38 mm) diameter, with 5/8 inch (16 mm) diameter double heat-treated pinion journal.
   c. Hydraulic Fluid: Fireproof, passing requirements of UL10C, and requiring no seasonal closer adjustment for temperatures ranging from 120 degrees F to -30 degrees F.
   d. Spring Power: Continuously adjustable over full range of closer sizes, and providing reduced opening force as required by accessibility codes and standards.
   e. Hydraulic Regulation: By tamper-proof, non-critical valves with separate adjustment for latch speed, general speed, and backcheck.
   f. Provide closers with a solid forged steel main arms and factory assembled heavy-duty forged forearms for parallel arm closers.
   g. Pressure Relief Valve (PRV) Technology: Not permitted.
   h. Finish for Closer Cylinders, Arms, Adapter Plates, and Metal Covers: Powder coating finish which has been certified to exceed 100 hours salt spray testing as described in ANSI/BHMA Standard A156.4 and ASTM B117, or has special rust inhibitor (SRI).
   i. Provide special templates, drop plates, mounting brackets, or adapters for arms as required for details, overhead stops, and other door hardware items interfering with closer mounting.
   j. Provide metal covers for cylinder assemblies. Plastic covers will not be accepted.

2.20 ELECTRO-MECHANICAL AUTOMATIC OPERATORS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. LCN Senior Swing
    a. Besam Swingmaster 900
    b. Horton 4000LE series
    c. Or approved equal

B. Requirements:

1. Provide low energy automatic operator units that are electro-mechanical design complying with ANSI/BHMA A156.19.

    a. Opening: Powered by DC motor working through reduction gears.
    b. Closing: Spring force.
    c. Manual, hydraulic, or chain drive closers: Not permitted.
    d. Operation: Motor is off when door is in closing mode. Door can be manually operated with power on or off without damage to operator. Provide variable adjustments, including opening and closing speed adjustment.
    e. Cover: Aluminum.

2. Provide units with manual off/auto/hold-open switch, push and go function to activate power operator, vestibule interface delay, electric lock delay, hold-open delay adjustable from 2 to 30 seconds, and logic terminal to interface with accessories, mats, and sensors.
3. Provide drop plates, brackets, or adapters for arms as required to suit details.
4. Provide hard-wired motion sensors and/or actuator switches for operation as specified. Provide weather-resistant actuators at exterior applications.
5. Provide key switches, with LED's, recommended and approved by manufacturer of automatic operator as required for function as described in operation description of hardware sets. Cylinders: Refer to "KEYING" article, herein.
6. Provide complete assemblies of controls, switches, power supplies, relays, and parts/material recommended and approved by manufacturer of automatic operator for each individual leaf. Actuators control both doors simultaneously at pairs. Sequence operation of exterior and vestibule doors with automatic operators to allow ingress or egress through both sets of openings as directed by the Commissioner. Locate actuators, key switches, and other controls as directed by the Commissioner.
7. Provide units with inputs for smoke evacuation doors, where specified, which allow doors to power open upon fire alarm activation and hold open indefinitely or until fire alarm is reset, presence detector input, which prevents closed door from opening or door that is fully opened from closing, hold open toggle input, which allows remote activation for indefinite hold open and close second time input is activated, vestibule inputs, which allow sequencing operation of two units, and SPDT relay for interfacing with latching or locking devices.

2.21 DOOR TRIM

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Ives
2. Burns
3. Rockwood
4. Or approved equal

B. Requirements:

1. Provide push plates 4 inches (102 mm) wide by 16 inches (406 mm) high by 0.050 inch (1 mm) thick and beveled 4 edges. Where width of door stile prevents use of 4 inches (102 mm) wide plate, adjust width to fit.
2. Provide push bars of solid bar stock, diameter and length as scheduled. Provide push bars of sufficient length to span from center to center of each stile. Where required, mount back to back with pull.
3. Provide offset pulls of solid bar stock, diameter and length as scheduled. Where required, mount back to back with push bar.
4. Provide flush pulls as scheduled. Where required, provide back-to-back mounted model.
5. Provide pulls of solid bar stock, diameter and length as scheduled. Where required, mount back to back with push bar.
6. Provide pull plates 4 inches (102 mm) wide by 16 inches (406 mm) high by 0.050 inch (1 mm) thick, beveled 4 edges, and prepped for pull. Where width of door stile prevents use of 4 inches (102 mm) wide plate, adjust width to fit.
7. Provide wire pulls of solid bar stock, diameter and length as scheduled.
8. Provide decorative pulls as scheduled. Where required, mount back to back with pull.

2.22 PROTECTION PLATES:

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Ives
2. Burns
3. Rockwood
4. Or approved equal

B. Requirements:

1. Provide kick plates, mop plates, and armor plates minimum of 0.050 inch (1 mm) thick, beveled four edges as scheduled. Furnish with sheet metal or wood screws, finished to match plates.
2. Sizes of plates:

   a. Kick Plates: 10 inches high by 2 inches less width of door on single doors, 1 inch less width of door on pairs.
   b. Mop Plates: 4 inches high by 2 inches less width of door on single doors, 1 inch less width of door on pairs.
   c. Armor Plates: 36 inches high by 2 inches less width of door on single doors, 1 inch less width of door on pairs.

2.23 OVERHEAD STOPS AND OVERHEAD STOP/HOLDERS:

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Glynn-Johnson
2. Rixson
3. Sargent
4. Or approved equal

B. Requirements:

1. Provide heavy duty concealed mounted overhead stop or holder as specified for exterior and interior vestibule single acting doors.
2. Provide heavy duty concealed mounted overhead stop or holder as specified for double acting doors.
3. Provide heavy or medium duty and concealed or surface mounted overhead stop or holder for interior doors as specified. Provide medium duty surface mounted overhead stop for interior doors and at any door that swings more than 140 degrees before striking wall, open against equipment, casework, sidelights, and where conditions do not allow wall stop or floor stop presents tripping hazard.
4. Where overhead holders are specified provide friction type at doors without closer and positive type at doors with closer.

2.24 DOOR STOPS AND HOLDERS:

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Ives
2. Burns
3. Rockwood
4. Or approved equal

B. Provide door stops at each door leaf:

1. Provide wall stops wherever possible. Provide convex type where mortise type locks are used and concave type where cylindrical type locks are used.
2. Where a wall stop cannot be used, provide universal floor stops for low or high rise options.
3. Where wall or floor stop cannot be used, provide medium duty surface mounted overhead stop.

2.25 THRESHOLDS, SEALS, DOOR SWEEPS, AUTOMATIC DOOR BOTTOMS, AND GASKETING:

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Zero International
2. National Guard
3. Reese
4. Or approved equal

B. Requirements:

1. Provide thresholds, weather-stripping (including door sweeps, seals, and astragals) and gasketing systems (including smoke, sound, and light) as specified and per architectural details. Match finish of other items.
2. Size of thresholds:
    a. Saddle Thresholds: 1/2 inch (13 mm) high by jamb width by door width
    b. Bumper Seal Thresholds: 1/2 inch (13 mm) high by 5 inches (127 mm) wide by door width.
3. Provide door sweeps, seals, astragals, and auto door bottoms only of type where resilient or flexible seal strip is easily replaceable and readily available.

2.26 SILENCERS:

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Ives
2. Burns
3. Rockwood
4. Or approved equal

B. Requirements:

1. Provide "push-in" type silencers for hollow metal or wood frames.
2. Provide one silencer per 30 inches (762 mm) of height on each single frame, and two for each pair frame.
3. Omit where gasketing is specified.

PART III- EXECUTION

3.1 EXECUTION REQUIREMENTS:

a. Refer to DDC General Conditions for execution requirements.

3.2 EXAMINATION:

A. Prior to installation of hardware, examine doors and frames, with Installer present, for compliance with requirements for installation tolerances, labeled fire-rated door assembly construction, wall and floor construction, and other conditions affecting performance.

B. Existing Door and Frame Compatibility: Field verify existing doors and frames receiving new hardware and existing conditions receiving new openings. Verify that new hardware is compatible with existing door and frame preparation and existing conditions.

C. Examine roughing-in for electrical power systems to verify actual locations of wiring connections before electrified door hardware installation.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.3 PREPARATION:

A. Where on-site modification of doors and frames is required:

1. Carefully remove existing door hardware and components being reused. Clean, protect, tag, and store in accordance with storage and handling requirements specified herein.
2. Field modify and prepare existing door and frame for new hardware being installed.
3. When modifications are exposed to view, use concealed fasteners, when possible.
4. Prepare hardware locations and reinstall in accordance with installation requirements for new door hardware and with:

a. Steel Doors and Frames: For surface applied door hardware, drill and tap doors and frames according to ANSI/SDI A250.6.
b. Wood Doors: DHI WDHS.5 "Recommended Hardware Reinforcement Locations for Mineral Core Wood Flush Doors."
c. Doors in rated assemblies: NFPA 80 for restrictions on on-site door hardware preparation.

3.4 INSTALLATION:

A. Mounting Heights: Mount door hardware units at heights to comply with the following, unless otherwise indicated.

1. Standard Steel Doors and Frames: ANSI/SDI A250.8.
2. Custom Steel Doors and Frames: HMMA 831.
3. Wood Doors: DHI WDHS.3, "Recommended Locations for Architectural Hardware for Wood Flush Doors."

B. Install each hardware item in compliance with manufacturer's instructions and recommendations, using only fasteners provided by manufacturer.

C. Do not install surface mounted items until finishes have been completed on substrate. Protect all installed hardware during painting.

D. Set units level, plumb and true to line and location. Adjust and reinforce attachment substrate as necessary for proper installation and operation.

E. Drill and countersink units that are not factory prepared for anchorage fasteners. Space fasteners and anchors according to industry standards.

F. Install operating parts so they move freely and smoothly without binding, sticking, or excessive clearance.

G. Hinges: Install types and in quantities indicated in door hardware schedule but not fewer than quantity recommended by manufacturer for application indicated or one hinge for every 30 inches (750 mm) of door height, whichever is more stringent, unless other equivalent means of support for door, such as spring hinges or pivots, are provided.

H. Intermediate Offset Pivots: Where offset pivots are indicated, provide intermediate offset pivots in quantities indicated in door hardware schedule but not fewer than one intermediate offset pivot per door and one additional intermediate offset pivot for every 30 inches (750 mm) of door height greater than 90 inches (2286 mm).

I. Lock Cylinders: Install construction cores to secure building and areas during construction period.

1. Replace construction cores with permanent cores as indicated in keying section.
2. Furnish permanent cores to The Commissioner for installation.

J. Wiring: Coordinate with Division 26, Electrical sections for:

1. Conduit, junction boxes and wire pulls.
2. Connections to and from power supplies to electrified hardware.
3. Connections to fire/smoke alarm system and smoke evacuation system.
4. Connection of wire to door position switches and wire runs to central room or area, as directed by the Commissioner.
5. Testing and labeling wires with the Commissioner's opening number.

K. Key Control System: Tag keys and place them on markers and hooks in key control system cabinet, as determined by final keying schedule.

L. Door Closers: Mount closers on room side of corridor doors, inside of exterior doors, and stair side of stairway doors from corridors. Closers shall not be visible in corridors, lobbies and other public spaces unless approved by the Commissioner.

M. Closer/Holders: Mount closer/holders on room side of corridor doors, inside of exterior doors, and stair side of stairway doors.

N. Power Supplies: Locate power supplies as indicated or, if not indicated, above accessible ceilings or in equipment room, or alternate location as directed by the Commissioner.

O. Thresholds: Set thresholds in full bed of sealant complying with requirements specified in Section 079200 "Interior Joint Sealants" and 079201 "Exterior Joint Sealants."

P. Stops: Provide floor stops for doors unless wall or other type stops are indicated in door hardware schedule. Do not mount floor stops where they may impede traffic or present tripping hazard.
Q. Perimeter Gasketing: Apply to head and jamb, forming seal between door and frame.
R. Meeting Stile Gasketing: Fasten to meeting stiles, forming seal when doors are closed.
S. Door Bottoms: Apply to bottom of door, forming seal with threshold when door is closed.

3.5 FIELD QUALITY CONTROL:

A. Architectural Hardware Consultant: Engage qualified independent Architectural Hardware Consultant to perform inspections and to prepare inspection reports.

1. Architectural Hardware Consultant will inspect door hardware and state in each report whether installed work complies with or deviates from requirements, including whether door hardware is properly installed and adjusted.

3.6 ADJUSTING:

A. Initial Adjustment: Adjust and check each operating item of door hardware and each door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate as intended. Adjust door control devices to compensate for final operation of heating and ventilating equipment and to comply with referenced accessibility requirements.

1. Spring Hinges: Adjust to achieve positive latching when door is allowed to close freely from an open position of 30 degrees.
2. Electric Strikes: Adjust horizontal and vertical alignment of keeper to properly engage lock bolt.
3. Door Closers: Adjust sweep period to comply with accessibility requirements.

B. Occupancy Adjustment: Approximately three months after date of Substantial Completion, Installer's Architectural Hardware Consultant shall examine and readjust each item of door hardware, including adjusting operating forces, as necessary to ensure function of doors, door hardware, and electrified door hardware.

3.7 CLEANING AND PROTECTION:

A. Clean adjacent surfaces soiled by door hardware installation.
B. Clean operating items as necessary to restore proper function and finish.
C. Provide final protection and maintain conditions that ensure door hardware is without damage or deterioration at time of Substantial Completion.

3.8 INSTRUCTION:

A. Provide instruction for the City of New York's operating personnel to adjust, operate, and maintain door hardware and door hardware finishes.

3.9 DOOR HARDWARE SCHEDULE

A. Locksets, exit devices, and other hardware items are referenced in the following hardware sets for series, type and function. Refer to the above-specifications for special features, options, cylinders/keying, and other requirements.
B. Hardware Sets: Refer to Section 080701 Door Hardware Schedule.

END OF SECTION 08 71 00

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SECTION 08 71 01
Door Hardware Schedule

PART I - GENERAL

1.1 RELATED DOCUMENTS

A. The following documents apply to all required work for the Project: (1) the Contract Drawings, (2) the Specifications, (3) the General Conditions, (4) the Addendum and (5) the Contract (City of New York Standard Construction Contract).

B. LEED / Environmentally Preferable Purchase (EPP) General Requirements:

1. Refer to DDC General Conditions and the Addendum to the General Conditions

2. LEED requirements apply to all Phase II work with the exception of the Existing Building scope. EPP requirements apply to the project's Existing Building scope only.

1.2 SUMMARY

A. Section includes:

1. Door Hardware Schedule

B. Related Sections

1. Section 08 71 00 Door Hardware

1.3 QUALITY ASSURANCE

A. Refer to DDC General Conditions Section 01 40 00 "Quality Requirements".

1.4 SUBMITTAL PROCEDURES

A. Refer to DDC General Conditions Section 01 33 00 "Submittal Procedures".

PART II – PRODUCTS

A. Door hardware schedule includes basis of design manufacturers only. Additional manufacturers are included in 08 71 00 Door Hardware.

B. Hardware for New Buildings (A1)

1. **Hardware Group No. 01** – Exterior Storefront Entrance – Card Reader – Pair Doors

a. Provide each PR door(s) with the following:

Qty		Description	Catalog Number	Finish	Mfr
2	EA	Concealed Floor Closer	By Storefront	-	-

2	EA	Top Pivot	By Storefront	-	-
2	EA	Bottom Pivot	By Storefront	-	-
2	EA	Panic Exit Device	DB-100-JS	SS	CRL
2	EA	Locking Ladder Pull	DB-100-JS	SS	CRL
2	EA	Mortise Cylinder			
2	EA	Electric Strike	6400 FSE	630	VON
1	EA	Integral Gasketing	By Storefront	-	-
2	EA	Door Bottom	328AA-S	AA	ZER
2	EA	Stile Gasketing	328AA-S	AA	ZER
1	EA	Perimeter Gasketing	8878AA-S	AA	ZER
1	EA	Threshold	655BK-V3-223	BK	ZER
1	EA	Power Supply			
2	EA	Door Position Switch	DPS-M	BK	ASSA
1	EA	Card Reader	By Security	-	-

b. Door Functions: Doors normally locked and secure. Presenting valid credentials retracts electric strike allowing entrance. In case of power failure or fire alarm, doors will be locked and secure with keyed entry override. Doors always available for free egress.

c. Notes: Electric strike mounted in header bar.

2. **Hardware Group No. 01A** – Exterior Storefront Entrance – Pair Doors Curtain

a. Provide each PR door(s) with the following:

Qty		Description	Catalog Number	Finish	Mfr
2	EA	Concealed Floor Closer	By Storefront	-	-
2	EA	Top Pivot	By Storefront	-	-
2	EA	Bottom Pivot	By Storefront	-	-
2	EA	Panic Exit Device	DB-100-JS	SS	CRL
2	EA	Locking Ladder Pull	DB-100-JS	SS	CRL
2	EA	Mortise Cylinder			
2	EA	Integral Gasketing	By Storefront	-	-
2	EA	Door Bottom	328AA-S	AA	ZER
2	EA	Stile Gasketing	328AA-S	AA	ZER
1	EA	Perimeter Gasketing	8878AA-S	AA	ZER
1	EA	Threshold	655BK-V3-223	BK	ZER

b. Door Functions: Doors always unlocked for free ingress/egress

3. **Hardware Group No. 02** – Not Used

4. **Hardware Group No. 03** – Exterior Exit

a. Provide each SGL door(s) with the following:

Qty		Description	Catalog Number	Finish	Mfr
1	EA	Cont. Hinge	157XY	710	IVE

1	EA	Exit Device	9875-L-NL-02	US32D	VON
1	EA	Rim Cylinder			
1	EA	Surface Closer	4111-SCUSH	BK	LCN
1	EA	Overhead Stop	90S-SPBLK	BLK	GLY
1	EA	Kickplate	8400 10" x 2" LDW	BLK	IVE
1	EA	Threshold	655BK-V3-223	BK	ZER
1	EA	Gasketing	328BK-S	BK	ZER
1	EA	Weather Stripping	488S	BK	ZER
1	EA	Door Bottom	355AA	AA	ZER

b. Notes: Surface closer on interior (room) side.

c. Door Functions: Doors normally locked and secure, allowing free egress only. Outside lever is always inoperable. Exterior trim provided for keyed entry during emergencies.

5. **Hardware Group No. 04** – Exterior Exit – Card Reader

a. Provide each SGL door(s) with the following:

Qty		Description	Catalog Number	Finish	Mfr
1	EA	Cont. Hinge	157XY	710	IVE
1	EA	Mortise Lockset	LV9080T 02A	630	SCH
1	EA	FSIC Core			
1	EA	Electric Strike	6400 FSE	630	VON
1	EA	Surface Closer	4111-SCUSH	BK	LCN
1	EA	Overhead Stop	90S-SPBLK	BLK	GLY
1	EA	Kickplate	8400 10" x 2" LDW	BLK	IVE
1	EA	Threshold	655BK-V3-223	BK	ZER
1	EA	Gasketing	328BK-S	BK	ZER
1	EA	Weather Stripping	488S	BK	ZER
1	EA	Door Bottom	355AA	AA	ZER
1	EA	Power Supply			
2	EA	Door Position Switch	DPS-M	BK	ASSA
1	EA	Card Reader	By Security	-	-

b. Notes: Surface closer on interior (room) side.

c. Door Functions: Doors normally locked and secure. Presenting valid credentials retracts electric strike allowing entrance. In case of power failure or fire alarm, doors will be locked and secure with keyed entry override. Outside lever is always inoperable. Doors always available for free egress.

6. **Hardware Group No. 05** – Exterior Exit

a. Provide each SGL door(s) with the following:

Qty		Description	Catalog Number	Finish	Mfr
1	EA	Cont. Hinge	157XY	710	IVE
1	EA	Mortise Lockset	LV9080T 02A	630	SCH

1	EA	FSIC Core			
1	EA	Surface Closer	4111-SCUSH	BK	LCN
1	EA	Overhead Stop	90S-SPBLK	BLK	GLY
1	EA	Kickplate	8400 10" x 2" LDW	BLK	IVE
1	EA	Threshold	655BK-V3-223	BK	ZER
1	EA	Gasketing	328BK-S	BK	ZER
1	EA	Door Bottom	355AA	AA	ZER

b. Notes: Surface closer on interior (room) side.

c. Door Functions: Doors normally locked and secure, allowing free egress only. Outside lever is always inoperable. Exterior trim provided for keyed entry during emergencies.

7. **Hardware Group No. 06** – Exterior Entrance

a. Provide each SGL door(s) with the following:

Qty		Description	Catalog Number	Finish	Mfr
1	EA	Cont. Hinge	157XY	710	IVE
1	EA	Exit Device	9875-L-02	630	VON
1	EA	Rim Cylinder			
1	EA	Surface Closer	4111-SCUSH	BK	LCN
1	EA	Overhead Stop	90S-SPBLK	BLK	GLY
1	EA	Kickplate	8400 10" x 2" LDW	BLK	IVE
1	EA	Threshold	655BK-V3-223	BK	ZER
1	EA	Gasketing	328BK-S	BK	ZER
1	EA	Door Bottom	355AA	AA	ZER

b. Notes: Lever style to match project standard Schlage L Standard Series #02 (refer to 08 71 00 Door Hardware for additional manufacturers and approved equal). Surface closer on interior (room) side.

c. Door Functions: Doors normally locked and secure. Doors always available for free egress.

8. **Hardware Group No. 07** – Interior Storefront Entrance – Passage – Pair Doors

a. Provide each PR door(s) with the following:

Qty		Description	Catalog Number	Finish	Mfr
2	EA	Concealed Floor Closer	By Storefront	-	-
2	EA	Top Pivot	By Storefront	-	-
2	EA	Bottom Pivot	By Storefront	-	-
4	EA	Ladder Pull	By Storefront	-	-
1	EA	Gasketing	By Storefront	-	-
1	EA	Threshold	655BK-V3-223	BK	ZER

b. Door Functions: Doors always unlocked for free ingress/egress.

9. **Hardware Group No. 08** – Interior 60-Min. Fire-Rated Storefront Entrance – Pair Doors

   a. Provide each PR door(s) with the following:

Qty		Description	Catalog Number	Finish	Mfr
8	EA	Hinges	By Storefront	-	-
2	EA	Surface Closer	By Storefront	-	-
2	EA	Fire Exit Device	By Storefront	-	-
1	EA	Gasketing	By Storefront	-	-

   b. Notes: Refer to Fire-Rated Aluminum Storefront Entrance Specs. Lever style to match project standard Schlage L Standard Series #02 (refer to 08 71 00 Door Hardware for additional manufacturers and approved equal). Surface closer on interior stair room side.

   c. Door Functions: Doors always unlocked for free ingress/egress.

10. **Hardware Group No. 09** – Office – Card Reader

   a. Provide each SGL door(s) with the following:

Qty		Description	Catalog Number	Finish	Mfr
4	EA	Hinge	5BB1 4.5 X 4.5 NRP	631	IVE
1	EA	Mortise Lockset	LV9080T 02A	630	SCH
1	EA	FSIC Core			
1	EA	Electric Strike	6400 FSE	630	VON
1	EA	Surface Closer w/ Stop	4111-SCUSH	BK	LCN
1	EA	Kickplate	8400 10" x 2" LDW	BLK	IVE
1	EA	Gasketing	328BK-S	BK	ZER
1	EA	Door Bottom	355AA	AA	ZER
1	EA	Power Supply			
1	EA	Door Position Switch	DPS-M	BK	ASSA
1	EA	Card Reader	By Security	-	-

   b. Note: Surface closer on interior office room side.

   c. Door Functions: Doors normally locked and secure. Presenting valid credentials retracts electric strike allowing entrance. In case of power failure or fire alarm, doors will be locked and secure with keyed entry override. Outside lever is always inoperable. Doors always available for free egress.

11. **Hardware Group No. 09A** – Office – Card Reader

   a. Same as above No. 09 except provide each SGL door(s) with the following:

Qty		Description	Catalog Number	Finish	Mfr
1	EA	Surface Closer w/ HO	4111-SHCUSH	BK	LCN

b. Notes: Provide surface closer with integral hold-open and stop at 90 degrees, mounted on pull-side of the opening in lieu of on push-side as specified in Hardware Group No. 09 above. Surface closer on interior office room side.

c. Door Functions: Doors normally locked and secure. Presenting valid credentials retracts electric strike allowing entrance. In case of power failure or fire alarm, doors will be locked and secure with keyed entry override. Doors always available for free egress on the pull side.

12. **Hardware Group No. 10** – Office

a. Provide each SGL door(s) with the following:

Qty		Description	Catalog Number	Finish	Mfr
3	EA	Hinge	5BB1 4.5 X 4.5 NRP	652	IVE
1	EA	Mortise Lockset	LV9070T 02A	630	SCH
1	EA	FSIC Core			
1	EA	Kickplate	8400 10" x 2" LDW	630	IVE
3	EA	Silencers	SR64	GRY	IVE
1	EA	Door Stop	FS410	626	IVE

b. Door Functions: Doors normally locked and secure. Outside lever remains unlocked until relocked by key. Doors always available for free egress.

13. **Hardware Group No. 10A** – Office

a. Same as above No. 10 except provide each SGL door(s) with the following:

Qty		Description	Catalog Number	Finish	Mfr
1	EA	Surface Closer	4011	689	LCN

b. Notes: Provide surface closer, mounted on interior office room side.

14. **Hardware Group No. 11** – Interior Storefront Entrance – Office

a. Provide each SGL door(s) with the following:

Qty		Description	Catalog Number	Finish	Mfr
4	EA	Hinge	5BB1 4.5 X 4.5 NRP	652	IVE
1	EA	Mortise Lockset	LV9070T 02A	630	SCH
1	EA	FSIC Core			
1	EA	Gasketing	By Storefront	-	-
1	EA	Door Stop	FS410	626	IVE

b. Door Functions: Doors normally locked and secure. Outside lever remains unlocked until relocked by key. Doors always available for free egress.

15. **Hardware Group No. 11A** – Interior Storefront Entrance – Office

a. Provide each SGL door(s) with the following:

Qty		Description	Catalog Number	Finish	Mfr
1	EA	Surface Closer	4011	689	LCN

b. Notes: Provide surface closer, mounted on interior office room side.

16. **Hardware Group No. 12** – Storage – Pair Doors

a. Provide each PR door(s) with the following:

Qty		Description	Catalog Number	Finish	Mfr
6	EA	Hinge	5BB1 4.5 X 4.5 NRP	652	IVE
1	EA	Const. Latch Flush Bolt	FB51T	630	IVE
1	EA	Mortise Lockset	LV9070T 02A	630	SCH
1	EA	FSIC Core			
2	EA	Silencers	SR64	GRY	IVE

b. Door Functions: Doors normally locked and secure. Outside lever remains unlocked until relocked by key. Doors always available for free egress.

17. **Hardware Group No. 13** – Storage

a. Provide each SGL door(s) with the following:

Qty		Description	Catalog Number	Finish	Mfr
3	EA	Hinge	5BB1 4.5 X 4.5 NRP	652	IVE
1	EA	Mortise Lockset	LV9080T 02A	630	SCH
1	EA	FSIC Core			
3	EA	Silencers	SR64	GRY	IVE
1	EA	Wall Stop	WS406/407CCV	630	IVE

b. Door Functions: Doors normally locked and secure. Outside lever is always inoperable. Doors always available for free egress.

18. **Hardware Group No. 13A** – 60 or 90-Min. Fire-Rated – Storage

a. Same as above No. 13 except provide each SGL door(s) with the following:

Qty		Description	Catalog Number	Finish	Mfr
1	EA	Surface Closer	4011	689	LCN

1	EA	Gasketing	328AA-S	AA	ZER
1	EA	Door Bottom	355AA	AA	ZER

b. Notes: Provide surface closer, mounted on interior room side and fire-gasketing. Surface closer on interior storage room side.

19. **Hardware Group No. 14** – Single Occupant Restroom

a. Provide each SGL door(s) with the following:

Qty		Description	Catalog Number	Finish	Mfr
3	EA	Hinge	5BB1 4.5 X 4.5 NRP	652	IVE
1	EA	Mortise Lockset	L9496T 02A	630	SCH
1	EA	FSIC Core			
1	EA	Surface Closer	4011	689	LCN
1	EA	Kickplate	8400 10" x 2" LDW	630	IVE
3	EA	Silencers	SR64	GRY	IVE
1	EA	Wall Stop	WS443/WS447	626	IVE

b. Notes: Surface closer on interior restroom side.

c. Door Functions: Passage set with deadbolt and occupancy indicator. Doors always available for free egress.

20. **Hardware Group No. 14A** – Single Occupant Restroom

a. Same as above No. 14 except provide each SGL door(s) with the following:

Qty		Description	Catalog Number	Finish	Mfr
1	EA	Surface Closer w/ Stop	4111-SCUSH	BK	LCN

b. Notes: Provide surface closer with integral stop in lieu of surface closer and wall stop as specified in Hardware Group No. 14 above. Surface closer on interior restroom side.

21. **Hardware Group No. 15** – Locker Room

a. Provide each SGL door(s) with the following:

Qty		Description	Catalog Number	Finish	Mfr
3	EA	Hinge	5BB1 4.5 X 4.5 NRP	652	IVE
1	EA	Mortise Lockset	L9465T 02A	630	SCH
1	EA	FSIC Core			
1	EA	Surface Closer	4011	689	LCN
1	EA	Kickplate	8400 10" x 2" LDW	630	IVE
3	EA	Silencers	SR64	GRY	IVE
1	EA	Wall Stop	WS443/WS447	626	IVE

b. Notes: Surface closer on interior locker room side.
c. Door Functions: Doors normally unlocked during normal business hours and locked and secure with keyed entry override after hours. Outside lever is always operable; deadbolt by key. Doors always available for free egress.

22. **Hardware Group No. 16** – Locker Room - Vestibule

a. Provide each SGL door(s) with the following:

Qty		Description	Catalog Number	Finish	Mfr
3	EA	Hinge	5BB1 4.5 X 4.5 NRP	652	IVE
1	EA	Passage Leverset	L9010T 02A	630	SCH
1	EA	Surface Closer	4011	689	LCN
1	EA	Kickplate	8400 10" x 2" LDW	630	IVE
3	EA	Silencers	SR64	GRY	IVE
1	EA	Wall Stop	WS443/WS447	626	IVE

b. Notes: Surface closer on interior vestibule room side.
c. Door Functions: Doors always unlocked and available for free ingress/egress. Passage leverset with solid strike plate and latchbolt retracted, allowing handle to turn without latching closed.

23. **Hardware Group No. 17** – Janitor's Closet

a. Provide each SGL door(s) with the following:

Qty		Description	Catalog Number	Finish	Mfr
3	EA	Hinge	5BB1 4.5 X 4.5 NRP	652	IVE
1	EA	Mortise Lockset	LV9080T 02A	630	SCH
1	EA	Surface Closer w/ Hold	4111-SHCUSH	689	LCN
1	EA	Kickplate	8400 10" x 2" LDW	630	IVE
3	EA	Silencers	SR64	GRY	IVE

b. Notes: Surface closer on interior janitor's closet room side.
c. Door Functions: Doors normally locked and secure. Doors always available for free egress. Outside lever is always inoperable. Surface closer with integral hold-open and stop at 105 degrees.

24. **Hardware Group No. 17A** – Janitor's Closet

a. Same as above No. 17 except provide each SGL door(s) with the following:

Qty		Description	Catalog Number	Finish	Mfr
1	EA	Surface Closer	4111	689	LCN
1	EA	Wall Stop	WS406/407CCV	630	IVE

b. Notes: Provide surface closer and wall stop in lieu of surface closer with integrated hold-open and stop at 105 as specified in Hardware Group No. 17 above. Surface closer on interior janitor's closet room side.

25. **Hardware Group No. 18** – 90-Min. Fire-Rated – Mechanical Room

a. Provide each SGL door(s) with the following:

Qty		Description	Catalog Number	Finish	Mfr
3	EA	Hinge	5BB1 4.5 X 4.5 NRP	652	IVE
1	EA	Mortise Lockset	LV9080T 02A	630	SCH
1	EA	Surface Closer w/ Stop	4111-SCUSH	689	LCN
1	EA	Armor Plate	8400 36" x 2" LDW	630	IVE
3	EA	Silencers	SR64	GRY	IVE
1	EA	Gasketing	328AA-S	AA	ZER
1	EA	Door Bottom	355AA	AA	ZER

b. Notes: Surface closer on interior mechanical room side.
c. Door Functions: Doors normally locked and secure. Outside lever is always inoperable. Doors always available for free egress.

26. **Hardware Group No. 18A** – 90-Min. Fire-Rated – Mechanical Room

a. Same as above No. 18 except provide each SGL door(s) with the following:

Qty		Description	Catalog Number	Finish	Mfr
1	EA	Surface Closer	4011	689	LCN
1	EA	Wall Stop	WS406/407CCV	630	IVE

b. Notes: Provide surface closer and wall stop in lieu of surface closer with integral stop as specified in Hardware Group No. 18 above. Surface closer on interior mechanical room side.

27. **Hardware Group No. 19** – 90-Min. Fire-Rated – Stair Entrance

a. Provide each SGL door(s) with the following:

Qty		Description	Catalog Number	Finish	Mfr
3	EA	Hinge	5BB1 4.5 X 4.5 NRP	652	IVE
1	EA	Mortise Lockset	LV9070T 02A	630	SCH
1	EA	Surface Closer	4011	689	LCN
1	EA	Kickplate	8400 10" x 2" LDW	630	IVE
3	EA	Silencers	SR64	GRY	IVE
1	EA	Perimeter Gasketing	8878AA-S	AA	ZER
1	EA	Door Bottom	355AA	AA	ZER

b. Notes: Surface closer on interior stair room side.
c. Door Functions: Doors normally locked and secure. Outside lever remains unlocked until relocked by key. Doors always available for free egress.

28. **Hardware Group No. 19A** – 90-Min. Fire-Rated – Stair Entrance

a. Same as above No. 19 except provide each SGL door(s) with the following:

Qty		Description	Catalog Number	Finish	Mfr
1	EA	Wall Stop	WS406/407CCV	630	IVE

b. Notes: Provide wall stop.

29. **Hardware Group No. 19B** – 90-Min. Fire-Rated – Stair Entrance

a. Same as above No. 19 except provide each SGL door(s) with the following:

Qty		Description	Catalog Number	Finish	Mfr
1	EA	Passage Leverset	L9010T 02A	630	SCH
1	EA	Wall Stop	WS406/407CCV	630	IVE

b. Notes: Provide passage leverset in lieu of mortise lockset as specified in Hardware Group No. 19 above.
c. Door Functions: Doors unlocked and always available for free ingress/egress.

30. **Hardware Group No. 19C** – 90-Min. Fire-Rated – Boiler Room Exit

a. Same as above No. 19 except provide each SGL door(s) with the following:

Qty		Description	Catalog Number	Finish	Mfr
1	EA	Mortise Lockset	LV9080T 02A	630	SCH

b. Notes: Provide storeroom-function mortise lockset in lieu of mortise lockset and remove kickplate as specified in Hardware Group No. 19 above.
c. Door Functions: Doors normally locked and secure. Outside lever is always inoperable. Doors always available for free egress.

31. **Hardware Group No. 20** – 90-Min. Fire-Rated – Mechanical Room Exit

a. Provide each SGL door(s) with the following:

Qty		Description	Catalog Number	Finish	Mfr
3	EA	Hinge	5BB1 4.5 X 4.5 NRP	652	IVE
1	EA	Fire Exit Device	9875-L-02-F	US32D	VON
1	EA	Surface Closer	4011	689	LCN
1	EA	Armor Plate	8400 36" x 2" LDW	630	IVE
3	EA	Silencers	SR64	GRY	IVE
1	EA	Gasketing	328AA-S	AA	ZER
1	EA	Door Bottom	355AA	AA	ZER

1	EA	Wall Stop	WS406/407CCV	630	IVE

b. Notes: Surface closer on interior mechanical room side.
c. Door Functions: Doors normally locked and secure. Outside lever remains unlocked until relocked by key. Doors always available for free egress.

32. **Hardware Group No. 21** – 45-Min. Fire-Rated Repair Shop Exit Door

a. Provide each SGL door(s) with the following:

Qty		Description	Catalog Number	Finish	Mfr
1	EA	Cont. Hinge	157XY	628	IVE
1	EA	Fire Exit Device	9875-L-02-F	US32D	VON
1	EA	Surface Closer w/ Stop	4111-SCUSH	689	LCN
1	EA	Armor Plate	8400 36" x 2" LDW	630	IVE
3	EA	Silencers	SR64	GRY	IVE
1	EA	Gasketing	328AA-S	AA	ZER
1	EA	Door Bottom	355AA	AA	ZER

b. Notes: Surface closer on interior repair shop room side.
c. Door Functions: Doors normally locked and secure. Outside lever remains unlocked until relocked by key. Doors always available for free egress.

33. **Hardware Group No. 21A** – 45-Min. Fire-Rated – Repair Shop Exit

a. Same as above No. 21 except provide each SGL door(s) with the following:

Qty		Description	Catalog Number	Finish	Mfr
1	EA	Surface Closer	4011	689	LCN
1	EA	Wall Stop	WS406/407CCV	630	IVE

b. Notes: Provide surface closer and wall stop in lieu of surface closer with integral stop as specified in Hardware Group No. 21 above. Surface closer on interior repair shop room side.

34. **Hardware Group No. 22** – 45-Min. Fire-Rated – Office – Card Reader

a. Provide each SGL door(s) with the following:

Qty		Description	Catalog Number	Finish	Mfr
3	EA	Hinge	5BB1 4.5 X 4.5 NRP	652	IVE
1	EA	Mortise Lockset	LV9080T 02A	630	SCH
1	EA	FSIC Core			
1	EA	Electric Strike	6400 FSE	630	VON
1	EA	Surface Closer	4011	689	LCN
1	EA	Kickplate	8400 10" x 2" LDW	630	IVE
3	EA	Silencers	SR64	GRY	IVE
1	EA	Gasketing	328AA-S	AA	ZER

1	EA	Weather Stripping	488S	BK	ZER
1	EA	Door Bottom	355AA	AA	ZER
1	EA	Wall Stop	WS443/WS447	626	IVE
1	EA	Power Supply			
1	EA	Door Position Switch	DPS-M	BK	ASSA
1	EA	Card Reader	By Security	-	-

b. Notes: Surface closer on interior office room side.

c. Door Functions: Doors normally locked and secure. Presenting valid credentials retracts electric strike allowing entrance. In case of power failure or fire alarm, doors will be locked and secure with keyed entry override. Outside lever is always inoperable. Doors always available for free egress on the pull side.

35. **Hardware Group No. 23** – Storage – Card Reader – Pair Doors

a. Provide each PR door(s) with the following:

Qty		Description	Catalog Number	Finish	Mfr
8	EA	Hinge	5BB1 4.5 X 4.5 NRP	652	IVE
1	EA	Auto. Comb. Flush Bolts	FB458	630	IVE
1	EA	Dust Proof Strike	DP2	626	IVE
1	EA	Coordinator	COR X FL	628	IVE
1	EA	Electrified Lockset	L9092EU 02A	630	SCH
1	EA	FSIC Core			
1	EA	Surface Closer w/ Stop	4111-SCUSH	689	LCN
2	EA	Armor Plate	8400 36" x 2" LDW	630	IVE
2	EA	Silencers	SR64	GRY	IVE
1	EA	Power Transfer	EPT10 CON	689	VON
1	EA	Power Supply			
1	EA	Door Position Switch	DPS-M	BK	ASSA
1	EA	Card Reader	By Security	-	-

b. Note: Surface closer on interior storage room side.

c. Door Functions: Doors normally locked and secure. Presenting valid credentials retracts electric strike allowing entrance. In case of power failure or fire alarm, doors will be locked and secure with keyed entry override. Outside lever is always inoperable. Active leaf of doors always available for free egress.

36. **Hardware Group No. 24** – Interior Storefront Entrance – Office – Card Reader

a. Provide each SGL door(s) with the following:

Qty		Description	Catalog Number	Finish	Mfr
4	EA	Hinge	5BB1 4.5 X 4.5 NRP	652	IVE
1	EA	Mortise Lockset	LV9080T 02A	630	SCH

1	EA	FSIC Core			
1	EA	Electric Strike	6400 FSE	630	VON
1	EA	Surface Closer	4011	689	LCN
1	EA	Integral Gasketing	By Storefront	-	-
1	EA	Door Bottom	328AA-S	AA	ZER
1	EA	Perimeter Gasketing	8878AA-S	AA	ZER
1	EA	Wall Stop	WS443/WS447	626	IVE
1	EA	Power Supply			
1	EA	Door Position Switch	DPS-M	BK	ASSA
1	EA	Card Reader	By Security	-	-

b. Notes: Surface closer on interior office room side.

c. Door Functions: Doors normally locked and secure. Presenting valid credentials retracts electric strike allowing entrance. In case of power failure or fire alarm, doors will be locked and secure with keyed entry override. Outside lever is always inoperable. Doors always available for free egress.

37. **Hardware Group No. 25** – Storage – Card Reader

a. Provide each SGL door(s) with the following:

Qty		Description	Catalog Number	Finish	Mfr
4	EA	Hinge	5BB1 4.5 X 4.5 NRP	652	IVE
1	EA	Mortise Lockset	LV9080T 02A	630	SCH
1	EA	FSIC Core			
1	EA	Electric Strike	6400 FSE	630	VON
1	EA	Surface Closer	4011	689	LCN
1	EA	Armor Plate	8400 36" x 2" LDW	630	IVE
3	EA	Silencers	SR64	GRY	IVE
1	EA	Wall Stop	WS406/407CCV	630	IVE
1	EA	Power Supply			
1	EA	Door Position Switch	DPS-M	BK	ASSA
1	EA	Card Reader	By Security	-	-

b. Notes: Surface closer on interior storage room side.

c. Door Functions: Doors normally locked and secure. Presenting valid credentials retracts electric strike allowing entrance. In case of power failure or fire alarm, doors will be locked and secure with keyed entry override. Outside lever is always inoperable. Doors always available for free egress on the pull side.

38. **Hardware Group No. 26** – Storage

a. Provide each SGL door(s) with the following:

Qty	Description	Catalog Number	Finish	Mfr

4	EA	Hinge	5BB1 4.5 X 4.5 NRP	652	IVE
1	EA	Mortise Lockset	LV9070T 02A	630	SCH
1	EA	FSIC Core			
1	EA	Surface Closer	4011	689	LCN
1	EA	Armor Plate	8400 36" x 2" LDW	630	IVE
3	EA	Silencers	SR64	GRY	IVE
1	EA	Wall Stop	WS406/407CCV	630	IVE

b. Notes: Surface closer on interior storage room side.

c. Door Functions: Doors normally locked and secure. Outside lever remains unlocked until relocked by key. Doors always available for free egress.

39. **Hardware Group No. 27** – Training

a. Provide each SGL door(s) with the following:

Qty		Description	Catalog Number	Finish	Mfr
3	EA	Heavy Duty Hinge	5BB1HW 4.5 X 4.5 NRP	652	IVE
1	EA	Mortise Lockset	LV9070T 02A	630	SCH
1	EA	FSIC Core			
3	EA	Silencers	SR64	GRY	IVE
1	EA	Wall Stop	WS406/407CCV	630	IVE

b. Door Functions: Doors normally locked and secure. Outside lever remains unlocked until relocked by key. Doors always available for free egress.

40. **Hardware Group No. 28** – 90-Min. Fire-Rated Mech. Access Corridor

a. Provide each SGL door(s) with the following:

Qty		Description	Catalog Number	Finish	Mfr
4	EA	Heavy Duty Hinge	5BB1HW 4.5 X 4.5 NRP	652	IVE
1	EA	Mortise Lockset	LV9080T 02A	630	SCH
1	EA	FSIC Core			
1	EA	Surface Closer	4011	689	LCN
1	EA	Armor Plate	8400 36" x 2" LDW	630	IVE
1	EA	Gasketing	328AA-S	AA	ZER
1	EA	Door Bottom	355AA	AA	ZER
1	EA	Wall Stop	WS406/407CCV	630	IVE

b. Notes: Surface closer on corridor side.

c. Door Functions: Doors normally locked and secure from both sides. Outside lever is always inoperable. Doors are not available for free egress and are for secured access only.

41. **Hardware Group No. 29** – Exterior Rooftop

a. Provide each SGL door(s) with the following:

Qty		Description	Catalog Number	Finish	Mfr
4	EA	Heavy Duty Hinge	5BB1HW 4.5 X 4.5 NRP	652	IVE
1	EA	Mortise Lockset	LV9080T 02A	630	SCH
1	EA	FSIC Core			
1	EA	Surface Closer w/ Stop	4111-SCUSH	689	LCN
1	EA	Armor Plate	8400 36" x 2" LDW	630	IVE
1	EA	Gasketing	328AA-S	AA	ZER
1	EA	Door Bottom	355AA	AA	ZER

b. Notes: Surface closer on interior (room) side.

c. Door Functions: Doors normally locked and secure from both sides. Outside lever is always inoperable. Doors are not available for free egress and are for secured access only.

42. **Hardware Group No. 50** – Exterior Overhead and Rapid Roll Door

a. Provide each SGL door(s) with the following:

Qty		Description	Mfr
1	EA	Remote-Control Station	By Overhead & Roll-Up Doors
1	EA	Limit Control Switch	By Overhead & Roll-Up Doors
1	EA	Obstruction Sensor	By Overhead & Roll-Up Doors
1	EA	Door Bottom Sensor	By Overhead & Roll-Up Doors
1	EA	Emergency Override	By Overhead & Roll-Up Doors
1	EA	Em. Manual Operation	By Overhead & Roll-Up Doors
1	EA	A-V Signal Alarms	By Overhead & Roll-Up Doors
1	EA	Radio Control System	By Overhead & Roll-Up Doors
1	EA	Door Head Seal	By Overhead & Roll-Up Doors
2	EA	Jamb Weather-Seals	By Overhead & Roll-Up Doors
1	EA	Door Bottom Seal	By Overhead & Roll-Up Doors

b. Notes: Refer to 083323 and 083324 for Overhead Coiling Doors and Roll-Up Door specs.

43. **Hardware Group No. 51** – Interior Repair Bay Overhead Door

a. Provide each SGL door(s) with the following:

Qty		Description	Mfr
1	EA	Remote-Control Station	By Overhead Door
1	EA	Limit Control Switch	By Overhead Door
1	EA	Obstruction Sensor	By Overhead Door
1	EA	Door Bottom Sensor	By Overhead Door
1	EA	Emergency Override	By Overhead Door

1	EA	Em. Manual Operation	By Overhead Door
1	EA	A-V Signal Alarms	By Overhead Door
1	EA	Radio Control System	By Overhead Door
1	EA	Door Head Seal	By Overhead Door
2	EA	Jamb Weather-Seals	By Overhead Door
1	EA	Door Bottom Seal	By Overhead Door

b. Notes: Refer to 083323 for Overhead Coiling Doors specs.

44. **Hardware Group No. 52** – Interior Storage Overhead Door

a. Provide each SGL door(s) with the following:

Qty		Description	Mfr
1	EA	Remote-Control Station	By Overhead Door
1	EA	Limit Control Switch	By Overhead Door
1	EA	Obstruction Sensor	By Overhead Door
1	EA	Door Bottom Sensor	By Overhead Door
1	EA	Emergency Override	By Overhead Door
1	EA	Em. Manual Operation	By Overhead Door
1	EA	A-V Signal Alarms	By Overhead Door
1	EA	Radio Control System	By Overhead Door

b. Notes: Refer to 083323 for Overhead Coiling Doors specs.

C. Hardware for Existing Building (A2):

1. **Hardware Group No. 70** – 60-Min. Fire-Rated – Existing Building (A2) Stair Entrance

a. Provide each SGL door(s) with the following:

Qty		Description	Catalog Number	Finish	Mfr
3	EA	Hinge	5BB1 4.5 X 4.5 NRP	652	IVE
1	EA	Passage Leverset	L9010T 02A	630	SCH
1	EA	Surface Closer	4011	689	LCN
1	EA	Kickplate	8400 10" x 2" LDW	630	IVE
3	EA	Silencers	SR64	GRY	IVE
1	EA	Gasketing	328AA-S	AA	ZER
1	EA	Door Bottom	355AA	AA	ZER
1	EA	Wall Stop	WS406/407CCV	630	IVE

b. Notes: Surface closer on interior stair room side.
c. Door Functions: Door always unlocked for free ingress/egress.

2. **Hardware Group No. 71** – 90-Min. Fire-Rated – Existing Building (A2) Mechanical Room

a. Provide each SGL door(s) with the following:

Qty		Description	Catalog Number	Finish	Mfr
3	EA	Hinge	5BB1 4.5 X 4.5 NRP	652	IVE
1	EA	Mortise Lockset	LV9080T 02A	630	SCH
1	EA	Surface Closer w/ Stop	4111-SCUSH	689	LCN
3	EA	Silencers	SR64	GRY	IVE
1	EA	Gasketing	328AA-S	AA	ZER
1	EA	Door Bottom	355AA	AA	ZER

b. Notes: Surface closer on interior mechanical room side.
c. Door Functions: Doors normally locked and secure. Outside lever is always inoperable. Doors always available for free egress.

3. **Hardware Group No. 72** – 45-Min. Fire-Rated – Existing Building (A2) Office

a. Provide each SGL door(s) with the following:

Qty		Description	Catalog Number	Finish	Mfr
3	EA	Hinge	5BB1 4.5 X 4.5 NRP	652	IVE
1	EA	Mortise Lockset	LV9070T 02A	630	SCH
1	EA	FSIC Core			
1	EA	Kickplate	8400 10" x 2" LDW	630	IVE
3	EA	Silencers	SR64	GRY	IVE
1	EA	Gasketing	328AA-S	AA	ZER
1	EA	Door Bottom	355AA	AA	ZER
1	EA	Door Stop	FS410	626	IVE

b. Door Functions: Doors normally locked and secure. Outside lever remains unlocked until relocked by key. Doors always available for free egress.

4. **Hardware Group No. 73** – Existing Building (A2) Storage

a. Provide each SGL door(s) with the following:

Qty		Description	Catalog Number	Finish	Mfr
3	EA	Hinge	5BB1 4.5 X 4.5 NRP	652	IVE
1	EA	Mortise Lockset	LV9070T 02A	630	SCH
1	EA	Surface Closer w/ Stop	4111-SCUSH	689	LCN
1	EA	Armor Plate	8400 36" x 2" LDW	630	IVE
3	EA	Silencers	SR64	GRY	IVE

b. Notes: Surface closer on interior storage room side.
c. Door Functions: Doors normally locked and secure. Outside lever remains unlocked until relocked by key. Doors always available for free egress.

5. **Hardware Group No. 74** – Existing Building (A2) Storage – Pair Doors

   a. Provide each PR door(s) with the following:

Qty		Description	Catalog Number	Finish	Mfr
8	EA	Hinge	5BB1 4.5 X 4.5 NRP	652	IVE
1	EA	Auto. Comb. Flush Bolts	FB458	630	IVE
1	EA	Dust Proof Strike	DP2	626	IVE
1	EA	Coordinator	COR X FL	628	IVE
1	EA	Mortise Lockset	LV9070T 02A	630	SCH
1	EA	FSIC Core			
1	EA	Surface Closer w/ Stop	4111-SCUSH	689	LCN
2	EA	Armor Plate	8400 36" x 2" LDW	630	IVE
2	EA	Silencers	SR64	GRY	IVE

   b. Note: Surface closer on interior storage room side.
   c. Door Functions: Doors normally locked and secure. Outside lever remains unlocked until relocked by key. Doors always available for free egress.

D. Hardware for Household Goods (A4):

1. **Hardware Group No. 80** – Household Goods (A4) Exterior Door

   a. Provide each SGL door(s) with the following:

Qty		Description	Catalog Number	Finish	Mfr
1	EA	Cont. Hinge	157XY	710	IVE
1	EA	Mortise Lockset	LV9070T 02A	630	SCH
1	EA	FSIC Core			
1	EA	Surface Closer	4111-SCUSH	BK	LCN
1	EA	Overhead Stop	90S-SPBLK	BLK	GLY
1	EA	Kickplate	8400 10" x 2" LDW	BLK	IVE
1	EA	Threshold	655BK-V3-223	BK	ZER
1	EA	Gasketing	328BK-S	BK	ZER
1	EA	Door Bottom	355AA	AA	ZER

2. Notes: Closer on interior (room) side.

3. Door Functions: Doors normally locked and secure. Outside lever remains unlocked until relocked by key. Doors always available for free egress.

PART III - EXECUTION

3.1 EXECUTION REQUIREMENTS

A. Refer to DDC General Conditions for execution requirements.

END OF SECTION 08 71 01

SECTION 08 80 00
Exterior Glazing

PART I - GENERAL

1.1 RELATED DOCUMENTS:

A. The following documents apply to all required work for the Project: (1) the Contract Drawings, (2) the Specifications, (3) the General Conditions, (4) the Addendum, and (5) the Contract (City of New York Standard Construction Contract).

B. LEED General Requirements

1. Refer to DDC General Conditions.

a. Section 01 33 00 – Submittal Procedures.

b. Section 01 81 13.04 – Sustainable Design Requirements for LEED v4 Buildings.

1.2 SUMMARY:

A. This Section includes the Glass and Glazing components for the associated building enclosure systems described in the Building Enclosure System Matrix.

B. Refer to Exterior Glass Type Matrix for a description of the components included in this Section as well as the requirements listed there.

C. This Section requires Engineering Services.

D. This Section incorporates the use of Sealants. Requirements specified in this Section are in addition to those in the following Section:

1. Section 07 92 01 – Exterior Joint Sealants.

2. Section 08 49 00 – Fire Rated Glass and Framing System.

E. The following Sections describe systems and materials that incorporate Glazing, and will require coordinated interfaces.

1. Section 08 40 01 – Glazed Storefronts and Curtain Wall System.

2. Section 08 63 01 – Aluminum-Framed Skylight System.

F. Reference Documents

1. Building Enclosure System Matrix: Refer to Drawing EN1-003.

2. Samples Matrix: Refer to Drawing EN1-003.

3. Exterior Glass Type Matrix: Refer to Drawing EN1-003.

1.3 DEFINITIONS:

A. Referenced System: Building enclosure system in which the Glazing shall be incorporated.

B. Glass Manufacturers: Firms that produce primary Glass, fabricated Glass, or both, as defined in referenced Glazing publications.

C. Glass Thicknesses: Indicated by the nominal SI thickness designations in millimeters according to ASTM C1036.

D. Interspace: Space between lites of an insulating Glass unit (IGU).

E. Sloped Glazing: Glass surfaces sloped more than 15° from vertical.

F. Definitions outlined in ASTM C162 are applicable to this Section.

1.4 REFERENCE STANDARDS AND REGULATIONS:

A. Refer to DDC General Conditions.

B. The Contractor's engineering, materials and workmanship shall comply with 2014 New York City Building Code and 2016 New York City Energy Conservation Code. Where their recommendations or requirements are to a lower standard than required by this Contract Document, the Contract Documents shall take precedence.

C. The Contractor's Engineering, materials, and workmanship shall comply with 2014 New York City Fire Code.

D. Comply with applicable provisions and recommendations of the standards listed below. Where standards conflict or conflict with the provisions of these Specifications, the more stringent shall apply. Unless otherwise noted, the latest editions of the standards shall apply:

1. American Architectural Manufacturers Association (AAMA)

   a. AAMA GDSG-1 – Glass Design for Sloped Glazing.

   b. AAMA TIR-A7 – Sloped Glazing Guidelines.

   c. AAMA 800 – Voluntary Specifications and Test Methods for Sealants.

   d. AAMA 806.1 – Specification for Bonding Type Back Bedding Glazing Tapes for Use with Architectural Aluminum.

   e. AAMA 807.1 – Specification for Oil Extended Cured Rubber Back Bedding Glazing Tapes for Use with Architectural Aluminum.

2. American Society of Civil Engineers (ASCE)

   a. ASCE 7 – Minimum Design Loads for Buildings and Other Structures.

3. American National Standards Institute (ANSI)

a. ANSI Z97.1 – Safety Glazing Materials Used in Buildings – Safety Performance Specifications and Methods of Test.

4. ASTM International (ASTM)

a. ASTM C162 – Terminology of Glass and Glass Products.

b. ASTM C1036 – Standard Specification for Flat Glass.

c. ASTM C1048 – Standard Specification for Heat-Strengthened and Fully Tempered Flat Glass.

d. ASTM C1115 – Standard Specification for Dense Elastomeric Silicone Rubber Gaskets and Accessories.

e. ASTM C1172 – Standard Specification for Laminated Architectural Flat Glass.

f. ASTM C1249 – Standard Guide for Secondary Seal for Sealed Insulating Glass Units for Structural Sealant Glazing Applications.

g. ASTM C1281 – Standard Specification for Preformed Tape Sealants for Glazing Applications.

h. ASTM C1330 – Standard Specification for Cylindrical Sealant Backing for Use with Cold Liquid-Applied Sealants.

i. ASTM C1376 – Standard Specification for Pyrolytic and Vacuum Deposition Coatings on Flat Glass.

j. ASTM C1401 – Standard Guide for Structural Sealant Glazing.

k. ASTM C1464 – Standard Specification for Bent Glass.

l. ASTM D2244 – Standard Practice for Calculation of Color Tolerances and Color Differences from Instrumentally Measured Color Coordinates.

m. ASTM D3363 – Standard Test Method for Film Hardness by Pencil Test.

n. ASTM E546 – Standard Test Method for Frost/Dew Point of Sealed Insulating Glass Units.

o. ASTM E576 – Standard Test Method for Frost/Dew Point of Sealed Insulating Glass Units in the Vertical Position.

p. ASTM E1300 – Standard Practice for Determining Load Resistance of Glass in Buildings.

q. ASTM E2188 – Standard Test Method for Insulating Glass Unit Performance.

r. ASTM E2189 – Standard Test Method for Testing Resistance to Fogging in Insulating Glass Units.

s. ASTM E2190 – Standard Specification for Insulating Glass Unit Performance and Evaluation.

t. ASTM E2269 – Standard Test Method for Determining Argon Concentration in Sealed Insulating Glass Units using Gas Chromatography.

u. ASTM E2649 – Standard Test Method for Determining Argon Concentration in Sealed Insulating Glass Units Using Spark Emission Spectroscopy.

5. Code of Federal Regulations (CFR)

a. 16 CFR Part 12 – Safety Standard for Architectural Glazing Materials.

6. European Committee for Standardization

a. EN 14179-1 – Glass in Building – Heat Soaked Thermally Toughened Soda Lime Silicate Safety Glass.

7. Glass Association of North America (GANA)

a. GANA Engineering Standards Manual.

b. GANA Glazing Manual.

c. GANA Laminated Glazing Reference Manual.

8. Insulating Glass Manufacturers Alliance (IGMA)

a. IGMA TB-3001 – Guidelines for Sloped Glazing.

b. IGMA TM-3000 – North American Glazing Guidelines for Sealed Insulating Glass Units for Commercial and Residential Use.

9. National Fenestration Rating Council (NFRC)

a. NFRC 100 – Procedure for Determining Fenestration Product U-Factors.

b. NFRC 200 – Procedure for Determining Fenestration Product Solar Heat Gain Coefficient and Visible Transmittance at Normal Incidence.

10. National Fire Protection Association (NFPA)

a. NFPA 252 – Standard Methods of Fire Tests of Door Assemblies.

b. NFPA 257 – Standard on Fire Test for Window and Glass Block Assemblies.

1.5 PERFORMANCE REQUIREMENTS:

A. General Prescriptive Requirements

1. Provide laminated Glass where indicated and under the following conditions:

a. Sloped Glazing.

B. General Performance

1. Engineer Glass, including comprehensive engineering analysis according to ASTM E1300 by a qualified Professional Engineer licensed in the State of New York.

2. Provide Glazing meeting the performance and loading criteria specified in Section 08 40 01 – Glazed Storefronts and Curtain Wall System and Section 08 63 01 – Aluminum-Framed Skylight System, as well as the requirements specified herein.

3. Glass thickness and heat-treatment type designations indicated are preliminary. Confirm Glass thicknesses by analyzing Project loads and in-service conditions for each associated building enclosure system where they will be incorporated.

   a. Use thinner lites than indicated only with Commissioner's approval.

   b. Subdivide Glazing types into more subtypes only with the Commissioner's approval.

   c. Engineer sloped Glazing for a probability of breakage not greater than 0.001.

4. Failure includes, but is not limited to:

   a. Glass breakage; inclusive of spontaneous Glass breakage and any secondary breakage caused by failure of other Glass or components.

   b. Cracking, crazing, flaking, discoloration of coatings on Glass.

   c. Delamination of laminated Glass units.

   d. Loss of Transparency of laminated Glass.

      1) Insulated glazing that exhibits fogging, staining, corrosion deterioration of interior coating, spacer migration, a decrease in air space dimension or appearance of dust, moisture, or a film of any kind.

      2) Primary seal blisters or discontinuities , including thin spots where primary seal does not fully "wet" to surface of glass, and locations where there are skips in the primary seal. Other deterioration or irregularity of hermetic seals shall also constitute failure.

   e. Primary seal infringement into vision area beyond industry limits.

   f. Loss of glass bite due to shifting of Glass.

   g. Loss of glass bearing on setting blocks due to shifting of Glass and/or blocks.

   h. Sealant failure.

   i. Glass color mismatch between glass units that are produced from different batches of glass. Glass shall be held to a color match criteria that keeps the hue of the glass within the same color quadrant when testing for L*a*b* values in accordance with ASTM D2244. See additional requirements in this Section for additional performance criteria regarding color matching glass."

C. Structural Performance

1. Glazing shall transmit and resist loads and their combinations as defined by the associated building enclosure system, to the supporting framing of that system.

2. Include in engineering calculations specific load cases required by Code for Glazing and sloped Glazing.

3. Engineer Glass to resist thermal stresses induced by differential shading.

   a. Provide thermal stress analysis for each exterior Glass type for each building elevation or facet of the building enclosure, as appropriate.

      1) Analysis shall clearly indicate all expected service temperature ranges and the effects of partial and full shading on the Glass.

      2) Append to the thermal stress analysis a statement from the Glass manufacturer that, based upon this analysis the resulting thermal stresses will not increase the specified "statistical probability of breakage."

4. Consider internal loads on IGUs in their engineering. This includes the building altitude as well as the combined effects of temperature, altitude, atmospheric pressure, together with other specified loads.

D. Movement Performance

1. Glazing shall accommodate the movements specified and developed by the Referenced System without any reduction in performance below the minimum levels required herein.

2. Maximum Lateral Deflection

   a. For Glass supported on all four edges, limit center-of-glass deflection at design wind pressure or suction to not more than 3/4 in. or the following, whichever is less:

      1) L/75 of the Glass edge length (L) for each individual Glazing lite less than or equal to 5 ft.

      2) L/120 + 0.3 in. of the Glass edge length (L) for each individual Glazing lite greater than 5 ft.

   b. IGUs shall be limited to an edge of Glass deflection not exceeding:

      1) L/175 of the Glass edge length (L) for each individual Glazing lite less than or equal to 13 ft-6 in.

      2) L/240 + 1/4 in. of the Glass edge length (L) for each individual Glazing lite greater than 13 ft-6 in.

3. Glazing shall accommodate the following thermal movements without any reduction in the specified performance:

   a. Allow for thermal movements resulting from the maximum change (range) in ambient and surface temperatures of the associated building enclosure system. Base engineering calculation on surface temperatures of materials due to both solar heat gain and night-time-sky heat loss.

   b. Use associated building enclosure system's environmental conditions for analysis.

c. Due to changes in temperature of the supporting structure and interfacing construction.

4. Glazing shall accommodate the following moisture movements without any reduction in the specified performance:

a. Due to changes in the moisture content of its components, and wetting from rain.

b. Expansion of absorbed or retained moisture due to freezing.

c. Due to changes in the moisture content of the supporting structure and interfacing construction.

E. Energy Performance

1. Glazing shall have certified energy performance ratings in accordance with the standards required by 2014 New York City Building Code and 2016 New York City Energy Conservation Code.

2. Thermal Transmittance (U-Value)

a. Coordinate Glazing U-value with the framing values of the associated building enclosure system to achieve the system U-value requirements provided in the Building Enclosure System Matrix.

b. Glazing shall not have a U-value greater than that listed in the Exterior Glass Type Matrix without Commissioner's approval.

3. Solar Heat Gain Coefficient (SHGC)

a. Coordinate Glazing SHGC with the framing values of the associated building enclosure system to achieve the system SHGC requirements provided in the Building Enclosure System Matrix.

b. Glazing shall not have a SHGC greater than that listed in the Exterior Glass Type Matrix without Commissioner's approval.

4. Visible Light Transmittance (VLT)

a. Coordinate Glazing VLT with the framing values of the associated building enclosure system to achieve the system VLT requirements provided in the Building Enclosure System Matrix.

b. Glazing shall not have a VLT less than that listed in the Exterior Glass Type Matrix without Commissioner's approval.

5. Condensation Resistance

a. Provide Glazing that will not condense on the inside face of the Glazing per the requirements of the associated building enclosure system.

b. Provide IGUs that will not exhibit frost or condensation within the air space at a temperature equal to or above the minimum exterior temperature of the associated building enclosure system as per ASTM E546 or ASTM E576.

F. Fire Performance

1. Glazing shall meet the performance requirements specified for the associated building enclosure system. Refer to the 2014 New York City Fire Code in addition to Section 08 49 00 – Fire Rated Glass and Framing System for requirements.

1.6 SUBMITTAL PROCEDURES

A. Refer to DDC General Conditions.

1.7 SUBMITTALS:

A. Calculations

1. Provide structural calculations for Glazing.

a. Provide Glass producer/fabricator's certification that it has reviewed the Glazing details and thicknesses and finds same suitable for the purpose intended in accordance with its published literature and these Specifications. This includes, but is not limited to, a written analysis of stress due to all loads including wind loads, environmental conditions, and thermal factors showing a probability of failure no greater than amount specified at design wind loads and local environmental conditions, including altitude relative to location of manufacture, temperature variations, and barometric pressure variations anticipated at the completed Project.

2. Provide thermal calculations for Glazing to describe:

a. U-value, SHGC, and VLT performance of Glazing.

b. Condensation resistance of all elements of Glazing.

B. Testing reports.

C. Product Data

1. For Glass and Glazing products, submit Glazing manufacturer's guidelines highlighting the manufacturing tolerances and defects in accordance with those specified and ASTM C1036, ASTM C1048, and ASTM C1172, prior to the time of preliminary Glass order for verification of acceptable manufacturing tolerances and defects.

2. For all heat-treated Glazing, including Samples, provide measurement data for roller wave, bow, and edge dip.

3. For all coated Glazing, including Samples, provide measurement data for color with the associated sample.

4. Submit glass manufacturer's certification that all fully tempered glass has been heat-soak tested in accordance with the requirements set forth in this Section, including but not limited to the following:

a. Quality control procedures for minimizing risks of float glass contamination from float glass manufacturer.

b. Factory logs documenting heat soak testing of all fully tempered glass in accordance with EN-14179-1.

c. Records of glass manufacturer's past spontaneous breakage events and how they were resolved

D. LEED submittals.

E. Samples

1. Provide three (3) Samples in 12 in. lengths for all types of the following products:

a. Spacers for each type and size of spacer used for all Glass types.

b. Secondary Sealant Sample for each color of secondary Sealant used for all Glass types.

F. Quality Control Plan

1. Submit certificates signed by Glass and Glazing product manufacturers, certifying that products furnished comply with requirements.

2. For solar-control low-e-coated Glass, provide documentation demonstrating that manufacturer of coated Glass is certified by coating manufacturer.

G. Provide certification from Glass producer/fabricator and where applicable from gasket and Sealant manufacturer and coated-Glass manufacturers that gaskets, Sealants, secondary Sealants, gas fills, spacers and Glass products that contact are chemically and otherwise compatible.

H. Completion of Work: Upon completion of installation of the Glazing, submit written certification that the manufacturer's representative has supervised the work of this Section and that all materials are correctly installed.

1.8 QUALITY ASSURANCE:

A. Refer to DDC General Conditions Section 01 40 00 – Quality Requirements.

B. Installer Qualifications: In addition, the Contractor or subcontractor must be licensed or approved by the manufacturer.

C. Manufacturer Qualifications for IGUs with Sputter-Coated, Low-E Coatings: A qualified insulating Glass manufacturer who is approved and certified by coated-Glass manufacturer.

D. Glass Testing Agency Qualifications: A qualified independent Testing Agency accredited according to the NFRC CAP 1 Certification Agency Program.

E. Source Limitations for Glass and Glass Accessories: Obtain Glass and Glass accessories from one source for each product indicated below for all associated building enclosure systems unless approved by the Commissioner:

1. Primary Glass.

2. Fabricated Glass, including Glass which is coated, heat treated, laminated, fritted or printed.

3. Glazing gaskets.

4. Glazing accessories.

F. Glazing Publications: Comply with published recommendations of Glass product manufacturers and organizations below, unless more stringent requirements are indicated. Refer to these publications for Glazing terms not otherwise defined in this Section or in referenced standards.

1. GANA Publications: Laminated Glazing Reference Manual and Glazing Manual.

2. AAMA Publications: GDSG-1 – Glass Design for Sloped Glazing and TIR-A7 – Sloped Glazing Guidelines.

3. IGMA Publications: TB-3001 – Guidelines for Sloped Glazing and TM-3000 – North American Glazing Guidelines for Sealed Insulating Glass Units for Commercial and Residential Use."

G. Safety Glass: Comply with the applicable requirements of the 2014 New York City Building Code. Wherever requirements conflict the more stringent shall apply. As a minimum, provide Category II materials complying with testing requirements in 16 CFR Part 12 and ANSI Z97.1.

1. Safety Glazing Labeling: Where safety Glazing labeling is indicated, permanently mark Glazing with certification label of the SGCC. Label shall indicate manufacturer's name, type of Glass, thickness, and safety Glazing standard with which Glass complies.

2. For Glazing types with multiple lites of Glass, laminated or assembled into an insulated unit, where safety labeling is required provide labels that align in position and orientation from lite to lite.

H. Insulating-Glass Certification Program: Permanently marked either on spacers or on at least one component lite of units with appropriate certification label of IGCC.

I. Secondary Sealant Pre-Construction Adhesion Testing: Provide Project specific test data for adhesion and compatibility testing between Project glazing lites and secondary sealant. Comply with requirements in Pre-Construction Compatibility and Adhesion Testing clause in Section 07 92 01.

1. Provide test data prior to the fabrication of project units.

2. Include testing with proposed coated glass. Document procedure and equipment used to remove glass coatings.

1.9 WARRANTY:

A. Manufacturer's Warranty on Glass: Written warranty made out to City of New York and signed by Glass manufacturer agreeing to promptly furnish replacements against breakage, including spontaneous breakage due to defects in Glass materials (including NiS), fabrication, and/or installation. Upon notification of such deterioration within the warranty period, promptly furnish replacement Glass units, including labor for installation, for failed Glass units at no cost to the City of New York.

1. Warranty Period: 10 yrs from date of Substantial Completion.

B. Manufacturer's Special Warranty for Coated Glass Products: Written warranty made out to City of New York and signed by Glass manufacturer agreeing to promptly furnish replacements against coated Glass units that deteriorate within specified warranty period. Deterioration of coated Glass is defined as defects developed from normal use that are not attributed to Glass breakage or to maintaining and cleaning coated Glass contrary to manufacturer's written instructions. Defects include peeling, cracking, and other indications of deterioration in coating. Upon notification of such deterioration within the warranty period,

promptly furnish replacement Glass units, including labor for installation, for failed Glass units at no cost to the City of New York.

1. Warranty Period: 10 yrs from date of Substantial Completion.

C. Manufacturer's Special Warranty on Laminated Glass: Written warranty made out to City of New York and signed by laminated Glass manufacturer agreeing to promptly furnish replacements for laminated Glass units that develop edge separation, delamination materially obstructing vision through Glass, and blemishes exceeding those allowed by GANA standards within the specified warranty period indicated below. Upon notification of such deterioration within the warranty period, promptly furnish replacement Glass units, including labor for installation, for those Glass units having edge separation, delamination and blemishes at no cost to the City of New York.

1. Warranty Period: 10 yrs from date of Substantial Completion.

D. Manufacturer's Special Warranty on Insulating Glass: Written warranty made out to City of New York and signed by insulating Glass manufacturer agreeing to promptly furnish replacements for insulating Glass units whose hermetic seal has failed within specified warranty period indicated below. Evidence of failure is the obstruction of vision by dust, moisture, or film on interior surfaces of Glass. Upon notification of such deterioration within the warranty period promptly furnish replacement Glass units, including labor for installation, for failed Glass units at no cost to the City of New York.

1. Warranty Period: 10 yrs from date of Substantial Completion.

PART II - PRODUCTS

2.1 GLASS PRODUCTS:

A. General: All Glass products fabricated of components listed herein shall incorporate the requirements of each subcomponent without exception.

B. Float Glass

1. ASTM C1036, Type I, Quality-Q3, Class I (clear) unless otherwise indicated.

2. Clear Glass shall mean non-low iron Glass.

3. To reduce possibility of Glass color range rejection, supplier of clear Glass products shall provide Glass from a single facility using stockpiled batch run materials from a single source for the entire Project.

4. Float Glass Quality Imperfection Limitations: In addition to the limitations included under ASTM C1036, all Glass supplied shall meet the following quality standards:

a. Point Blemishes: Seeds/stones with distortion, stain spots, dirt, or surface damage shall be limited to 0.06 in. maximum separated by $\geq$ 12 in.

b. Glass scratch/rubs shall be rejected if detectable at 10 ft.

c. Water blow off stains, tag residue, and handprints are not permitted.

5. Provide chamfered edges.

C. Heat-Treated Float Glass

1. Heat-treated lites to comply with ASTM C1048 and associated requirements specified herein for float Glass.

   a. For uncoated Glass, comply with requirements for Condition A.

   b. For coated vision Glass, comply with requirements for Condition C (other coated Glass).

2. Fabrication Quality Requirements: The allowable range of defects in heat-treated Glass shall be as accepted through Glass Sample submissions. Installed heat-treated Glass products outside of the accepted Sample range are subject to rejection by the Commissioner. In order to reduce the possibility of Glass rejections, the supplier of heat-treated Glass products shall provide Glass production runs for the entire Project from a single facility. The allowable range of defects are defined as follows:

   a. Bow and edge dip shall be half than the figures stated in relevant ASTM standards.

   b. Roller wave distortion shall be limited to 0.006 in. over 12 in.

   c. Roller wave distortion shall be parallel to bottom edge of Glass as installed unless otherwise indicated.

      1) Measure roller wave distortion of curved Glass over the arc length of 12 in. of the curved edge.

   d. Chill cracks, roller marks, and picture framing are not permitted.

   e. Tracking / Cloud, and Heat Dimples: Shall be rejected if detectable at 10 ft.

   f. The appearance of anisotropy, also known as "leopard spots" and "quench patterns", is known to be associated with heat-treated Glass under certain polarized lighting conditions. This will not be considered a fault unless it is visible in a range of reasonably typical naturally occurring conditions. The Commissioner will determine the acceptable range(s) of anisotropy from Glass Sample submittals and thereafter from the mockups and Sample installations. Coatings applied to heat-treated Glass products shall not exacerbate anisotropy to an unacceptable range(s).

3. Every lite of fully tempered Glass used on the Project shall be heat soaked off line in order to convert Nickel Sulfide impurities to the stable beta phase. Statistical heat soaking shall not be permitted.

   a. Heat soak test all fully tempered Glass in accordance with EN 14179-1, except as modified below:

      1) Holding Phase Glass Surface Temperature: 260°C (+/- 10°C); 270°C maximum.

      2) Holding Phase Duration: 4 hrs minimum.

b. Each pane of heat soak tested Glass shall be traceable to individual heat soak test batches, so that, in the event of failure, it is possible to identify and locate all Panels from that heat soaked batch.

c. Written warranties against nickel sulfide inclusions in lieu of heat soaking will not be accepted.

4. Sizes and Cutting

a. Prior to heat treatment, cut Glass to required sizes as determined by accurate measurement of openings to be glazed, making allowance for required edge clearances. Cut and process edges in accordance with Glass manufacturer's recommendations. Do not cut or treat edges in the field.

D. Tinted Float Glass

1. ASTM C1036, Type I, Quality-Q3, Class 2, complying with other requirements specified.

2. Tint Color: Refer to Exterior Glass Type Matrix.

E. Ceramic-Coated Float

1. Heat-treated lites to comply with ASTM C1048, Condition B and specified requirements for heat-treated float Glass.

2. Ceramic enamel applied by silk-screened process complying with Specification No. 95-1-31 in GANA's Tempering Division's – Engineering Standards Manual and with other requirements specified.

3. Ceramic Coating Color and Pattern: Refer to Exterior Glass Type Matrix.

F. Coated Float

1. Complying with ASTM C1376, coated by vacuum deposition (sputter-coating) process, and complying with other requirements specified in this Section and in the Exterior Glass Type Matrix.

2. Coating Quality Requirements: The allowable range of defects in coatings applied to Glass shall be as accepted through Glass Sample submissions. Installed coated Glass products which are outside of the accepted Sample range are subject to rejection by the Commissioner. In order to reduce the possibility of Glass rejections, the supplier of coated Glass products shall provide Glass coating production runs for the entire Project from a single coating facility. The allowable range of defects are defined as follows:

a. The vision Glass area is defined as the field of Glass which is greater than 1 in. from the Glass unit edge.

b. Pinholes

1) At an indoor viewing distance of 10 ft for non-reflective and reflective low-emissivity coatings:

a) Pinholes greater than 0.06 in. in diameter, separated by greater than or equal to 12 in., are not permitted in 80% of the central portion of the vision Glass area. Pinholes larger than 0.1 in. separated by greater than or equal to 12 in. are not allowed in the outer 20% of the perimeter vision Glass area.

b) No more than two readily-apparent blemishes are allowed in a 3 in. dia. circle and no more than five readily-apparent blemishes are allowed in a 12 in. diameter circle.

c. Scratches

1) At an indoor viewing distance of 10 ft for non-reflective and reflective low emissivity coatings:

a) Scratches are allowed in the 80% of the central Glass area if not detectable at the viewing distance; and scratches less than or equal to 1 in. are allowed in the outer 20% area if not detectable at the viewing distance. Concentrated scratches or abraded areas are not allowed.

b) Scuffs, rub marks, cup marks, or abraded areas are not permitted in any Glass area.

d. Reflectance and Transmission Inspection

1) When viewed outdoors against a bright uniform opaque background at a distance of 10 ft for low emissivity coatings, color, reflectance, and transmission is permitted to have a slight variance subject to Commissioner's acceptance.

a) Mottling and streaking of the coating is not permitted.

b) Coating arcing is not permitted.

c) Water blow off stains are not permitted.

d) Handprints are not permitted.

e) Roller marks are not permitted.

f) Positive and negative air distortion is not permitted.

g) Tag residue is not permitted.

2) Checkerboarding of coated Glass is not permitted. Checkerboarding occurs when Glazing panels of the same type take on noticeably different hues. In addition to the ASTM C1376 requirements, the color readings taken by the manufacturer shall all lie in the same quadrant of the L*a*b* color space as defined in ASTM D2244. Stated differently, 'a*' values (representing the red-green axis) shall be either all positive or all negative. In the same way, the 'b*' values (representing the yellow-blue axis) shall be either all positive or all negative.

G. Laminated Float

1. Comply with ASTM C1172, and comply with testing requirements in 16 CFR Part 12 for Category II materials, and with other specified requirements.

2. Use materials that have a proven record of no tendency to bubble, discolor, or lose physical and mechanical properties after fabrication and installation.

3. Where laminated Glass edges will be in direct contact with adjacent materials such as Sealants, provide one of the following:

   a. Manufacturers test data demonstrating long-term durability of the interlayer against delamination, discoloration, or any other loss of performance.

   b. Provide edge protection tape demonstrating compatibility with the Glass interlayer and adjacent material.

4. Use ionoplast-type interlayer where specified or where laminated Glass edges will be exposed to direct wetting or relative humidity (RH) conditions greater than 60%.

   a. Variations from this requirement are permitted only where approved by the Commissioner and reviewed and approved by the interlayer manufacturer.

5. Laminating Quality Requirements

   a. Prior to laminating, cut Glass to required sizes and profiles as determined by accurate measurement of openings to be glazed, making allowance for required edge clearances. Cut and process edges in accordance with Glass manufacturer's recommendations. Do not cut or treat edges in the field.

   b. Fabricate laminated Glass to produce Glass free of scuff vinyl markings, handprints, tag residue, and foreign substances such as lint, hair, vinyl shavings in the central Glass area and the outer 20% area when viewed from a distance of 3 ft and 10 ft respectively. Handprints, tag residue, scuff vinyl markings and foreign substances must be separated by distance greater than 12 in. if not detectable at less than the viewing distances.

   c. Delaminations, blow-ins, short interlayers, and air or gas pockets shall not be permitted in the central Glass area. In the outer 20% area, delamination will not be permitted, blow-ins, air or gas pockets, and short interlayers shall be limited to a maximum dimension of 0.1 in. in diameter, and 0.06 in. long respectively.

   d. Hazing: Hazing or clouding due to improper fabrication of the laminate interlayers is not acceptable

   e. No splicing of the interlayer material is permitted.

   f. Laminate units with the specified interlayer in autoclave with heat plus pressure process in strict accordance with the interlayer manufacturer's requirements for the following:

      1) Vacuum bag pressure and pre-vacuum times.

      2) Relative humidity.

3) Provide quality data of fabrication process.

4) Heat strengthening flatness.

5) Autoclave settings including temperature, pressure, and time.

g. Permanent deformation of the Glass during lamination which causes debonding stress on the interlayer shall be limited to 1/100th of the bond strength of the laminate. Provide procedures to comply with this criterion at the edges of each laminated unit.

6. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Kuraray.

b. Saflex.

c. Everlam.

d. Or approved equal.

7. Products: Subject to compliance with requirements, provide products by one of the following:

a. Kuraray; Trosifol Ultraclear.

b. Saflex; Saflex Clear PVB Interlayer.

c. Everlam; Everlam Clear PVB.

d. Or approved equal.

H. Insulating Glass

1. Factory-assembled units consisting of sealed lites of Glass separated by a dehydrated interspace, qualified according to ASTM E2190, and certified with the IGCC complying with other requirements specified.

2. Argon Filled Glass Unit Requirements

a. Argon filled insulated units shall have a minimum argon concentration of 95% when tested to ASTM E2269 or ASTM E2649. The Glass fabricator shall provide documentation demonstrating the concentration of units produced for each Referenced System.

3. Split spacers, bowing spacer sightlines, primary and secondary seal discontinuities, and excessive unit slide are not permitted.

4. Sealing System

a. Dual seal, with black polyisobutylene and silicone primary and secondary, respectively. The secondary seal shall conform to ASTM C1249.

1) Primary seal shall not have a reduced thickness at the corners. An increased thickness of the primary seal at the corners is acceptable.

b. Provide secondary Sealant compatible with structural and weather Sealants.

c. Select colors during pre-construction submittal and mockup review and evaluation.

5. Spacer type as specified in the Exterior Glass Type Matrix.

a. Locate spacer joint at the top or sides of the units, but in no instances at the sill or corners.

b. Engineer units to minimize the number of spacer joints. Provide welded spacer joints or solid keys, embedded in butyl sealant on all four sides, at spacer joints.

6. Provide molecular sieve or silica gel, or blend of both types of desiccant.

a. Desiccant shall not be visible on inside surfaces of the IGU.

7. Combined bow and pillowing of IGU lites shall not exceed half of the bow limits specified in ASTM C1048 and shall be measured on site.

2.2 GLAZING GASKETS:

A. Refer to requirements in the Referenced System.

2.3 SEALANTS:

A. Refer to Section 07 92 01 – Exterior Joint Sealants for performance requirements..

2.4 GLAZING TAPES:

A. Back-Bedding Mastic Glazing Tapes: Preformed, butyl-based, 100% solids elastomeric tape; nonstaining and nonmigrating in contact with nonporous surfaces; with or without spacer rod as recommended in writing by tape and Glass manufacturers for application indicated; and complying with ASTM C1281 and AAMA 800 for products indicated below:

1. AAMA 806.1 tape, for Glazing applications where tape is subject to continuous pressure.

2. AAMA 807.1 tape, for Glazing applications where tape is not subject to continuous pressure.

B. Expanded Cellular Glazing Tapes: Closed-cell, PVC foam tapes; factory coated with adhesive on both surfaces; and complying with AAMA 800 for the following types:

1. AAMA 810.1, Type 1, for Glazing applications where tape acts as primary Sealant.

2. AAMA 810.1, Type 2, for Glazing applications where tape is used in combination with a full bead of liquid Sealant.

2.5 MISCELLANEOUS GLAZING MATERIALS:

A. Provide products of material, size, and shape complying with referenced Glazing standards, requirements of Glass and other Glazing material manufacturers for application indicated, and with a proven record of compatibility with surfaces contacted in installation.

B. Cleaners, Primers, and Sealers: Types recommended by Sealant or gasket manufacturer.

C. Setting Blocks: Silicone complying with ASTM C1115 (Type C) with a Shore, Type A durometer hardness of 85, plus or minus 5. 0.063 in. less than the channel width, and length based on the Glass unit face area to be supported, in accordance with GANA standards and Glass manufacturer recommendations but not less than 4 in.

D. Spacers: Silicone complying with ASTM C1115 (Type C), blocks or continuous extrusions of hardness and size of hardness required by Glass manufacturer to maintain Glass lites in place for installation indicated.

E. Edge Blocks: Silicone complying with ASTM C1115 (Type C), blocks of hardness and size needed to limit Glass lateral movement (side walking).

F. Cylindrical Glazing Sealant Backing: ASTM C1330, Type C (closed-cell material with a surface skin), of size and density to control Glazing Sealant depth and otherwise produce optimum Glazing Sealant performance.

G. Perimeter Insulation for Fire-Resistive Glazing: Product approved by Independent Testing Agency that listed and labeled fire-resistant Glazing product with which it is used for application and fire-protection rating indicated.

PART III - EXECUTION

3.1 EXECUTION REQUIREMENTS

A. Refer to DDC General Conditions for execution requirements.

3.2 EXAMINATION:

A. Examine Glazing, associated framing, Glazing channels, and stops, with Installer present, for compliance with the following:

1. Manufacturing and installation tolerances, including those for size, squareness, and offsets at corners.
2. Presence and functioning of weep systems.
3. Minimum required face and edge clearances.
4. Effective sealing between joints of Glass-framing members.

B. Proceed with installation only after unsatisfactory conditions have been corrected

3.3 DELIVERY, STORAGE, AND HANDLING:

A. Protect Glazing materials according to manufacturer's written instructions. Prevent damage to Glass and Glazing materials from condensation, temperature changes, direct exposure to sun, and other causes.

B. Deliver Glass to the site bearing the manufacturer's label (including clear identification of the location of low-e coatings and "glaze this side in" stickers), complete with Glazing instructions where applicable.

C. Where applicable based on the location of manufacture, comply with insulating Glass manufacturer's written recommendations for venting and sealing units to avoid hermetic seal ruptures due to altitude change.

3.4 PREPARATION:

A. Inspect each unit of Glass immediately before installation. Do not install units which are improperly sized or have damaged edges, scratches or abrasions, or other evidence of damage.

B. Examine Glazing units to locate exterior and interior surfaces. Label or mark units as needed so that exterior and interior surfaces are readily identifiable. Do not use materials that will leave visible marks in the completed work.

C. Clean Glazing stops, Glazing channels, and rabbets that will contact the Glazing materials immediately before Glazing. Remove loose particles present or resulting from fabrication and cleaning by blowing out joints with oil-free compressed air or by vacuuming joints.

D. Remove protective coatings, oils from cutting and drilling operations, and residue on metallic surfaces with solvents that leave no residue. Do not allow solvent to air dry without wiping.

E. Use only lint-free towels for wiping of surfaces.

F. Wipe metal surfaces with IPA (isopropyl alcohol) unless otherwise required by compatibility and adhesion testing results.

G. Prime surfaces to receive Glazing compounds. When priming, comply with wet Glazing manufacturer's recommendations.

H. Remove labels from Glass immediately after installation.

3.5 FABRICATION OF GLAZING UNITS:

A. Fabricate Glazing units in sizes required to fit openings indicated for Project, with edge and face clearances, edge and surface conditions, and bite complying with written instructions of product manufacturer and referenced Glazing publications, to comply with system performance requirements.

B. Edge and Surface Conditions: Comply with the recommendations of AAMA CW-12 Structural Properties of Glass for "clean cut" edges, except comply with manufacturer's recommendations when they are at variance therewith.

C. Clean-cut or flat-grind vertical edges of butt-Glazed monolithic lites to produce square edges with slight chamfers at junctions of edges and faces.

D. Grind smooth and polish exposed Glass edges and corners.

3.6 GLAZING:

A. Comply with combined written instructions of manufacturers of Glass, Sealants, gaskets, and other Glazing materials, unless more stringent requirements are indicated in these Specifications or on the Drawings, including those in referenced Glazing publications.

B. Adjust Glazing channel dimensions as required by Project conditions during installation, to provide necessary bite on Glass, minimum edge and face clearances, and adequate Sealant thicknesses, with reasonable tolerances.

C. Protect Glass edges from damage during handling and installation. Remove damaged Glass from Project site and legally dispose of off Project site. Damaged Glass is Glass with edge damage or other imperfections that, when installed, could weaken Glass and impair performance and appearance.

D. Apply primers to joint surfaces where required for adhesion of Sealants, as determined by pre-construction testing.

E. Install setting blocks in sill rabbets, sized and located to comply with referenced Glazing publications, unless more stringent requirements are provided by Glass manufacturer. Place blocks to allow water passage to weep holes. Set blocks in thin course of silicone Sealant.

F. Do not exceed edge pressures stipulated by Glass manufacturers for installing Glass lites.

G. Provide spacers for Glass lites where length plus width is larger than 50 in.

1. Locate spacers directly opposite each other on both inside and outside faces of Glass. Install correct size and spacing to preserve required face clearances, unless gaskets and Glazing tapes able to maintain required face clearances and comply with system performance requirements are used.

2. Provide 0.125 in. minimum bite of spacers on Glass and use thickness equal to Sealant width. With Glazing tape, use thickness slightly less than final compressed thickness of tape.

H. Provide edge blocking to prevent Glass lites from moving sideways in Glazing channel, sized and located to comply with the Glass manufacturers recommendations and referenced Glazing publication requirements.

I. Set Glass lites in each series with uniform pattern, draw, bow, and similar characteristics.

J. Set Glass lites with proper orientation so that coatings face specified direction.

K. Install factory-molded gaskets as recommended by gasket manufacturer to provide an airtight and watertight seal at all joints.

1. Where wedge-shaped gaskets are driven into one side of channel to pressurize Sealant or gasket on opposite side, provide adequate anchorage so gasket cannot walk out when installation is subjected to movement.

2. Square cut wedge-shaped gaskets at corners and install gaskets as recommended by gasket manufacturer to prevent corners from pulling away; seal corner joints and butt joints with Sealant recommended by gasket manufacturer.

3.7 TAPE GLAZING:

A. Position tapes on fixed stops so that, when compressed by Glass, their exposed edges are flush with or protrude slightly above sightline of stops.

B. Install tapes continuously, but not necessarily in one continuous length. Do not stretch tapes to fit opening.

C. Cover vertical framing joints by applying tapes to heads and sills first and then to jambs. Cover horizontal framing joints by applying tapes to jambs and then to heads and sills.

D. Place joints in tapes at corners of opening with adjoining lengths butted together, not lapped. Seal joints in tapes with compatible Sealant approved by tape manufacturer.

E. Do not remove release paper from tape until right before each Glazing unit is installed.

F. Where indicated, apply heel bead of elastomeric sealant.

G. Center Glass lites in openings on setting blocks and press firmly against tape by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings.

H. Apply cap bead of elastomeric sealant over exposed edge of tape.

3.8 GASKET GLAZING (DRY):

A. Cut compression gaskets to lengths recommended by gasket manufacturer to fit openings exactly, with allowance for stretch during installation.

B. On exterior and interior of units, use weather strip and gasket material that has been fabricated into units with molded or vulcanized corners. Where lineal gasket material must be used, miter cut and bond units at corners with Sealant recommended by gasket manufacturer.

C. Insert soft compression gasket between Glass and frame or fixed stop so it is securely in place with joints miter cut and bonded together at corners.

D. Installation with Drive-in Wedge Gaskets: Center Glass lites in openings on setting blocks and press firmly against soft compression gasket by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings. Compress gaskets to produce a weathertight seal without developing bending stresses in Glass. Seal gasket joints with Sealant recommended by gasket manufacturer.

E. Installation with Pressure-Glazing Stops: Center Glass lites in openings on setting blocks and press firmly against soft compression gasket. Install dense compression gaskets and pressure-Glazing stops, applying pressure uniformly to compression gaskets. Compress gaskets to produce a weathertight seal without developing bending stresses in Glass. Seal gasket joints with sealant recommended by gasket manufacturer.

F. Install gaskets so they protrude past face of Glazing stops.

3.9 SEALANT GLAZING (WET):

A. Install continuous spacers, or spacers combined with cylindrical Sealant backing, between Glass lites and Glazing stops to maintain Glass face clearances and to prevent Sealant from extruding into Glass channel and blocking weep systems until Sealants cure. Secure spacers or spacers and backings in place and in position to control depth of installed Sealant relative to edge clearance for optimum Sealant performance.

B. Force Sealants into Glazing channels to eliminate voids and to ensure complete wetting or bond of sealant to Glass and channel surfaces.

C. Tool exposed surfaces of Sealants to provide a substantial wash away from Glass.

3.10 STRUCTURAL SILICONE GLAZING:

A. Glazing with structural silicone Sealant shall be accomplished in the shop. Units shall not be moved until structural silicone seal has achieved full cure.

B. Strictly observe the printed instructions of Sealant manufacturer regarding joint size, limitations, backer rod, mixing, cleaning, surface preparation, priming, and application.

C. Examine joints indicated to receive structural silicone Sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting joint-Sealant performance. Proceed with installation only after unsatisfactory conditions have been corrected.

D. Surface Cleaning of Joints: Clean out joints immediately before installing structural silicone Sealants to comply with Sealant manufacturer's written instructions and the following requirements:

1. Cleaners used in the work shall be the same as those used in laboratory testing.

2. Remove foreign material from joint substrates that could interfere with adhesion of Sealant, including dust, protective coatings, oil, grease, water, surface dirt, and frost.

3. Clean nonporous surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint Sealants.

E. Joint Priming: Prime joint substrates unless recommended otherwise in writing by joint-Sealant manufacturer, based on pre-construction joint-Sealant-substrate tests and prior experience. Apply primer to comply with joint-Sealant manufacturer's written instructions. Confine primers to areas of joint-Sealant bond; do not allow spillage or migration onto adjoining surfaces.

F. Masking Tape: Use masking tape where required to prevent Sealant contact with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove Sealant smears. Remove tape immediately after tooling without disturbing joint seal.

G. Structural-Sealant Glazing: Comply with recommendations in ASTM C1401 – Standard Guide for Structural Sealant Glazing.

H. Install Sealant backings and spacers of type indicated and approved by Sealant manufacturer to support Sealants during application and at position required to produce cross-sectional shapes and depths of installed Sealants relative to joint widths that meet structural performance requirements.

I. Do not leave gaps between ends of Sealant backings.

J. Do not stretch, twist, puncture, or tear Sealant backings.

K. Remove absorbent Sealant backings that have become wet before Sealant application and replace with dry materials.

L. Install temporary retaining clips to secure Glass in position and prevent movement until Sealant has fully cured.

M. Care shall be exercised to ensure against "Three Surface Adhesion."

N. Install bond-breaker tape behind Sealants where Sealant backings are not used between Sealant and back of joints.

O. Install Sealants by proven techniques complying with the following and at the same time backings are installed:

1. Place Sealants so they directly contact and fully wet joint substrates.

2. Completely fill recesses provided for each joint configuration.

3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum Sealant movement capability.

P. Tooling of Nonsag Sealants: Immediately after Sealant application and before skinning or curing begins, tool Sealants according to requirements specified below to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of Sealant with sides of joint.

1. Remove excess Sealants from surfaces adjacent to joint.

Q. Remove temporary retaining clips after structural silicone has cured to its full strength. Fill openings left at clips with Sealant, following Sealant manufacturer's written instructions.

3.11 CLEANING AND PROTECTION:

A. Protect exterior Glass from damage immediately after installation by attaching crossed streamers to framing held away from Glass. Do not apply markers to Glass surface. Remove nonpermanent labels and clean surfaces.

B. Protect Glass from contact with contaminating substances resulting from construction operations. If, despite such protection, contaminating substances contact Glass, remove substances immediately as recommended in writing by Glass manufacturer.

C. Examine Glass surfaces adjacent to or below exterior concrete and other masonry surfaces at frequent intervals during construction, but not less than once a month, for buildup of dirt, scum, alkaline deposits, or stains; remove as recommended in writing by Glass manufacturer.

D. Remove and replace Glass that is broken, chipped, cracked, or abraded or that is damaged from natural causes, accidents, and vandalism, during construction period.

E. Wash Glass on both exposed surfaces in each area of Project not more than four (4) days before date scheduled for inspections that establish date of Substantial Completion. Wash Glass as recommended in writing by Glass manufacturer.

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SECTION 08 80 10
Interior Glass and Glazing

PART I - GENERAL

1.1 RELATED DOCUMENTS

A. The following documents apply to all required work for the Project: (1) the Contract Drawings, (2) the Specifications, (3) the General Conditions, (4) the Addendum and (5) the Contract (City of New York Standard Construction Contract).

B. LEED General Requirements:

1. Refer to DDC General Conditions

   a. Section 01 33 00 "Submittal Procedures"
   b. Section 01 81 13.04 "Sustainable Design Requirements for LEED v4 Buildings"

1.2 SUMMARY

A. Section includes:

1. Interior doors.
2. Interior borrowed lites.
3. Interior laminated glass partitions.
4. Interior frameless mirrors.

B. Related Sections

1. Steel Doors and Frames - Section 08 11 13.
2. Exterior Glazing - Section 08 80 00.
3. Toilet Accessories - Section 10 28 13, for framed bathroom mirrors.

1.3 REFERENCES

A. Comply with the recommendations of the following references unless more stringent requirements are indicated herein.

1. FGMA Publications: FGMA Glazing Manual.
2. LSGA Publications: LSGA Design Guide.
3. Safety Glass: Products complying with ANSI Z97.1 and testing requirements of 16 CFR Part 1201, Safety Standards for Architectural Glazing, Sealed Insulating Glass Manufacturing Association.

4. Fire-Resistive Glazing Products for Door Assemblies: Products identical to those tested per ASTM E 152, labeled and listed by UL or another testing and inspecting agency acceptable to the Commissioner.

5. ASTM C 920, Elastomeric Joint Sealant.

1.4 PERFORMANCE REQUIREMENTS

A. General: Provide glazing systems capable of withstanding normal thermal movement and impact loads (where applicable) without failure, including loss or glass breakage attributable to the following: defective manufacture, fabrication, and installation; failure of sealants or gaskets to remain watertight and airtight; deterioration of glazing materials; or other defects in construction.

B. Glass units shall be annealed, heat strengthened, fully tempered or laminated where required to meet safety glazing requirements, as shown, specified, or recommended by the glass fabricator, and as required by the 2014 New York City Building Code.

1.5 SUBMITTAL PROCEDURES

A. Refer to DDC General Conditions Section 01 33 00 "Submittal Procedures".

1.6 SUBMITTALS

A. Product Data: Submit manufacturer's printed product data, specifications, standard details, installation instructions, use limitations and recommendations for each material used. Provide certifications that materials and systems comply with specified requirements, including performance requirements.

B. Submit compatibility and adhesion test reports from sealant manufacturer indicating materials were tested for compatibility and adhesion with glazing sealant, as well as other glazing materials including insulation units.

C. Initial Selection Samples: Submit samples of each glass and glazing material showing complete range of colors, textures, and finishes available for each material used.

D. Verification Samples: Submit representative samples of each glass and glazing material that is to be exposed in completed work. Show full color ranges and finish variations expected. Provide glass samples having minimum size of 144 sq. in. and 6 in. long samples of sealants and glazing materials; all samples shall bear the name of the manufacturer, brand name, thickness, and quality.

E. Test Reports: Provide certified reports for specified tests.

F. Warranties: Provide written warranties as specified herein.

1.7 QUALITY ASSURANCE

A. Refer to DDC General Conditions Section 01 40 00 "Quality Requirements".

B. Source: For each glass and glazing type required for work of this Section, provide primary materials which are products of one manufacturer. Provide secondary or accessory materials which are acceptable to manufacturers of primary materials.

C. Installer: A firm with a minimum of three years' experience in type of work required by this Section and which is properly trained by manufacturers of primary materials; and with a successful record of in-service installations similar in size and scope to this Project.

D. Glass Thickness: Glass thicknesses shown on drawings and/or specified herein are minimum thicknesses. Determine and provide size and thickness of glass products that are certified to meet or exceed performance requirements specified in this Section.

E. Glazing Publications: Comply with published recommendations of glass product manufacturers and organizations below, unless more stringent requirements are indicated.

1. GANA Publications: GANA's "Glazing Manual" and "Laminated Glass Design Guide."

F. Glazing for Fire-Rated Door Assemblies: Glazing for assemblies that comply with NFPA 80 and that are listed and labeled by a testing and inspecting agency acceptable to the Commissioner, for fire-protection ratings indicated, based on testing according to NFPA 252.

G. Safety Glazing Products: Comply with testing requirements in 16 CFR 1201.

1. Subject to compliance with requirements, obtain safety glazing products permanently marked with certification label of the Safety Glazing Certification Council.

2. Where glazing units, including Kind FT glass and laminated glass, are specified in Part 2 articles for glazing lites more than 9 sq. ft. in exposed surface area of one side, provide glazing products that comply with Category II materials, for lites 9 sq. ft. or less in exposed surface area of one side, provide glazing products that comply with Category I or II materials, except for hazardous locations where Category II materials are required by 16 CFR 1201 and the 2014 New York City Building Code.

1.8 PROJECT CONDITIONS

A. Temperature Limits: Install sealants only when temperatures are within limits recommended by sealant manufacturer, except, never install sealants when temperatures are below 40 deg. F.

1.9 DELIVERY, STORAGE AND HANDLING

A. Deliver materials and products in unopened, factory labeled packages. Store and handle in strict compliance with manufacturer's instructions and recommendations and GANA Manual.

1. Protect materials from moisture, sunlight, excess heat, sparks and flame.

2. Sequence deliveries to avoid delays, but minimize on-site storage.

1.10 WARRANTIES

A. Manufacturer's Warranty on Coated Glass Products: Provide written warranty signed by manufacturer of coated glass agreeing to furnish f.o.b. point of manufacture, within specified warranty period indicated below, replacements for those coated glass units which develop manufacturing defects. Manufacturing defects are defined as peeling, cracking or deterioration in metallic coating due to normal conditions and not due to handling or installation or cleaning practices contrary to glass manufacturer's published instructions.

1. Warranty Period: Manufacturer's standard but not less than five (5) years after date of substantial completion.

B. Manufacturer's Warranty on Laminated Glass: Manufacturer's standard form, made out to the City of New York and signed by laminated glass manufacturer agreeing to replace laminated glass units that deteriorate as defined in "Definitions" Article, f.o.b. the nearest shipping point to Project site, within specified warranty period indicated below.

1. Warranty period five (5) years from date of Substantial Completion.

PART II - PRODUCTS

2.1 MANUFACTURERS/FABRICATORS

A. All glass and glazing used at the exterior of the Project shall be manufactured by the same manufacturer. The same manufacturer and the same furnace shall be used for all tempered and heat strengthened glass used throughout the project.

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. PPG Industries
2. Guardian Industries
3. Pilkington
4. AFG
5. JE Berkowitz, LP
6. Viracon
7. Or approved equal

2.2 GLASS MATERIALS AND PRODUCTS

A. Clear Float Glass: ASTM C 1036, Type I (Transparent, Flat), Class 1 (Clear), Quality q3, minimum 1/4" thick.

B. Float Glass: ASTM C 1036, Type I (transparent, flat), Class 1 (clear) or Class 2 (tinted) as indicated, Quality q3, minimum 1/4" thick.

C. Heat-Strengthened Float Glass: ASTM C 1048, Kind HS (heat strengthened), Type I, Condition A (uncoated) unless otherwise indicated, Type I, Class 1 (clear) or Class 2 (tinted) as indicated, Quality q3. Fabricate by horizontal (roller-hearth) process with roll-wave distortion parallel to bottom edge of glass as installed unless otherwise indicated.

D. Tempered Glass: ASTM C 1048, Condition A (uncoated), Type I (transparent, flat), Class 1 (clear) or Class 2 (tinted) as indicated, Quality q3, Kind FT, minimum 1/4" thick. Tempered glass must be certified by SGCC to meet applicable standards.

1. Performance Requirements for Tempered Glass

a. Length and Width: For 2.9 mm to 6.0 mm; +/-1.6 mm.
b. Diagonal: +/- 3.0 mm.

c. Edgework: Belt seaming or diamond wheels. 1.5 mm seam of upper and lower glass edges. No sharp edges.
d. Corners: No more than 3.0 mm from square.
e. Float Glass Defects: Must meet the requirements of ASTM C 1036. The most common defects are scratches, stones gaseous bubbles and edge chips. Tables in the glass standards have limits for size/quantity of defects.
f. Tempered glass shall have a minimum surface compression of 10,000 psi.
g. Tempered glass to be heat-treated by horizontal (roller hearth) process with inherent roller-wave distortion parallel to the bottom edge of the glass when installed.
h. Flatness Tolerances
   1). Roller-Wave or Ripple: The deviation from flatness at any peak shall be targeted not exceed 0.003" as measured per peak to valley for ¼" (6mm) thick glass.
   2). Bow and Warp: The bow and warp tolerances shall not exceed 1/32" per linear foot.
   3). Fully tempered glass shall be heat soaked.

E. Laminated Safety Glass: Provide two glass panes of equal thickness, laminated together with a polyvinyl butyl interlayer, conforming to ASTM C 1172 and as follows:

1. Interlayer Color: Clear unless otherwise noted.

2. Interlayer Materials

   a. PVB Interlayers: Eastman Chemical "Saflex" or "Vanceva," DuPont "Butacite," or approved equal, 0.030" thick at vertical applications, and 0.060" thick at sloped or horizontal applications.
   b. Ionoplast Interlayer: Dupont "SentryGlas Plus," Trosifol, Kurary America, Inc. or approved equal.

3. Minimum thickness of 1/4".

F. Frameless Mirrors: 1/4", Quality q2, clear float glass with silver, copper, and organic coating, edges uniformly ground and polished.

2.3 GLAZING MATERIALS AND PRODUCTS

A. General: Provide sealants and gaskets with performance characteristics suitable for applications indicated. Ensure compatibility of glazing sealants with insulating glass sealants, with laminated glass interlayers, and with any other surfaces in contact.

B. General Glazing and Cap Bead Sealant: Provide sealant with maximum Shore A hardness of 50.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Dow Corning 795
   b. General Electric Silglaze N 2500 or Contractors SCS-1000
   c. Tremco Spectrem 2
   d. Or approved equal

C. Dense Elastomeric Compression Seal Gaskets: Provide molded or extruded neoprene or EPDM gaskets, Shore A hardness of 75±5 for hollow profile, and 60±5 for solid profiles, ASTM C 864.

D. Cellular, Elastomeric Preformed Gaskets: Provide extruded or molded closed cell, integral-skinned neoprene, Shore A 40±5, and 20% to 35% compression, ASTM C 509; Type II.

E. Preformed Glazing Tape: Provide solvent-free butyl-polyisobutylene rubber with 100% solids content complying with ASTM C 1281 AAMA A 800 with integral continuous EPDM shim. Provide preformed glazing tape in extruded tape form.

F. Setting Blocks: Provide 100% silicone blocks with Shore A hardness of 80-90. Provide products certified by manufacturer to be compatible with silicone sealants. Length to be not less than 4". Width for setting blocks to be 1/16" more than glass thickness and high enough to provide the lite recommended by glass manufacturer. When thickness of setting block exceeds 3/4" the glass manufacturer must be consulted for sizes and configuration. In a vented system, setting block shall be designed so as to not restrict the flow of water within the glazing rabbet to the weep holes.

1. Shims: For shims used with setting blocks, provide same materials, hardness, length and width as setting blocks.

2. Structural Silicone Glazing: Provide silicone setting blocks where structural silicone occurs at sills and at insulating units with silicone edge seals.

G. Edge Blocks: Provide neoprene or silicone as required for compatibility with glazing sealants. Provide blocks with Shore A hardness of 55±5.

H. Spacers: Elastomeric blocks or continuous extrusions with a Shore A durometer hardness required by glass manufacturer to maintain glass lites in place.

I. Miscellaneous Glazing Materials: Provide sealant backer rods, primers, cleaners, and sealers of type recommended by glass and sealant manufacturers.

J. Mirror Adhesive: Adhesive mastic for adhering glass plate. Mastic must be compatible with mirror backing.

1. Clips: No. 4 finish Type 304 stainless steel.

2.4 FABRICATION OF GLASS AND OTHER GLAZING PRODUCTS

A. Fabricate glass and other glazing products in sizes required to glaze openings indicated for Project, with edge and face clearances, edge and surface conditions, and bite complying with written instructions of product manufacturer and referenced glazing standard, to comply with system performance requirements.

B. Clean-cut or flat-grind vertical edges of butt-glazed monolithic lites in a manner that produces square edges with slight kerfs at junctions with indoor and outdoor faces.

C. Grind smooth and polish exposed glass edges.

PART III - EXECUTION

3.1 EXECUTION REQUIREMENTS

A. Refer to DDC General Conditions for execution requirements.

3.2 PREPARATION

A. Clean glazing channels and other framing members receiving glass immediately before glazing. Remove coatings not firmly bonded to substrates.

3.3 GENERAL GLAZING STANDARDS

A. Install products using the recommendations from the manufacturer of glass, sealants, gaskets and other glazing materials, except where more stringent requirements are indicated, including those in the GANA "Glazing Manual."

B. Install glass in prepared glazing channels and other framing members.

C. Install setting blocks in rabbets as recommended by referenced glazing standards in GANA's "Glazing Manual."

D. Provide bite on glass, minimum edge and face clearances and glazing material tolerances recommended by GANA's "Glazing Manual."

E. Provide weep system as recommended by GANA's "Glazing Manual."

F. Set glass lites in each series with uniform pattern, draw, bow and similar characteristics.

G. Distribute the weight of glass unit along the edge rather than the corner.

H. Comply with manufacturers and referenced industry standards on expansion joint and anchors; accommodating thermal movement; glass openings; use of setting blocks, edge, face, and bite clearances; use of glass spacers; edge blocks and installation of weep systems.

I. Protect glass edge damage during handling and installation.

J. Prevent glass from contact with contaminating substances that result from construction operations, such as weld spatter, fireproofing or plaster.

K. Remove and replace glass that is broken, chipped cracked or damaged in any way.

3.4 GLAZING

A. Glazing channel dimensions, as indicated on Shop Drawings, provide necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances. Adjust as required by Project conditions during installation.

B. Protect glass edges from damage during handling and installation. Remove damaged glass from Project site and legally dispose of off Project site. Damaged glass is glass with edge damage or other imperfections that, when installed, could weaken glass and impair performance and appearance.

C. Apply primers to joint surfaces where required for adhesion of sealants, as determined by preconstruction sealant-substrate testing.

D. Install setting blocks in sill rabbets, sized and located to comply with referenced glazing publications, unless otherwise required by glass manufacturer. Set blocks in thin course of compatible sealant suitable for heel bead. Install setting blocks at the one greater points of each lite along the horizontal mullion.

E. Do not exceed edge pressures stipulated by glass manufacturers for installing glass lites.

F. Provide spacers for glass lites where the length plus width is larger than 50 inches as follows:

1. Locate spacers directly opposite each other on both inside and outside faces of glass. Install correct size and spacing to preserve required face clearances, unless gaskets and glazing tapes are used that have demonstrated ability to maintain required face clearances and to comply with system performance requirements.

2. Provide 1/8-inch minimum bite of spacers on glass and use thickness equal to sealant width. With glazing tape, use thickness slightly less than final compressed thickness of tape.

G. Provide edge blocking where indicated or needed to prevent glass lites from moving sideways in glazing channel, as recommended in writing by glass manufacturer and according to requirements in referenced glazing publications.

H. Set glass lites in each series with uniform pattern, draw, bow, and similar characteristics.

I. Where wedge-shaped gaskets are driven into one side of channel to pressurize sealant or gasket on opposite side, provide adequate anchorage so gasket cannot walk out when installation is subjected to movement.

J. Square cut wedge-shaped gaskets at corners and install gaskets in a manner recommended by gasket manufacturer to prevent corners from pulling away; seal corner joints and butt joints with sealant recommended by gasket manufacturer.

K. Flush Glazing

1. If the butt joint in the metal framing is in the vertical direction, the glazier shall run the tape initially on the head and sill members going directly over this joint. Should the butt joint in the metal framing run horizontally, tapes must first be applied to the jambs so that it crosses over the joint.

2. Each tape section shall butt the adjoining tape and be united with a tool to eliminate any opening.

3. Do not overlap the adjoining length of tape or rubber shim as this will prevent full contact around the perimeter of glass.

L. Off-Set Glazing

1. Where the glazing legs are off-set, the difference in the rabbet width shall be compensated by employing different glazing tapes with different diameter shims. The difference in shim shall be equal to the size of the off-set. The thinner tape shall be positioned first on the glazing leg closest to the interior. The thicker tape shall be cut to the exact length of the dimension between the applied tapes, and installed on the outermost glazing leg.

2. Immediately prior to setting glass, paper backing shall be removed. Apply a toe bead of sealant 6" in each direction, from each corner.

3. Locate setting blocks in the sill member at quarter points, or if necessary to within 6" of each corner. Setting blocks must be set equal distance from center line of the glass and high enough to provide the recommended bite and edge clearances.

4. Set edge block according to glass manufacturer's recommendations.

5. Set Glass: The glass shall be pressed firmly against the tape to achieve full contact.

6. In a vented system, apply a heel bead (air seal) of sealant around the perimeter of glass, between the sole of the I.G. unit and the base of the rabbet of the metal framing developing a positive bond to the unit and to the metal framing. The bead of the sealant shall be deep enough so that it will partially fill the channel to a depth of 1/4" between the glass edge and the base of the metal framing rabbet.

7. Interior stops shall be set, and glazing tape spline for the appropriate face clearance shall be rolled into place, compressing the glass to the shim within the glazing tape.

3.5 TAPE GLAZING

A. Position tapes on fixed stops so that, when compressed by glass, their exposed edges are flush with or protrude slightly above sightline of stops.

B. Install tapes continuously, but not necessarily in one continuous length. Do not stretch tapes to make them fit opening.

C. Where framing joints are vertical, cover these joints by applying tapes to heads and sills first and then to jambs. Where framing joints are horizontal, cover these joints by applying tapes to jambs and then to heads and sills.

D. Place joints in tapes at corners of opening with adjoining lengths butted together, not lapped. Seal joints in tapes with compatible sealant approved by tape manufacturer.

E. Do not remove release paper from tape until just before each glazing unit is installed.

F. Apply heel bead of elastomeric sealant as recommended by glass manufacturer or glass frame manufacturer.

G. Center glass lites in openings on setting blocks and press firmly against tape by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings.

H. Apply cap bead of elastomeric sealant over exposed edge of tape where noted on approved shop drawings.

3.6 GASKET GLAZING (DRY)

A. Fabricate compression gaskets in lengths recommended by gasket manufacturer to fit openings exactly, with stretch allowance during installation.

B. Insert soft compression gasket between glass and frame or fixed stop so it is securely in place with joints miter cut and bonded together at corners.

C. Center glass lites in openings on setting blocks and press firmly against soft compression gasket by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings. Compress gaskets to produce a weathertight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended by gasket manufacturer.

D. Install gaskets so they protrude past face of glazing stops.

3.7 SEALANT GLAZING (WET)

A. Install continuous spacers, or spacers combined with cylindrical sealant backing, between glass lites and glazing stops to maintain glass face clearances and to prevent sealant from extruding into glass channel and blocking weep systems until sealants cure. Secure spacers or spacers and backings in place and in position to control depth of installed sealant relative to edge clearance for optimum sealant performance.

1. Exterior glazing gasket shall be set a minimum of 1/8" below exterior glazing stop to create a channel for sealant installation.

B. Force sealants into glazing channels to eliminate voids and to ensure complete wetting or bond of sealant to glass and channel surfaces.

C. Tool exposed surfaces of sealants to provide a substantial wash away from glass.

3.8 FRAMELESS MIRRORS

A. Apply mastic to back of mirror "pats" spaced 4 pats/sq. ft.; adjust mirror so that it is plumb and in place to avoid distortion of reflecting images. Allow 1/8" space between back of mirror and wall surface.

1. Apply "pats" using an electric applicator.

B. Apply stainless steel z-clips or cleats concealed behind mirror; securely clip to substrate using non-corrosive anchors. At drywall back-up anchors must be secured to studs or steel wallplate spanning from stud to stud.

3.9 PROTECTION AND CLEANING

A. Protect exterior glass from damage immediately after installation by attaching crossed streamers to framing held away from glass. Do not apply markers to glass surface. Remove nonpermanent labels, and clean surfaces.

B. Protect glass from contact with contaminating substances resulting from construction operations, including weld splatter. If, despite such protection, contaminating substances do come into contact with glass, remove them immediately as recommended by glass manufacturer.

C. Examine glass surfaces adjacent to or below exterior concrete and other masonry surfaces at frequent intervals during construction, but not less than once a month, for build-up of dirt, scum, alkaline deposits, or stains; remove as recommended by glass manufacturer.

D. Remove and replace glass that is broken, chipped, cracked, abraded, or damaged in any way, including natural causes, accidents, and vandalism, during construction period.

E. Clean excess sealant or compound from glass and framing members immediately after application, using solvents or cleaners recommended by manufacturers.

F. Glass to be cleaned according to:

1. GANA Glass Informational Bulletin GANA 01-0300 – "Proper Procedure for Cleaning Architectural Glass Products."

2. GANA Glass Informational Bulletin GANA TD-02-0402 – "Heat Treated Glass Surfaces are Different."

G. Do not use razor blades, scrapers or metal tools to clean glass.

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SECTION 08 90 00
Louvers

PART I - GENERAL

1.1 RELATED DOCUMENTS

A. The following documents apply to all required work for the Project: (1) the Contract Drawings, (2) the Specifications, (3) the General Conditions, (4) the Addendum and (5) the Contract (City of New York Standard Construction Contract).

B. LEED General Requirements:

1. Refer to DDC General Conditions

a. Section 01 33 00 "Submittal Procedures"
b. Section 01 81 13.04 "Sustainable Design Requirements for LEED v4 Buildings"

1.2 SUMMARY

A. Section includes:

1. Aluminum louvers.
2. Blank off panels.
3. Bird screens.

B. Related Sections

1. Unit Masonry - Section 04 20 00.
2. Interior Joint Sealants - Section 07 92 00.
3. Exterior Joint Sealants - Section 07 92 01.
4. Steel Doors and Frames - Section 08 11 13 for louvers in hollow metal doors.

1.3 QUALITY ASSURANCE

A. Refer to DDC General Conditions Section 01 40 00 "Quality Requirements".

B. Structural Performance: Provide exterior metal louvers capable of withstanding the effects of loads and stresses from wind and snow and normal thermal movement without evidencing permanent deformation of louver components including blades, frames, and supports; noise or metal fatigue caused by louver blade rattle or flutter or permanent damage to fasteners and anchors.

1. Wind Load: Uniform pressure (velocity pressure) of not less than 30 lbf/sq. ft., acting inward or outward or greater.

C. Thermal Movements: Provide louvers that allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures by preventing buckling, opening of joints, overstressing of components, and other detrimental effects.

1. Temperature Change (Range): 120 deg. F., ambient; 180 deg. F, material surfaces.

D. Comply with SMACNA "Architectural Sheet Metal Manual" recommendations for fabrication, construction details and installation procedures, except as otherwise indicated.

E. Shop Assembly: Coordinate shop drawings with fabrication and shop assembly to minimize field adjustments, splicing, mechanical joints and field assembly of units. Preassemble units in shop to greatest extent possible and disassemble as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation.

1.4 SUBMITTAL PROCEDURES

A. Refer to DDC General Conditions Section 01 33 00 "Submittal Procedures".

1.5 SUBMITTALS

A. Product Data: Submit manufacturer's specifications, certified test data, where applicable, and installation instructions for required products, including finishes.

B. Shop Drawings: Submit shop drawings for fabrication and erection of louver units and accessories. Include plans, elevations and details of sections and connections to adjoining work. Indicate materials, finishes, fasteners, joinery and other information to determine compliance with specified requirements.

C. Samples: Submit six (6) inch square samples of each required finish. Prepare samples on metal of same gauge and alloy to be used in work. Where normal color and texture variations are to be expected, include two (2) or more units in each sample showing limits of such variations.

1.6 WARRANTY

A. Finish shall be warranted for a period of 20 years, starting from date of Substantial Completion of the Project.

PART II - PRODUCTS

2.1 LOUVER MATERIAL

A. Provide nominal 7" deep storm resistant fixed horizontal louver (no mullions), Model No. RS-7315 by Construction Specialties or similar product from a manufacturer listed below, or approved equal.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Construction Specialties
   b. Airolite
   c. Airline Products Co.
   d. American Warming and Ventilating
   e. Or approved equal

B. Material: Heads, sills, jambs and mullions to be one-piece structural aluminum members with integral caulking slot and retaining beads. Louver shall be designed to collect and drain water to exterior at sill by means of multiple gutters in blades and channels in jambs and mullions. Louvers to be supplied with 4" high by full depth sill flashings formed from minimum 0.050" thick aluminum. Sill flashings to have welded side panels. Louvers and sill flashings to be installed in accordance with the manufacturer's recommended procedures to ensure complete water integrity performance of the louver system

C. AMCA Performance: A 4' x 4' unit shall conform to the following:

1. Free Area: 8.09 sq. ft.

2. Intake Pressure Drop at 900 fpm Free Area Velocity: 0.312 in. H_2O.

3. Exhaust Pressure Drip at 900 fpm Free Area Velocity: 0.394 in. H_2O.

D. Wind Driven Rain Performance: The louver test was based on a 39.370" x 39.370" core area. Unit tested at a rainfall rate of 3.0" per hour and with a wind directed tot he face of the louver at a velocity 29.1 mph. The test data shall show the water penetration effectiveness rating at each corresponding ventilation rate.

1. Core Ventilation Rate: (ft/min)	0	132	196	283	375	468	587	673
2. Free Area Velocity (ft/min)	0	264	392	567	751	937	1175	1347
3. Rating Effectiveness @ 29 & 3	A	A	A	A	B	C	C	D

E. High-Performance Organic Finish: AA-C12C42R1x (Chemical Finish: Cleaned with inhibited chemicals; Chemical Finish: Acid-chromate-fluoride-phosphate conversion coating; Organic Coating: As specified below). Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturer's written instructions.

1. Fluoropolymer Two-Coat System: Manufacturer's standard two-coat, thermocured system consisting of specially formulated inhibitive primer and fluoropolymer color topcoat containing not less than 70 percent polyvinylidene fluoride resin by weight; complying with AAMA 2605.

2. Color and Gloss: Manufacturer's standard black and standard gloss.

F. Bird Screens

1. All louvers to be furnished with bird screens, finish to match louvers.

2. Screens to be 5/8" mesh, 0.050" thick expanded and flattened aluminum bird screen secured with 0.055" thick extruded aluminum frames. Frames to have mitered corners and corner locks.

G. Blank off panels to be 2" thick and to be faced on both sides with 0.032" thick aluminum sheet. Panels to be fabricated with an expanded polystyrene (EPS) core having an R-value of 8. Panel perimeter frame to be 0.050" thick formed aluminum channels. Panel frame to be mitered at the corners. Panels to be finished to match louvers.

H. Fastenings: Fasteners for exterior application shall be stainless steel. Provide types, gauges and lengths to suit unit installation conditions. Use Phillips flat head machine screws for exposed fasteners, unless otherwise indicated.

I. Anchors and Inserts: Use non-ferrous metal or hot dip galvanized anchors and inserts for exterior installations and elsewhere as required for corrosion resistance. Use steel or lead expansion bolt devices for drilled in place anchors. Furnish inserts, as required, to be set into concrete or masonry work.

J. Bituminous Paint: SSPC-Paint 12 (cold applied asphalt mastic).

2.2 FABRICATION, GENERAL

A. Fabricate frames including integral sills to suit adjacent construction with tolerances for installation, including application of sealants in joints between louvers and adjoining work.

B. Include supports, anchorages, and accessories required for complete assembly.

C. Provide sill extensions made of same material as louvers, where indicated, or required for drainage to exterior and to prevent water penetrating to interior.

D. Join frame members to one another and to stationary louver blades by welding, except where indicated otherwise or where field bolted connections between frame members are necessary by size of louvers. Maintain equal blade spacing, including separation between blades and frames at head and sill, to produce uniform appearance.

PART III - EXECUTION

3.1 EXECUTION REQUIREMENTS

A. Refer to DDC General Conditions for execution requirements.

3.2 PREPARATION

A. Coordinate setting drawings, diagrams, templates, instructions and directions for the installation of anchorages which are to be embedded in masonry construction.

3.3 INSTALLATION

A. Anchor louvers to the building substructure.

B. Erection Tolerances:

1. Maximum variation from plane or location shown on the approved shop drawings: 1/8" per 12 feet of length, but not exceeding 1/2" in any total building length or portion thereof (non-cumulative).

2. Maximum offset from true alignment between two members abutting end to end, edge to edge in line or separated by less than 3": 1/16" (shop or field joints). This limiting condition shall prevail under both load and no load conditions.

C. Cut and trim component parts during erection only with the approval of the manufacturer or fabricator, and in accordance with his recommendations. Restore finish completely. Remove and replace members where cutting and trimming has impaired the strength or appearance of the assembly.

D. Set units level, plumb and true to line, with uniform joints.

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SECTION 09 29 00
Gypsum Drywall

PART I - GENERAL

1.1 RELATED DOCUMENTS

A. The following documents apply to all required work for the Project: (1) the Contract Drawings, (2) the Specifications, (3) the General Conditions, (4) the Addendum and (5) the Contract (City of New York Standard Construction Contract).

B. LEED / Environmentally Preferable Purchase (EPP) General Requirements:

1. Refer to DDC General Conditions and the Addendum to the General Conditions

2. LEED requirements apply to all Phase II work with the exception of the Existing Building scope. EPP requirements apply to the project's Existing Building scope only.

1.2 SUMMARY

A. Section includes:

1. Gypsum board work for partitions, ceilings, column enclosures, furring, and elsewhere where gypsum drywall work is shown on drawings.

2. Metal supports for gypsum drywall construction.

3. Acoustical insulation for gypsum drywall work.

4. Sealant for gypsum drywall work.

5. Concealed metal reinforcing for attachment of railings, toilet partitions and other items supported on drywall partitions and walls.

6. Taping and finishing of drywall joints.

7. Installing rings and frames in drywall surfaces for grilles, registers and lighting fixtures.

8. Gypsum shaftwall construction.

9. Bracing and connections.

B. Related Sections

1. Thermal Insulation - Section 07 21 00.

2. Firestops and Smokeseals - Section 07 84 13.

3. Steel Doors and Frames - Section 08 11 13.

4. Access Doors - Section 08 31 13.

5. Painting and Finishing - Section 09 90 00.
6. Diffusers, Registers and Grilles - Section 23 37 13.
7. Interior Lighting - Section 26 51 00.
8. Corner Guards – Section 10 26 00.

1.3 QUALITY ASSURANCE

A. Refer to DDC General Conditions Section 01 40 00 "Quality Requirements".

B. The following standards, as well as other standards which may be referred to in this Section, shall apply to the work of this Section:

1. The Gypsum Construction Handbook, latest edition, USG.
2. Construction Guide, latest edition, National Gypsum.
3. ASTM A 568 "Standard Specification for Steel, Sheet, Carbon, and High-Strength, Low-Alloy, Hot-Rolled and Cold-Rolled, General Requirements For"
4. ASTM C 475 "Standard Specification for Joint Treatment Materials For Gypsum Wallboard Construction"
5. ASTM C 645 "Standard Specification for Non-Structural Steel Framing Members"
6. ASTM C 754 "Standard Specification for Installation of Steel Framing Members to Receive Screw Attached Gypsum Panel Products"
7. ASTM C 840 "Standard Specification for Application and Finishing of Gypsum Board"
8. ASTM C 919 "Standard Specification for Use of Sealants in Acoustical Applications"
9. ASTM C 954 "Standard Specification for Steel Drill Screws For the Application of Gypsum Board or Metal Plaster Bases to Steel Studs From 0.033 in. to 0.112 in. in Thickness"
10. ASTM C 1002 "Standard Specification for Steel Self-Piercing Tapping Screws For the Application of Gypsum Board"
11. ASTM C 1177 "Standard Specification for Glass Mat Gypsum Substrate for Use as Sheathing"
12. ASTM C 1178 "Standard Specification for Glass Mat Water Resistant Gypsum Backing Board"
13. ASTM C 1278 "Standard Specification for Fiber-Reinforced Gypsum Panel"
14. ASTM C 1396 "Standard Specification for Gypsum Board"
15. ASTM D 3273 "Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber"

C. Allowable Tolerances: 1/32" offsets between planes of board faces, and 1/16" in 8'-0" for plumb, level, warp and bow.

D. System Design Load

1. Provide standard drywall wall assemblies designed and tested by manufacturer to withstand a lateral load of 5 lbs. per sq. ft. for the maximum wall height required, and with deflection limited to L/240 of partition height.

a. Drywall assemblies with tile finish shall have a deflection limit of L/360.

2. Provide drywall ceiling assemblies designed, fabricated and installed to have a deflection not to exceed L/360.

E. Fire-Resistance Rating: Where gypsum drywall with fire resistance ratings are indicated, provide materials and installations which are identical with those of applicable assemblies tested per ASTM E 119 by fire testing laboratories, or to design designations in UL "Fire Resistance Directory" or in listing of other testing agencies acceptable to the Commissioner, and compliant with UL Test #2079; criteria for cycle movement for all field height wall sections requiring allowance for vertical deflection within framing details.

F. Installer: Firm with not less than 3 years of successful experience in the installation of specified materials.

1.4 SUBMITTAL PROCEDURES

A. Refer to DDC General Conditions Section 01 33 00 "Submittal Procedures".

1.5 SUBMITTALS

A. Submit shop drawing for each drywall partition, furring and ceiling system showing size and gauges of framing members, hanger and anchorage devices, wallboard types, insulation, sealant, methods of assembly and fastening, control joints indicating column lines, corner details, joint finishing and relationship of drywall work to adjacent work.

B. Submit control joint plan.

C. Samples: Each material specified herein, 12" x 12", or 12" long, or in manufacturer's container, as applicable for type of material submitted.

D. Manufacturer's Literature: Submit technical and installation instructions for each drywall partition, furring and ceiling system specified herein, and for each fire-rated and sound-rated gypsum board assembly. Submit other data as required to show compliance with these specifications, including data for mold resistant joint compound.

E. Test Reports: This Contractor shall submit test report, obtained by drywall manufacturer, indicating conformance of drywall assemblies to required fire ratings and sound ratings.

1.6 JOB MOCK-UP

A. Build a portion of a finished wall and ceiling demonstrating the quality of work, including finishing, to be obtained under this Section. Omit drywall boards in locations as directed by the Commissioner to show stud spacing and attachments; after acceptance, complete assembly.

B. Adjust the finishing techniques as required to achieve the finish required by the Commissioner as described in this Section.

C. Upon approval of the mock-up, the mock-up may be left in place as a portion of the finished work of this Section.

D. All drywall work shall be equal in quality to approved mock-up.

PART II - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers of drywall: Subject to compliance with requirements, provide products by one of the following:

1). U.S. Gypsum Co.
2). Georgia Pacific
3). CertainTeed Corporation
4). Continental
5). National Gypsum Co.
6). Or approved equal

B. Manufacturers for Metal Supports of Drywall Assemblies: Subject to compliance with requirements, provide products by one of the following:

1). ClarkDietrich Building Systems
2). Super Stud Building Products
3). Marino/Ware
4). Or approved equal

2.2 METAL SUPPORTS

A. Metal Floor and Ceiling Runners

1. Channel Type: Formed from 20 U.S. Std. gauge (unless otherwise noted) galvanized steel, width to suit channel type metal studs. Use 20 ga. top runners with 1-1/4" minimum flanges.

2. Ceiling runners and head of wall connections at rated partitions shall conform to UL #2079 for cycle movement. Provide positive mechanical connection of framing to structure, allowing for vertical movement within connections. Minimum of 20 ga. galvanized steel for clips, 25 ga. galvanized steel for ceiling runners. Providing a friction free – anti-seizure movement capacity.

a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1). Steel Network
2). VertiClip or VertiTrack
3). Metal-Lite Inc.
4). Fire Trak Corporation
5). Or approved equal

3. Track (including stud clips)

a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1). Fire Trak Corporation
2). Metal-Lite Inc.
3). ClarkDietrich Building Systems
4). Or approved equal.

4. "J" Type: Formed from 20 U.S. Std. gauge galvanized steel, 1" x 2-1/2" or 4" wide (to suit detail) x 2-1/4" (for shaft wall).

B. Vertical Movement Clips:

Basis of Design: Subject to compliance with requirements, provide Fastclip Side Clips (FCSC) by ClarkDietrich Building Systems or comparable product by one of the following:

1). Super Stud Building Products
2). Marino/Ware
3). Or approved equal.

C. Metal Studs, Framing and Furring

1. Channel Type Studs: Channel type with holes for passage of conduit formed from minimum 20 U.S. Std. gauge (unless heavier gauge is required to meet deflection limits) galvanized steel, width as shown on drawings.

2. Furring Channels: Hat shaped, formed from galvanized steel, 25 U.S. Std. gauge.

3. "C-H," "CT," or "I" Type Stud: 1-1/2" x 2-1/2", 4" or 6" wide (to suit detail) galvanized steel. Use for shaft wall construction; gauge and size as required to meet deflection limits given herein.

4. Double "E" Type Stud or "J" Track with Holding Tabs: 1" x 2-1/2", 4" or 6" wide (to suit detail) galvanized steel. Use for shaft wall construction; gauge and size as required to meet deflection limits given herein.

5. Continuous 16 gauge x 8" wide steel wall plate screwed to studs as required for support of railings, toilet partitions and other items supported on drywall partitions and walls.

D. Suspended Ceiling and Fascia Supports

1. Main Runners: 1-1/2" steel channels, cold rolled at 0.475 lbs. per ft., rust-inhibitive paint finish.

2. Furring Members: Screw-type hat-shaped furring channels of 25 ga. zinc-coated steel; comply with ASTM C 645.

3. Hangers: Galvanized, 1" x 3/16" flat steel slats capable of supporting 5x calculated load supported.

4. Hanger Anchorages: Provide inserts, clips, bolts, screws and other devices applicable to the required method of structural anchorage for ceiling hangers. Size devices for 5x calculated load supported.

5. Furring Anchorages: 16 ga. galvanized wire ties, manufacturer's standard clips, bolts or screws as recommended by furring manufacturer.

E. All galvanized steel members shall have coating conforming to ASTM A 653, G60.

2.3 GYPSUM WALLBOARD TYPES

A. Gypsum Wall Board: 5/8" thick unless otherwise noted; 48" wide, in maximum lengths available to minimize end-to-end butt join

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. "Sheetrock" by USG
b. "Gold Bond" by National Gypsum
c. "Regular Gypsum" by CertainTeed Corp.
d. Or approved equal

B. Fire Rated Gypsum Wall Board: 5/8" thick unless otherwise noted; 48" wide, in maximum lengths available to minimize end-to-end butt join

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. "Sheetrock Firecode C" by USG
b. "Firecheck Type C" by Lafarge/Continental
c. "Gold Bond Fireshield" by National Gypsum
d. or approved equal

C. Water Resistant Backing Board for Tile Finish: 5/8" thick unless otherwise noted; Cover joints with a pressure sensitive woven glass fiber tape.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. "Fiberock Aqua-Tough" by USG
b. "Dens-Shield Tile Backer Board" by Georgia Pacific
c. "DiamondBack Tile Backer" by CertainTeed Corp.
d. or approved equal.

D. Moisture/Mold Resistant Gypsum Wall Board at locations listed below, unless otherwise shown on drawings: 5/8" thick unless otherwise noted; 48" wide, in maximum lengths available to minimize end-to-end butt joints. Board must have a rating of 10 per ASTM D 3273 with a core that meets ASTM C 1396, Section 6 or ASTM C 1658.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. "Mold Tough" or "Mold Tough FR" by U.S. Gypsum
   b. "DensArmor Plus" by Georgia Pacific
   c. "Mold Defense" and/or "Mold Defense Type X" by Lafarge/Continental
   d. "Gold Bond EXP Interior Extreme Gypsum Board" by National Gypsum
   e. Or approved equal

2. Areas in toilet rooms, lockers, janitor's closets not scheduled to receive ceramic tile, or where fire rating is required.

3. Walls and ceilings of spaces containing condensers, water tanks, water pumps and pressure reduction valves.

4. Portions of walls within 2 feet of kitchen sinks to a height of 4 feet above the floor.

5. Portions of walls within 2 feet of kitchen stoves to a height of 4 feet above the floor.

6. Walls of bathrooms that are not solely water closet compartments, other than walls where cement board is specifically required.

7. Walls and ceilings in service sink closets.

8. Portion of walls within 2 feet of mop sinks or service sinks to a height of 4 feet above the floor.

9. All perimeter walls and wet shafts.

E. Mold Resistant Shaft Wall Liner: Solid gypsum board liner for shaft wall construction, 1" thick, 24" wide, as required to suit condition, by standard lengths as required, beveled edges.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. "Mold Tough Liner Panel" by USG
   b. "DensGlass Ultra Shaft Guard" by Georgia Pacific
   c. "Mold Defense Shaftliner Type X" and/or "Weather Defense Shaftliner Type X" by Lafarge/Continental
   d. "Gold Bond Brand Fireshield Shaft Liner XP," "Gold Bond Brand EXP Extended Exposure Shaft Liner" by National Gypsum,
   e. "M2Tech Shaftliner" by CertainTeed Corp.
   f. Or approved equal.

2. Liner board must have a rating 10 per ASTM D 3273 with a core that meets ASTM C 1396 Section 6.

F. Horizontal Shaftwall Duct and Ceiling Assemblies: 1" thick fire-resistant gypsum core shaftwall panel with additives to enhance fire resistance of the core and surfaced with water repellent paper on front, back, and long edges and complying with ASTM C 1396

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. Type X; "Firecode C Core, Sheetrock Brand" by USG

b. "Gold Bond Brand Fire-Shield Shaftliner" by National Gypsum
c. "DensGlass Ultra Shaft Guard" by Georgia Pacific
d. Or approved equal.

G. Impact-Resistant Wallboard: 5/8" thick,

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. "Sheetrock Brand Mold Tough VHI" by USG
b. "DensArmor Plus Impact-Resistant Panels" by Georgia-Pacific
c. "EXP Interior Extreme IR"
d. "Gold Bond Brand Hi-Impact XP" by National Gypsum
e. "Protecta HIR 300" by Lafarge/Continental
f. "AirRenew Extreme Impact" by CertainTeed Corp.
g. Or approved equal

2. 48" wide, in maximum lengths available to minimize end-to-end butt joints.

2.4 ACCESSORIES

A. Acoustical Insulation: Paper-less, non-combustible, semi-rigid mineral fiber, thickness to match full stud width, in walls (unless otherwise indicated), 3 lb./cu. ft. maximum density;

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Thermafiber LLC "Thermafiber,"
b. Roxul "Comfortbatt,"
c. Owens Corning "Sound Attenuation Fire Batt Insulation/MW,"
d. Or approved equal.

B. Fasteners for Wall Board: USG Brand Screws, or approved equal; Type S Bugle Head for fastening wallboard to lighter gauge interior metal framing (up to 20 ga.). Type S-12 Bugle Head for fastening wallboard to heavier gauge interior metal framing (20 ga. to 12 ga.); Type S and Type S-12 Pan Head for attaching metal studs to door frames and runners; and Type G Bugle Head for fastening wallboard to wall board. Lengths specified below under "Part 3 - Execution" Articles and as recommended by drywall manufacturer.

C. Laminating Adhesive: Adhesive or joint compound recommended for directly adhering gypsum panels to continuous substrate.

D. Metal Trim - Corner Beads: For 90 degree External Corners - 27 U.S. Std. ga. galvanized steel, 1-1/4" x 1-1/4", for 90 degree external corners; ASTM C 1047.

E. Metal Trim - Edge Beads: Paper-faced galvanized-steel sheet; ASTM C 1047.

F. Metal Trim Treatment Materials and Joint Treatment Materials for Gypsum Drywall Boards: Paper tape for joint reinforcing; setting type or lightweight setting type joint compound for taping and topping; and ready-mix compound for finishing.

1. For mold-resistant drywall, water resistant drywall, and tile backer board, use glass mesh tape with setting joint compound that is rated 10 when tested in accordance with ASTM D 3273 and evaluated in accordance with ASTM D 3274.

2. Joint compound

   a. Basis of Design: Subject to compliance with requirements, provide "Rapid Set One Pass" made by CTS Cement Manufacturing Corp. or comparable product by one of the following:

      1). "Rapid Joint" manufactured by Lafarge North America
      2). "M2Tech 90" manufactured by CertainTeed
      3). Or approved equal

G. Control Joints:

1. Basis of Design: Subject to compliance with requirements, provide No. 0.093 by USG or comparable product by one of the following:

   1). Lafarge
   2). National Gypsum
   3). Or approved equal.

H. Acoustical Sealant:

1. Basis of Design: Subject to compliance with requirements, provide USG "Sheetrock Brand Acoustical Sealant"

   1). Tremco Mfg. Co. "Tremco Acoustical Caulking"
   2). Pecora "AIS-919"
   3). Or approved equal.

I. Neoprene Gaskets: Conform to ASTM D 1056.

PART III - EXECUTION

3.1 EXECUTION REQUIREMENTS

A. Refer to DDC General Conditions for execution requirements.

3.2 GENERAL INSTALLATION REQUIREMENTS

A. General

1. All metal framing for drywall partitions shall extend from floor to underside of structural deck above. Provide for vertical deflection with positive mechanical connections of framing members to structure.

2. Provide concealed reinforcement, 16 ga. thick by eight (8) inches wide or as detailed or as recommended by manufacturer, for attachment of railings, toilet partitions, and other items to be supported on the partitions which cannot be attached to the metal framing members. Concealed

reinforcement shall span between metal studs and be attached thereto using two (2) self-tapping pan head screws at each stud.

a. Back of drywall shall be scored or notched to prevent bulging out where reinforcement plate occurs.

B. Fire-Rated Assemblies: Install fire-rated assemblies in accordance with requirements of the 2014 New York City Building Code, Underwriters' Laboratories and test results obtained and published by the drywall manufacturer, for the fire-rated drywall assembly types indicated on the drawings.

C. Acoustical Assemblies: Install acoustically-rated assemblies to achieve a minimum STC as noted on drawings, in accordance with test results obtained and published by the drywall manufacturer, for the drywall assembly type indicated on the drawings.

D. Sealant

1. Install continuous acoustical sealant bead at top and bottom edges of wallboard where indicated or required for sound rating as wallboard is installed, and between metal trim edge beads and abutting construction.

2. Install acoustical sealant in 1/8" wide vertical control joints within the length of the wall or partitions, and in all other joints, specified below under "Control Joints." Install bead of acoustical sealant around electric switch and outlet boxes, piping, ducts, and around any other penetration in the wallboard; place sealant bead between penetrations and edge of wallboard.

3. Where sealant is exposed to view, protect adjacent surfaces from damage and from sealant material, and tool sealant flush with and in same plane as wallboard surface. Sealant beads shall be 1/4" to 3/8" diameter.

E. Wall Board Application

1. Do not install wallboard panels until steel door frames are in place; coordinate work with Section 08 11 13, "Steel Doors and Frames."

2. See drawings for all board types. Use fire-rated wallboard for fire-rated assemblies. Use sag-resistant board for ceilings. Use water-resistant wallboard where indicated on drawings and where wallboard would be subject to moisture. Install water-resistant wallboard in full, large sheets (no scraps) to limit number of butt joints.

3. Apply wallboard with long dimension parallel to stud framing members, and with abutting edges occurring over stud flanges.

4. Install wallboard for partitions from floor to underside of structure above and secure rigidly in place by screw attachment, unless otherwise indicated.

5. Provide safing insulation meeting standards of Section 07 84 13, Firestops and Smokeseals, at flutes of metal deck where partitions carry up to bottom of metal deck.

6. Neatly cut wallboard to fit around outlets, switch boxes, framed openings, piping, ducts, and other items which penetrate wallboard; fill gaps with acoustic sealant.

7. Where wallboard is to be applied to curved surfaces, dampen wallboard on back side as required to obtain required curve. Finish surface shall present smooth, even curve without fluting or other imperfections.

8. Screw fasten wallboard with power-driven electric screw driver, screw heads to slightly depress surface of wallboard without cutting paper, screws not closer than 3/8" from ends and edges of wallboard.

9. Where studs are doubled-up, screw fasten wallboard to both studs in a staggered pattern.

F. Cementitious Backer Board

1. General: Furnish cementitious backer board in maximum available lengths. Install horizontally, with end joints over framing members.

2. Fastening: Secure cementitious backer board to each framing member with screws spaced not more than 12 inches on center and not closer than 1/2" from the edge. Install screws with a conventional screw gun so that the screw heads are flush with the surface of the board.

3. Joint Treatment: Fill space between edge of backer and receptor with dry-set Portland cement or latex-Portland cement mortar. Fill all horizontal and vertical joints and corners with dry-set Portland cement or latex-Portland cement mortar. Apply fiberglass tape over joints and corners and embed with same mortar.

G. Metal Trim: Install and mechanically secure in accordance with manufacturer's instructions; and finish with three (3) coats of joint compound, feathered and finish sanded smooth with adjacent wallboard surface, in accordance with manufacturer's instructions.

1. Corner Beads: Install specified corner beads in single lengths at all external corners, unless corner lengths exceed standard stock lengths.

2. Edge Beads: Install specified edge beads in single lengths at all terminating edges of wallboard exposed to view, where edges abut dissimilar materials, where edges would be exposed to view, and elsewhere where shown on drawings. Where indicated on drawings, seal joint between metal edge bead and adjoining surface with specified gasket, 1/8" wide minimum and set back 1/8" from face of wallboard, unless other size and profile indicated on drawings.

3. Casing beads shall be set in long lengths, neatly butted at joints. Provide casing beads at juncture of board and vertical surfaces and at exposed perimeters.

H. Control Joint Locations: Gypsum board surfaces shall be isolated with control joints where:

1. Ceiling abuts a structural element, dissimilar wall or other vertical penetration.

2. Construction changes within the plane of the partition or ceiling.

3. Shown on approved shop drawings.

4. Ceiling dimensions exceed thirty (30) feet in either direction.
5. Wings of "L," "U," and "T" shaped ceiling areas are joined.
6. Expansion or control joints occur in the structural elements of the building.
7. Shaftwall runs exceed 30' without interruption.
8. Partition or furring abuts a structural element or dissimilar wall or ceiling.
9. Partition or furring runs exceed 30' without interruption.
10. Where control joints are required, ceiling height door frames may be used as control joints. Less than ceiling height frames shall have control joints extending to the ceiling from both corners.

I. Joint Treatment and Spackling

1. Joints between face wallboards in the same plane, joints at internal corners of intersecting partitions and joints at internal corners of intersections between ceilings and walls or partitions shall be filled with joint compound.
2. Screw heads and other depressions shall be filled with joint compound. Joint compound shall be applied in three (3) coats, feathered and finish surface sanded smooth with adjacent wallboard surface, in accordance with manufacturer's instructions. Treatment of joints and screw heads with joint compound is also required where wallboard will be covered by finish materials which require a smooth surface, such as vinyl wall coverings.

3.3 FURRED WALLS AND PARTITIONS

A. Use specified metal furring channels. Run metal furring channel framing members vertically, space sixteen (16) inches o.c. maximum. Fasten furring channels to concrete or masonry surfaces with power-driven fasteners or concrete stub nails spaced sixteen (16) inches o.c. maximum through alternate wing flanges (staggered) of furring channel. Furring channels shall be shimmed as necessary to provide a plumb and level backing for wallboard. At inside of exterior walls, an asphalt felt protection strip shall be installed between each furring channel and the wall. Furring channel and splices shall be provided by nesting channels at least eight (8) inches and securely anchoring to concrete or masonry with two (2) fasteners in each wing.

B. Wallboard Installation: Same as specified under Article 3.4 - "Metal Stud Partitions."

3.4 METAL STUD PARTITIONS

A. Unless otherwise noted, steel framing members shall be installed in accordance with ASTM C 754.

B. Runner Installation: Use channel type. Align accurately at floor according to partition layout. Anchor runners securely sixteen (16) inches o.c. maximum with power-driven anchors to floor slab, with power-driven anchors to structural slab above. See "Stud Installation" below for runners over heads of metal door frames. Where required, carefully remove sprayed-on fireproofing to allow partition to be properly installed.

C. Stud Installation

1. Use channel type, positioned vertically in runners, spaced as noted on drawings, but not more than twenty-four (24) inches o.c.

2. Anchor studs to floor runners with screw fasteners. Provide snap-in or slotted hole slip joint bolt connections of studs to ceiling runners leaving space for movement. Anchor studs at partition intersections, partition corners and where partition abuts other construction to floor and ceiling runners with sheet metal screws through each stud flange and runner flange.

3. Connection at ceiling runner for non-rated partitions shall be snap-in or slotted hole slip joint bolt connection that shall allow for movement. Seal studs abutting other construction with 1/8" thick neoprene gasket continuously between stud and abutting construction.

4. Connections for fire rated partitions at ceiling runners shall conform to UL Design #2079.

5. Install metal stud horizontal bracing wherever vertical studs are cut or wallboard is cut for passage of pipes, ducts or other penetrations, and anchor horizontal bracing to vertical studs with sheet metal screws.

6. At jambs of door frames and borrowed light frames, install doubled-up studs (not back to back) from floor to underside of structural deck, and securely anchor studs to jamb anchors of frames and to runners with screws. Provide cross braces from hollow metal frames to underside of slab.

7. Over heads of door frames, install cut-to-length section of runner with flanges slit and web bent to allow flanges to overlap adjacent vertical studs, and securely anchor runner to adjacent vertical studs with sheet metal screws. Install cut-to-length vertical studs from runner (over heads of door frame) to ceiling runner sixteen (16) inches maximum o.c. and at vertical joints of wallboard, and securely anchor studs to runners with sheet metal screws.

8. At control joints, in field of partition, install double-up studs (back to back) from floor to ceiling runner, with 1/4" thick continuous compressible gasket between studs. When necessary, splice studs with eight (8) inches minimum nested laps and attach flanges together with two (2) sheet metal screws in each flange. All screws shall be self-tapping sheet metal screws.

D. Runners and Studs at Chase Wall: As specified above for "Runners" and "Studs" and as specified herein. Chase walls shall have either a single or double row of floor and ceiling runners with metal studs sixteen (16) inches o.c. maximum and positioned vertically in the runners so that the studs are opposite each other in pairs with the flanges pointing in the same direction. Anchor all studs to runner flanges with sheet metal screws through each stud flange and runner flange following requirements of paragraph 3.4, B. Provide cross bracing between the rows of studs by attaching runner channels or studs set full width of chase attached to vertical studs with one self-tapping screw at each end. Space cross bracing not over thirty-six (36) inches o.c. vertically.

E. Wallboard Installation - Single Layer Application (Screw Attached)

1. Install wallboard with long dimension parallel to framing member and with abutting edge joints over web of framing member. Install wallboard with long dimension perpendicular to framing members

above and below openings in drywall extending to second stud at each side of opening. Joints on opposite sides of wall shall be arranged so as to occur on different studs.

2. Boards shall be fastened securely to metal studs with screws as specified. Where a free end occurs between studs, back blocking shall be required. Center abutting ends over studs. Correct work as necessary so that faces of boards are flush, smooth, true.

3. Wallboard screws shall be applied with an electric screw gun. Screws shall be driven not less than 3/8" from ends or edges of board to provide uniform dimple not over 1/32" deep. Screws shall be spaced twelve (12) inches o.c. in the field of the board and 8" o.c. staggered along the abutting edges.

4. All ends and edges of wallboard shall occur over screwing members (studs or furring channels). Boards shall be brought into contact but shall not be forced into place. Where ends or edges abut, they shall be staggered. Joints on opposite sides of a partition shall be so arranged as to occur on different studs.

5. At locations where piping receptacles, conduit, switches, etc., penetrate drywall partitions, provide non-drying sealant and an approved sealant stop at cut board locations inside partition.

F. Wallboard Installation - Double-Layer Application

1. General: See drawings for wallboard partition types required.

2. First Layer (Screw Attached): Install as described above for single layer application.

3. Second Layer (Screw Attached): Screw attach second layer, unless laminating method of attachment indicated on drawings or necessary to obtain required sound rating or fire rating. Install wallboard vertically with vertical joints offset thirty-two (32) inches from first layer joints and staggered on opposite sides of wall. Attach wallboard with 1-5/8" screws sixteen (16) inches o.c. along vertical joints and sixteen (16) inches o.c. in the field of the wallboard. Screw through first layer into metal framing members.

4. Second Layer (Laminated): Install wallboard vertically. Stagger joints of second layer from first layer joints. Laminate second layer with specified laminating adhesive in beads or strips running continuously from floor to ceiling in accordance with manufacturer's instructions. After laminating, screw wallboard to framing members with 1-5/8" screws, spaced twelve (12) inches o.c. around perimeter of wallboard.

G. Wallboard Installation - Laminated Application: Where laminated wallboard is indicated, use specified laminating adhesive, install wallboard vertically and retain tolerances as specified for screw attached wallboard.

H. Insulation Installation: Install where indicated on drawings. Place blanket tightly between studs.

I. Deflection of Structure Above: To allow for possible deflection of structure above partitions, provide top runners for non-rated partitions with 1-1/4" minimum flanges and do not screw studs or drywall to top runner. Where positive anchorage of studs to top runner is required, anchorage device shall be by means of slotted hole (in clip connection with screw attachment to web of steel through bushings located in slots of clips), or other anchorage device approved by the Commissioner.

J. Control Joints

1. Leave a 1/2" continuous opening between gypsum boards for insertion of surface mounted joint.
2. Back by double framing members.
3. Attach control joint to face layer with 9/16" galvanized staples six (6) inches o.c. at both flanges along entire length of joint.
4. Provide two (2) inch wide gypsum panel strip or other adequate seal behind control joint in fire rated partitions and partitions with safing insulation.

3.5 DRYWALL FASCIAS AND CEILINGS

A. Furnish and install inserts, hanger clips and similar devices in coordination with other work.

B. Secure hangers to inserts and clips. Clamp or bolt hangers to main runners.

C. Space main runners 4'-0" o.c. and space hangers 4'-0" o.c. along runners, except as otherwise shown.

D. Level main runners to a tolerance of 1/4" in 12'-0", measured both lengthwise on each runner and transversely between parallel runners.

E. Metal Furring Channels: Space sixteen (16) inches o.c. maximum. Attach to 1-1/2" main runner channels with furring channel clips (on alternate sides of main runner channels). Furring channels shall not be let into or come in contact with abutting masonry walls. End splices shall be provided by nesting furring channels no less than eight (8) inches and securely wire tying. At any openings that interrupt the furring channels, install additional cross reinforcing to restore lateral stability.

F. Mechanical accessories, hangers, splices, runner channels and other members used in suspension system shall be of metal, zinc coated, or coated with rust inhibitive paint, of suitable design and of adequate strength to support units securely without sagging, and such as to bring unit faces to finished indicated lines and levels.

1. Provide special furring where ducts are over two (2) feet wide.

G. Apply board with its long dimension at right angles to channels. Locate board butt joints over center of furring channels. Attach board with one (1) inch self-drilling drywall screws twelve (12) inches o.c. in field of board at each furring channel; eight (8) inches o.c. at butt joints located not less than 3/8" from edges.

3.6 SHAFT WALLS

A. General: Install gypsum board vertical and horizontal shaft wall assemblies to comply with requirements of fire-resistance-rated assemblies indicated and manufacturer's written installation instructions.

B. Runner Installation: Use "J" metal runners at floor and ceiling, with the short leg toward finish side of wall. Securely attach runners to structural supports with power-driven fasteners at both ends and twenty-four (24) inches o.c.

C. Shaft Wall Liner: Cut shaft wall liner panels one (1) inch less from floor to ceiling height and erect vertically between J-runners.

D. C-H Studs: Cut metal studs 3/8" to not more than 1/2" less than floor to ceiling height and install between shaft wall liner panels so that panels are fitted snugly into the one (1) inch wide "H," "T," or "I" portion of the stud. Space studs twenty-four (24) inches o.c., unless otherwise indicated on drawings. Install full-length steel E-Studs or J-runners vertically at T-intersections, corners, door jambs, and columns. Install full length E-Studs or J-runners over shaft wall liner both sides of closure panels. Frame openings cut within a liner panel with J-Runner around perimeter. For openings, frame with vertical E-Stud or J-runner at edges, horizontal runner at head and sill, and reinforcing as shown on the drawings. Suitably frame all openings to preserve structural support for wall. Over metal doors, install a cut to length section of runner and attach to strut-studs with clip angles and 3/8" Type S Screws space twelve (12) inches o.c.

E. Wallboard Installation - Double Layer Installation: Erect gypsum wallboard base layer vertically or horizontally to meet fire rating on one side of studs with end joints staggered. Fasten base layer panels to studs with one (1) inch Type S screws twenty-four (24) inches o.c. Caulk perimeter of base layer panels. Apply gypsum wallboard face layer vertically over base layer with joints staggered and attached with 1-5/8" Type S screws staggered from those in base, spaced eight (8) inches o.c. and driven into studs.

F. Wallboard Installation (Where Both Sides of Shaft Wall are Finished): Apply gypsum wallboard face layers vertically both sides of studs. Stagger joints on opposite partition sides. Fasten panels with one (1) inch or two (2) inches Type S screws spaced eight (8) inches o.c. in field and along edges into studs.

G. Where handrails are indicated for direct attachment to drywall shaft system, provide not less than a sixteen (16) ga. x eight (8) inches wide galvanized steel reinforcement strip, accurately positioned and secured to studs and concealed behind not less than one 1/2" thick course of gypsum board in the system.

H. Integrate stair hanger rods with drywall shaft system by locating cavity of system as required to enclose rods.

I. Horizontal Shaftwall Duct and Ceiling Assemblies: Provide I-stud cavity shaftwall system for horizontal duct protection consisting of I-studs 24" o.c. with 1" fire-rated shaft liner panels inserted in the stud tabs, and three layers of 1/2" firecode C gypsum board attached to the stud flanges opposite the shaft liner panels.

3.7 ERECTION AT COLUMN ENCLOSURES

A. Metal furring supports shall be provided under work of this Section, and shall be cut to lengths as necessary for tight fit such that spacing is not more than sixteen (16) inches o.c.

B. Board shall be fastened securely to supports with screws as specified. Place boards in position with minimum amount of joints. Where free ends occur between supports, back-blocking or furring shall be required. Center abutting ends over supports. Correct work as necessary so that faces of boards are flush, smooth and true. Provide clips or cross furring for attachment as required.

C. All layers shall be screw attached to furring.

3.8 FINISHING

A. Taping: A thin, uniform layer of compound shall be applied to all joints and angles to be reinforced. Reinforcing tape shall be applied immediately, centered over the joint, seated into the compound. A skim coat shall follow immediately, but shall not function as a fill or second coat. Tape shall be properly folded and embedded in all angles to provide a true angle.

B. Filling: After initial coat of compound has hardened, additional compound shall be applied, filling the board taper flush with the surface. The fill coat shall cover the tape and feather out slightly beyond the tape. On joints with no taper, the fill coat shall cover the tape and feather out at least four (4) inches on either side of the tape. No fill coat is necessary on interior angles.

C. After compound has hardened, a finishing coat of compound shall be spread evenly over and extending slightly beyond the fill coat on all joints and feathered to a smooth, uniform finish. Over tapered edges, the finished joint shall not protrude beyond the plane of the surface. All taped angles shall receive a finish coat to cover the tape and taping compound, and provide a true angle. Where necessary, sanding shall be done between coats and following the final application of compound to provide a smooth surface, ready for painting.

D. Fastener Depressions: Compound shall be applied to all fastener depressions followed, when hardened by at least two (2) coats of compound, leaving all depressions level with the plane of the surface.

E. Finishing Beads and Trim: Compound shall be applied to all bead and trim and shall be feathered out from the ground to the plane of the surface. When hardened, this shall be followed by two (2) coats of compound each extending slightly beyond the previous coat. The finish coat shall be feathered from the ground to the plane of the surface and sanded as necessary to provide a flat, smooth surface ready for decoration.

F. Except as otherwise noted, level of finish for surface exposed to view shall conform to Level 4 of ASTM C 840 and GA-214 of the Gypsum Association.

END OF SECTION 09 29 00

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SECTION 09 30 00
Tiling

PART I - GENERAL

1.1 RELATED DOCUMENTS

A. The following documents apply to all required work for the Project: (1) the Contract Drawings, (2) the Specifications, (3) the General Conditions, (4) the Addendum and (5) the Contract (City of New York Standard Construction Contract).

B. LEED / Environmentally Preferable Purchase (EPP) General Requirements:

1. Refer to DDC General Conditions and the Addendum to the General Conditions

2. LEED requirements apply to all Phase II work with the exception of the Existing Building scope. EPP requirements apply to the project's Existing Building scope only.

1.2 SUMMARY

A. Section includes:

1. Porcelain floor, wall tile and base.

2. Setting beds, grout, sealant and waterproofing membrane.

3. Metal edge strips.

B. Related Sections

1. Unit Masonry - Section 04 20 00.

2. Gypsum Drywall - Section 09 29 00.

1.3 REFERENCES

A. ANSI A108 Series/A118 Series - American National Standards for Installation of Ceramic Tile.

B. ANSI A136.1 - American National Standards for Organic Adhesives for Installation of Ceramic Tile.

C. ASTM C 144 - Standard Specification for Aggregate for Masonry Mortar.

D. ASTM C 150 - Standard Specification for Portland Cement.

E. TCNA - Handbook for Ceramic, Glass and Stone Tile Installation; Tile Council of North America.

F. ISO 13007 - International Standards Organization; Classification for Grout and Adhesives.

1.4 QUALITY ASSURANCE

A. Refer to DDC General Conditions Section 01 40 00 "Quality Requirements".

B. Qualifications of Installers: For cutting, installing and grouting of tile, use experienced tile setters who are completely familiar with the requirements of this work and the recommendations contained in the referenced standards. Installers must be properly trained for the specified work.

1.5 SUBMITTAL PROCEDURES

A. Refer to DDC General Conditions Section 01 33 00 "Submittal Procedures".

1.6 SUBMITTALS

A. Refer to DDC General Conditions.

B. Samples

1. Submit sample panels, approximately 12" x 12", mounted on hardboard back-up with selected grout color for each color and pattern of tile and grout specified.

2. Submit 12" x 12" samples of waterproofing membrane.

C. Master Grade Certificates: Prior to opening tile containers, submit to the Commissioner a Master Grade Certificate, signed by an officer of the firm manufacturing the tile used, and issued when the shipment is made, stating the grade, kind of tile, identification marks for tile containers, and the name and location of the project.

D. Mock-Ups

1. At an area on the site where approved by the Commissioner, provide a mock-up tile installation.

   a. Make the mock-up approximately 36" x 36" in dimension.
   b. Provide one mock-up for each type, class, and color of installation required under this Section.
   c. The mock-ups may be used as part of the Work, and may be included in the finished Work when so approved by the Commissioner.
   d. Revise as necessary to secure the Commissioner's approval.

2. The mock-ups, when approved by the Commissioner, will be used as datum for comparison with the remainder of the work of this Section for the purposes of acceptance or rejection.

3. If the mock-up panels are not permitted to be part of the finished Work, completely demolish and remove them from the job site upon completion and acceptance of the work of this Section.

PART II - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Manufacture all tile in accordance with Standard Grade Requirements of ANSI A-137.1.

B. Install all tile in accordance with the recommendations contained in "Tile Council of North America Handbook for Ceramic, Glass, and Stone Tile Installation (TCNA)," latest edition.

C. All floor surfaces shall have a minimum wet DCOF AcuTest value of 0.42 and tested per ANSI A326.3 Dynamic Coefficient of Friction of Hard Surface Flooring Materials.

2.2 MANUFACTURERS OF TILE

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Dal-Tile Corp.
   2. Fiandre
   3. Stone Source
   4. Nemo
   5. American Olean
   6. Or approved equal

B. Basis of Design Product(s): See Finish Schedule.

2.3 TRIM AND SPECIAL SHAPES

A. Provide external and internal corners, trim shapes at openings, and all other trim and special shapes to match the tile specified herein, as required by field conditions and drawing details.

B. Metal Edge Strips: Angle or L-shaped, height to match tile and setting bed thickness.

   1. Exposed Edge Material: Extruded aluminum, finish as indicated on drawings.

   2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. Schluter Systems, L.P.
      b. Blanke Corp.
      c. Ceramic Tool Co. Inc.
      d. Or approved equal

2.4 SETTING BEDS AND GROUT

A. Portland Cement: ASTM C 150, Type 1.

B. Hydrated Lime: ASTM C 207, Type S.

C. Sand: ASTM C 144, clean and graded natural sand.

D. Manufacturers of Latex Admixture for Mortar Bed: Subject to compliance with requirements, provide products by one of the following:
   1. MAPEI, Planicrete AC, blended with a 3:1 site mix.

   2. Laticrete 333.

   3. Pro Spec; Acrylic Additive.

   4. Custom Building Products; Custom Crete Thin Set Additive.

   5. Or approved equal.

E. Latex-Portland Cement Bond Coat, complying with ANSI A118.4 and ISO 13007, C2ES2P2 with minimum compressive strength of 400 psi.

   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. MAPEI, Keralastic System thin set mortar, consisting of Kerabond dry-set mortar and Keralastic latex admixture.
b. Laticrete; 211 dry-set mortar and 4237 latex admixture.
c. Pro Spec; Permalastic System consisting of Permalastic Dryset Mortar and Permalastic Admixture
d. Custom Building Products; Pro-Lite.
e. Or approved equal.

F. Wall and Base Tile

1. Over drywall, use ANSI A136.1-1967 Organic Adhesive for installation of tile, Type I and ISO 13007 D2TE. Shear strength shall be 50 psi minimum. Adhesive primer as recommended by adhesive manufacturer. Manufacturer shall certify, in writing, that adhesive and primer used are proper types for the intended tile types and application. Conform to TCA Detail W-242.

   a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

      1). MAPEI Type 1 Mastic.
      2). Laticrete Type 1 Adhesive.
      3). ProSpec B-1000 Tile Adhesive.
      4). Custom Building Products' Reliabond Adhesive Type 1.
      5). Or approved equal.

2. Over masonry, use a mortar bed leveling coat conforming to ANSI A108.1A followed by a Latex Portland Cement Bond Coat, MAPEI, Kerabond/Keralastic System, Custom Mega Flex or equal by Laticrete, Pro Spec or approved equal, conforming to ANSI A118.4, ISO 13007-C2ES2P2, and TCA Detail W-211.

3. Over cement board, use a Latex Portland cement mortar bond coat, MAPEI, Kerabond/Keralastic System, Custom Mega Flex or equal by Laticrete, Pro Spec or approved equal, conforming to ANSI A118.4, ISO 13007-C2ES2P2, and TCA Detail W-244; coat back of board with waterproof membrane as specified below.

4. Over glass mat water resistant gypsum backer board, use a Latex Portland cement mortar bond coat, MAPEI, Kerabond/Keralastic System or equal by Laticrete, Custom Building Products or approved equal, conforming to ANSI A118.4, ISO 13007-C2ES2P2, and TCA Detail W-245.

G. Floor Tile: Comply with TCNA Detail F-144, thinset and waterproofing over CBU over plywood. CBU to be screwed down and joints to be finished per manufacturer's requirements.

H. Crack Isolation Membrane: Liquid rubber membrane meeting ASTM A118.12, with up to 1/8" in plane crack isolation

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. Mapei
   b. Laticrete
   c. Custom Building Products
   d. or approved equal

I. Waterproofing Membrane: Complying with ANSI A118.10 and ANSI A118.12; and having IAPMO certification as a shower pan liner;

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. "Mapelastic 400" by Mapei with factory blended "Bio-Block" antimicrobial protection,
   b. "Laticrete 9235 with Microban" made by Laticrete International,"
   c. ProSpec "B6000," Custom Building Products 9240,"
   d. Or approved equal

2. Reinforce membrane with polyester fabric.

3. Run waterproofing up full height of walls.

J. Water: Clean, fresh and suitable for drinking.

K. Grout complying with A118.7; and ISO 13007, CG2WAF: For grouting tile, provide a commercial Portland cement grout.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. "Ultracolor Plus" (additive not required) made by MAPEI
   b. Laticrete Permacolor Select
   c. Custom Prism Sure Color Grout; (addition not required)
   d. Or approved equal

2. Add latex additive to grout made by same manufacturer as grout.

3. Color: Silver Grey unless otherwise noted on Finish Schedule.

L. Physical Properties: The setting beds and grouts must meet the following physical requirements:

1. Compressive Strength: 3000 psi min.

2. Shear Bond Strength: 500 psi min.

3. Water Absorption: 4.0% max.

4. Service Rating (ASTM C 627): Extra Heavy Duty.

M. Sealer: Seal all grout joints and all unglazed tile

1. Basis of Design: Subject to compliance with requirements, provide "Sealer's Choice 15 Gold" as manufactured by Aqua Mix Inc. or comparable product by one of the following:

   a. DuPont
   b. 3M
   c. Or approved equal

N. Temporary Protective Coating: Either product indicated below that is applied in the tile manufacturer's factory and formulated to protect exposed surfaces of tile against adherence of mortar and grout;

compatible with tile, mortar, and grout products; and easily removable after grouting is completed without damaging grout or tile.

1. Petroleum paraffin wax, applied hot, fully refined and odorless, containing at least 0.5 percent oil with a melting point of 120 to 140 deg. F. per ASTM D 87.

2. Grout release in form of manufacturer's standard proprietary liquid coating that is specially formulated and recommended for use as temporary protective coating for tile.

O. Tile Cleaner: A neutral cleaner capable of removing soil and residue without harming tile and grout surfaces, specifically approved for materials and installations indicated by tile and grout manufacturers.

2.5 SEALANT

A. Joint Backing: Preformed, compressible, resilient, non-extruding, non-staining strips of foam neoprene, foam polyethylene, or other material recommended by sealant manufacturer.

B. Bond Breaker: Polyethylene tape, 3 mils thick, or other material recommended by sealant manufacturer.

C. Sealant Primer: Colorless, non-staining, or type to suit substrate surface, as recommended by sealant manufacturer.

D. Sealant: One-part silicone based sanitary sealant, conforming to ASTM C 920, Type S, Grade NS, Class 25. Sealant hardness upon full cure shall be between 20-30 Shore "A" Durometer. Color of sealant to blend with or match adjacent materials, and as selected by the Commissioner.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Sanitary SCS1700 by GE Construction Sealants, 786-M White by Dow Corning Corporation,
   b. Bondaflex Sil 100 WF by May National Associates, Inc.;
   c. A Subsidiary of Sika Corporation U.S.,
   d. Or approved equal

PART III - EXECUTION

3.1 EXECUTION REQUIREMENTS

A. Refer to DDC General Conditions for execution requirements.

3.2 PREPARATION

A. Blending: For tile exhibiting color variations, verify that tile has been factory blended and packaged so tile units taken from one package show same range of colors as those taken from other packages and match approved samples. If not factory blended, either return to manufacturer or blend tiles at project site before installing.

B. Field Applied Temporary Protective Coating: Pre-coat tile with continuous film of temporary protective coating, taking care not to coat unexposed tile surfaces.

3.3 JOINTS IN TILE WORK

A. Joint Widths: 1/16"

B. Alignment: Wall, base and floor joints shall align through the field and trim. Direction and location of all joints as directed by Commissioner.

C. Movement Joints: Conform to TCA Detail EJ171. Locate where movement joints are in back-up material. Provide movement joint at joints between mop receptors and tile. Provide movement joint at all vertical internal joints of wall tile. Movement joints 1/8" wide in tile. Fill all movement joints with specified backing and sealant. Use bond breaker where sufficient space for joint backing does not exist.

1. Provide sealant between tile and plumbing fixtures, mirrors, pipes, countertops and other dissimilar materials penetrating or adjacent to tile.

3.4 INSTALLATION

A. Comply with the following installation standards:

1. Wall tile over drywall using organic adhesive - ANSI A136.1 and ISO 13007, D2TE.

2. Wall tile over cement board or glass mat backer board using dry set mortar with latex additive - ANSI A118.4 and ISO 13007, C2ES2P2.

3. Wall tile over masonry or concrete using dry set mortar with latex additive - ANSI A118.4 and ISO 13007, C2ES2P2.

4. Floor tile: ANSI A118.1, ANSI A118.4.

B. All setting beds and/or adhesives shall provide for an average contact area of not less than 95% coverage.

C. Allowable Variations in Finished Work: Do not exceed the following deviations from level and plumb, and from elevations, locations, slopes and alignment shown.

1. Walls: 1/8" in 8'-0" run, any direction; 1/8" at any location; offset at any location, 1/32".

2. Joints: +/- 1/32" joint width variation of any location; 1/16" in 3'-0" run deviation from plumb and true.

D. Waterproofing Membrane: Install the membrane in strict accordance with manufacturer's written recommendations.

E. Handle, store, mix and apply setting and grouting materials in compliance with the manufacturer's instructions.

F. Terminate work neatly at obstructions, edges and corners without disruption of pattern or joint alignment.

G. Accurately form intersections and returns. Perform cutting and drilling of tile without marring visible surfaces. Carefully grind cut edges of tile abutting trim, finish, or built-in items for straight, aligned joints. Fit tile closely to electrical outlets, piping and fixtures so that plates, collars, or covers overlap tile.

H. Lay tile in grid pattern. Align joints when adjoining tiles on floor, base, walls and trim are the same size. Lay out tile work and center tile fields both directions in each space or on each wall area. Adjust to minimize tile cutting. Provide uniform joint widths.

3.5 CLEANING AND PROTECTION OF TILE

A. Cleaning: On completion of placement and grouting, clean all tile surfaces so they are free of foreign matter.

1. Remove grout residue from tile as soon as possible.

2. Clean grout smears and haze from tile according to tile and grout manufacturer's written instructions but no sooner than 10 days after installation. Use cleaners only after determining that cleaners are safe to use by testing on samples of tile and other surfaces to be cleaned. Protect metal surfaces and plumbing fixtures from effects of cleaning. Flush surfaces with clean water before and after cleaning to insure removal of all cleaning material.

3. Remove temporary protective coating by method recommended by coating manufacturer and that is acceptable to tile and grout manufacturer. Trap and remove coating to prevent drain clogging.

B. Protect installed tile work with Kraft paper or other heavy covering during construction period to prevent staining, damage, and wear. Apply coat of sealer to all grout joints and all unglazed tile.

END OF SECTION 09 30 00

SECTION 09 51 13
Acoustical Panel Ceilings

PART I - GENERAL

1.1 RELATED DOCUMENTS

A. The following documents apply to all required work for the Project: (1) the Contract Drawings, (2) the Specifications, (3) the General Conditions, (4) the Addendum and (5) the Contract (City of New York Standard Construction Contract).

B. LEED / Environmentally Preferable Purchase (EPP) General Requirements:

1. Refer to DDC General Conditions and the Addendum to the General Conditions

2. LEED requirements apply to all Phase II work with the exception of the Existing Building scope. EPP requirements apply to the project's Existing Building scope only.

1.2 SUMMARY

A. Section includes:

1. Acoustical panel units.

2. Exposed "T" suspension system, including hangers and inserts.

3. Provisions for the installation of lighting fixtures, diffusers, grilles and similar items provided under other Sections.

4. Cutting, drilling, scribing and fitting as required for electro-mechanical penetrations.

5. Perimeter and column moldings, trim and accessories for acoustical ceilings.

B. Related Sections

1. Gypsum Drywall - Section 09 29 00.

2. Diffusers, Registers and Grilles - Section 23 37 13.

3. Interior Lighting - Section 26 51 00.

1.3 QUALITY ASSURANCE

A. Refer to DDC General Conditions Section 01 40 00 "Quality Requirements".

B. Qualifications of Installers

1. For the actual fabrication and installation of all components of the system, use only personnel who are experienced in the skills required and completely familiar with the requirements established for this work.

2. Installer shall have a record of successful installation of similar ceilings acceptable to the Commissioner.

C. Referenced Standards

1. ASTM C 635 "Standard Specification for Metal Suspension Systems for Acoustical Tile and Lay-In Panel Ceilings," American Society for Testing and Materials.

2. ASTM C 636 "Standard Recommended Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-In Panels," American Society for Testing and Materials.

3. Comply with recommendations published by the Ceilings and Interior Systems Construction Association (CISCA).

1.4 SUBMITTAL PROCEDURES

A. Refer to DDC General Conditions Section 01 33 00 "Submittal Procedures".

1.5 SUBMITTALS

A. Shop Drawings: Submit completely dimensioned ceiling layouts for all areas where acoustical ceilings are required, showing:

1. Any deviations from reflected ceiling plan layouts, especially lighting fixture and dimensions. Also indicate if any light fixtures will not fit into the ceiling layout due to dimensional restrictions or field conditions.

2. Direction and spacing of suspension members and location of hangers for carrying suspension members.

3. Direction, sizes and types of acoustical units, showing suspension grid members, and starting point for each individual ceiling area.

4. Moldings at perimeter of ceiling, at columns and elsewhere as required due to penetrations or exposure at edge of ceiling tiles.

5. Location and direction of lights, air diffusers, air slots, and similar items in the ceiling plane.

6. Details of construction and installation at all conditions.

7. Materials, gauges, thickness and finishes.

B. Product Data

C. Samples

1. Twelve (12) inch long components of suspension systems, including moldings.

2. Acoustical units — full size.

PART II - PRODUCTS

2.1 ACOUSTICAL UNITS

A. Basis of Design: Subject to compliance with requirements, provide Armstrong World Industries or comparable product by one of the following:

1). USG Interiors, Inc.
2). Roxul Rockfon
3). Or approved equal

B. Acoustical Tiles

1. ACT-01: Provide 3/4" thick, 24" x 24" mineral fiber panels equal to "Ultima High NRC" with beveled tegular edge

   a. Basis of Design: Subject to compliance with requirements, provide Armstrong World Industries or comparable product by one of the following:

      1). USG Interiors, Inc.,
      2). Roxul Rockfon
      3). Or approved equal.

   b. Panels shall meet ASTM E 1264, Type IV, Form 2, Pattern E, Fire Class A, with Flame Spread Index 25 or less and Smoke Developed Index 50 or less per ASTM E 84.

2. ACT-02: Provide 7/8" thick, 24" x 24" mineral fiber panels with acoustically transparent water repellent membrane

   a. Basis of Design: Subject to compliance with requirements, provide "Ultima Health Zone High NRC" with beveled tegular edge, as manufactured by Armstrong World Industries or comparable product by one of the following:

      1). USG Interiors, Inc.
      2). Roxul Rockfon
      3). Or approved equal

   b. Panels shall meet ASTM E 1264, Type IV, Form 2, Pattern E, Fire Class A, with Flame Spread Index 25 or less and Smoke Developed Index 50 or less per ASTM E 84.

3. ACT-03: Provide 2'-0" x 8'-0" USG Halcyon Acoustical Panels with FL Edge

   a. Basis of Design: Subject to compliance with requirements, provide USG Interiors, Inc. or comparable product by one fo the following:

      1). Armstrong World Industries
      2). Chicago Metallic Corp

3). Or approved equal

2.2 SUSPENSION SYSTEM

A. ACT-01, ACT-02: Provide exposed "T" steel suspension system with low sheen white baked enamel finish, "Suprafine" 9/16" 2-way grid system by Armstrong, or comparable product by one of the manufacturers listed below, or approved equal.

1. Basis of Design: Subject to compliance with requirements, provide Armstrong World Industries or comparable product by one of the following:

1). USG Interiors, Inc.
2). Chicago Metallic Corp.
3). Or approved equal

B. ACT-03: Provide USG DONN Brand Identitee DXI 9/16" suspension system

1. Basis of Design: Subject to compliance with requirements, provide USG Interiors, Inc. or comparable product by one of the following:

1). Armstrong World Industries
2). Chicago Metallic Corp.
3). Or approved equal

C. The suspension system shall support the ceiling assembly shown on the drawings and specified herein, with a maximum deflection of 1/360 of the span, in accordance with ASTM C 635.

D. Hanger for suspension system shall be 1" x 3/16", galvanized steel flats or 1/4" diameter galvanized pencil rods spaced 4'-0" o.c. conforming to 2014 New York City Building Code.

E. Main carrying channels, to which suspension systems shall be fastened, shall be 1-1/2" cold rolled galvanized steel channel; spaced 4'-0" o.c., conforming to 2014 New York City Building Code.

F. Provide ceiling clips and inserts to receive hangers, type as recommended by suspension system manufacturer, sizes for pull-out resistance of not less than five (5) times the hanger design load, as indicated in ASTM C 635.

G. Suspension systems shall conform to ASTM C 635, intermediate duty.

H. Provide manufacturer's standard wall moldings with off-white baked enamel finish to match suspension systems. For circular penetrations of ceilings, provide edge moldings fabricated to diameter required to fit penetration exactly.

I. Provide perimeter shadow molding at all ACT systems.

PART III - EXECUTION

3.1 EXECUTION REQUIREMENTS

A. Refer to DDC General Conditions for execution requirements.

3.2 INSTALLATION

A. Establish layout of acoustical units to balance border widths at opposite edges of each ceiling. Avoid use of less-than-half width units at borders, and comply with reflected ceiling plans.

B. Install acoustical panel ceilings according to ASTM C 636.

C. Install suspension systems to comply with ASTM C 636, with hangers supported only from building structural members. Locate hangers not more than 6" from each end, leveling to tolerance of 1/8" in 12'-0".

D. Space rod or flat iron hangers not more than 4'-0" o.c. along main carrying channels; attach by clips or wire ties to building structure. Locate hangers not more than 6" from each end. Space main carrying channels 4'-0" o.c. Attach suspension system to carrying channels using clips or ties, leveling to a tolerance of 1/8" in 12'-0".

E. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum which are not part of supporting structural or ceiling suspension system. Splay hangers only where required to miss obstructions and offset resulting horizontal force by bracing, reinforcing, countersplaying or other equally effective means.

F. Install edge moldings at edges of each acoustical ceiling area, and at locations where edge of acoustical units would otherwise be exposed after completion of the work.

1. Secure moldings to building construction by fastening through vertical leg. Space holes not more than 3" from each end and not more than sixteen (16) inches o.c. between end holes. Fasten tight against vertical surfaces.

2. Level moldings with ceiling suspension system, to a level tolerance of 1/8" in 12'-0".

G. Install acoustical units in coordination with suspension system, with edges concealed by support of suspension members. Scribe and cut panels to fit accurately at borders and at penetrations.

H. Install hold-down clips in toilet areas, and in areas where required by 2014 New York City Building Code; space 2'-0" o.c. on all cross tees.

I. Light fixtures or other ceiling apparatus shall not be supported from main beams or cross tees if their weight causes the total load to exceed the deflection capability of the ceiling suspension system. In such cases the load shall be supported by supplemental hangers furnished and installed by this Section of work.

J. Where fixture or ceiling apparatus installation causes eccentric loading on runners, provide stabilizer bars to prevent rotation.

END OF SECTION 09 51 13

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SECTION 09 51 33
Metal Ceilings

PART I - GENERAL

1.1 RELATED DOCUMENTS

A. The following documents apply to all required work for the Project: (1) the Contract Drawings, (2) the Specifications, (3) the General Conditions, (4) the Addendum and (5) the Contract (City of New York Standard Construction Contract).

B. LEED General Requirements:

1. Refer to DDC General Conditions

   a. Section 01 33 00 "Submittal Procedures"
   b. Section 01 74 19 "Construction Waste Management and Disposal"
   c. Section 01 81 13.04 "Sustainable Design Requirements for LEED v4 Buildings"
   d. Section 01 81 13.13 "Volatile Organic Compound Limits for Adhesives, Sealants, Paints and Coatings for LEED Buildings"
   e. Section 01 81 19 "Indoor Air Quality Requirements for LEED Buildings"

1.2 SUMMARY

A. Section includes:

1. Metal ceilings.
2. Concealed suspension system, including hangers and inserts.
3. Provisions for the installation of lighting fixtures, diffusers, grilles and similar items provided under other Sections.
4. Cutting, drilling, scribing and fitting as required, including for all electro/mechanical penetrations.
5. Perimeter and column moldings, trim and accessories for acoustical ceilings.

B. Related Sections

1. Cast-in-Place Concrete - Section 03 30 00.
2. Metal Decking - Section 05 30 00.
3. Gypsum Drywall - Section 09 29 00.
4. Diffusers, Registers and Grilles - Section 23 37 13.
5. Interior Lighting - Section 26 51 00.

1.3 QUALITY ASSURANCE

A. Refer to DDC General Conditions Section 01 40 00 "Quality Requirements".

B. Qualifications of Installers

1. For the actual fabrication and installation of all components of the system, use only personnel who are experienced in the skills required and completely familiar with the requirements established for this work.

2. Installer shall have a record of successful installation of similar ceilings acceptable to the Commissioner.

C. Referenced Standards

1. ASTM C 635 "Standard Specification for Metal Suspension Systems for Acoustical Tile and Lay-In Panel Ceilings," American Society for Testing and Materials.

2. ASTM C 636 "Standard Recommended Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-In Panels," American Society for Testing and Materials.

3. Comply with recommendations published by the Ceilings and Interior Systems Construction Association (CISCA).

1.4 SUBMITTAL PROCEDURES

A. Refer to DDC General Conditions Section 01 33 00 "Submittal Procedures".

1.5 SUBMITTALS

A. Shop Drawings: Submit completely dimensioned ceiling layouts for all areas where metal ceilings are required, showing:

1. Any deviations from Commissioner's reflected ceiling plan layouts, especially lighting fixture and dimensions. Also indicate if any light fixtures will not fit into Commissioner's ceiling layout due to dimensional restrictions of field conditions.

2. Direction and spacing of suspension members and location of hangers for carrying suspension members.

3. Direction, sizes and types of metal ceiling units, showing suspension grid members, and starting point for each individual ceiling area.

4. Moldings at perimeter of ceiling, at columns and elsewhere as required due to penetrations or exposure at edge of ceiling tiles.

5. Location and direction of lights, air diffusers, air slots, and similar items in the ceiling plane.

6. Details of construction and installation at all conditions.

7. Materials, gauges, thickness and finishes.

B. Product Data

C. Samples

1. All components of suspension systems, including moldings.
2. Metal ceiling unit: 24" x 24".

PART II - PRODUCTS

2.1 METAL CEILING UNITS

A. Provide products by Armstrong World Industries, Hunter Douglas Architectural Products, Inc., Ceilings Plus or approved equal.

B. Metal Ceiling Panels (MCT-01): See Finish Schedule.

2.2 SUSPENSION SYSTEM

A. See Finish Schedule.

B. Hanger for suspension system shall be 1" x 3/16", galvanized steel flats or 1/4" diameter galvanized pencil rods spaced 4'-0" o.c. conforming to New York City Building Code.

C. Main carrying channels, to which suspension systems shall be fastened, shall be 1-1/2" cold rolled galvanized steel channel; spaced 4'-0" o.c., conforming to New York City Building Code.

D. Provide ceiling clips and inserts to receive hangers, type as recommended by suspension system manufacturer, sizes for pull-out resistance of not less than five (5) times the hanger design load, as indicated in ASTM C 635.

E. Suspension system shall conform to ASTM C635, intermediate duty, with deflection limited to 1/360 of span.

F. Complete wall connection, consisting of galvanized steel perimeter trim, with relevant punchings, adjusted to the extruded drop-slide aluminum profile.

G. For circular penetrations of ceilings, provide edge moldings fabricated to diameter required to fit penetration exactly.

PART III - EXECUTION

3.1 EXECUTION REQUIREMENTS

A. Refer to DDC General Conditions for execution requirements.

3.2 PREPARATION

A. Measure each ceiling area and establish layout of metal ceiling units to balance border widths at opposite edges of each ceiling. Avoid use of less-than-half width units at borders and comply with reflected ceiling plans.

3.3 INSTALLATION

A. Install suspension systems to comply with ASTM C636, as applicable, with hangers supported only from building structural members. Locate hangers not less than 6" from each end and leveling to tolerance of 1/8" in 12'-0".

B. Install suspension systems to comply with ASTM C 636, with hangers supported only from building structural members. Locate hangers not more than 6" from each end, leveling to tolerance of 1/8" in 12'-0".

C. Space rod or flat iron hangers not more than 4'-0" o.c. along main carrying channels; attach by clips or wire ties to building structure. Locate hangers not more than 6" from each end. Space main carrying channels 4'-0" o.c. Attach suspension system to carrying channels using clips or ties, leveling to a tolerance of 1/8" in 12'-0".

D. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum which are not part of supporting structural or ceiling suspension system. Splay hangers only where required to miss obstructions and offset resulting horizontal force by bracing, reinforcing, countersplaying or other equally effective means.

E. Install edge moldings at perimeter of acoustical ceiling area and at locations where necessary to conceal edges of acoustical units.

1. Screw-attach moldings to substrate at intervals not over 16" o.c. and not more than 3" from ends, leveling with ceiling suspension system to tolerance of 1/8" in 12'-0". Miter corners accurately and connect securely.

F. Scribe and cut metal ceiling units for accurate fit at borders and at interruptions and penetrations for work through the ceilings. Stiffen edges of cut units as required to eliminate evidence of oil-canning or buckling.

G. Install snap-in acoustical units, complete with acoustical pads, in coordination with suspension system and exposed moldings.

1. Align joints in adjacent courses to form uniform, straight joints parallel to room axis in both directions.

2. Fit adjoining tile to form flush, tight joints. Scribe and cut for accurate fit at borders and around work which penetrates ceiling.

H. Light fixtures or other ceiling apparatus shall not be supported from main beams or cross tees if their weight causes the total load to exceed the deflection capability of the ceiling suspension system. In such cases the load shall be supported by supplementary hangers furnished and installed by this Section of work.

END OF SECTION 09 51 33

SECTION 09 65 00
Resilient Tile Flooring

PART I - GENERAL

1.1 RELATED DOCUMENTS

A. The following documents apply to all required work for the Project: (1) the Contract Drawings, (2) the Specifications, (3) the General Conditions, (4) the Addendum and (5) the Contract (City of New York Standard Construction Contract).

B. LEED General Requirements:

1. Refer to DDC General Conditions

a. Section 01 33 00 "Submittal Procedures"
b. Section 01 74 19 "Construction Waste Management and Disposal"
c. Section 01 81 13.04 "Sustainable Design Requirements for LEED v4 Buildings"
d. Section 01 81 13.13 "Volatile Organic Compound Limits for Adhesives, Sealants, Paints and Coatings for LEED Buildings"
e. Section 01 81 19 "Indoor Air Quality Requirements for LEED Buildings"

1.2 SUMMARY

A. Section includes:

1. Rubber tile.
2. Rubber base.
3. Accessories.

B. Related Sections

1. Cast-in-Place Concrete - Section 03 30 00.
2. Ornamental Metals - Section 05 70 00, for metal transition strips.
3. Gypsum Drywall - Section 09 29 00.

1.3 QUALITY ASSURANCE

A. Refer to DDC General Conditions Section 01 40 00 "Quality Requirements".

B. Qualifications of Installers: Use only personnel who are experienced in the skills required and completely familiar with the requirements established for this work.

1.4 SUBMITTAL PROCEDURES

A. Refer to DDC General Conditions Section 01 33 00 "Submittal Procedures".

1.5 SUBMITTALS

A. Product Data.

B. Samples

1. Tile: Full size.

2. Base and Edging Strips: Six (6) inches long.

1.6 FIELD CONDITIONS

A. Keep ambient temperatures within range recommended by manufacturer, but not less than 70 deg F. or more than 95 deg F., in spaces to receive floor tile during the following time periods:

1. 48 hours before installation.

2. During installation.

3. 48 hours after installation.

B. After installation and until Substantial Completion, keep ambient temperatures within range recommended by manufacturer, but not less than 55 deg F. or more than 95 deg F.

C. Close spaces to traffic during floor tile installation.

D. Close spaces to traffic for 48 hours after floor tile installation.

E. Install floor tile after other finishing operations, including painting, have been completed.

1.7 WARRANTY

A. Provide manufacturer's 5-year limited warranty.

PART II - PRODUCTS

2.1 RUBBER TILE (RF-01, RF-02, RF-03)

A. 12" x 12" x 1/8" thick rubber tile

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Flexco
   b. Pirelli
   c. Nora
   d. Or approved equal

2. Provide tile units with uniformly distributed color and pattern throughout the thickness of tile. Variations in shades and off-pattern matches between containers are not acceptable.

3. Type 1-A homogeneous rubber tile.

4. RLT Profile Color: See Finish Schedule.

5. Color: See Finish Schedule.

B. Rubber tile shall be oil resistant.

2.2 RUBBER BASE (RB-01)

A. Provide Rubber Wall Base

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Flexco
   b. Johnsonite
   c. Burke Mercer Flooring Products
   d. Armstrong World Industries
   e. Roppe Corporation
   f. Or approved equal

2. Product Standard: ASTM F 1861, Type TP (rubber, thermoplastic.

3. 4" high cove base; preformed outside corners, job formed inside corners.

4. Color: See Finish Schedule.

2.3 ACCESSORIES

A. Adhesives: Waterproof, stabilized type, as recommended by the tile manufacturer for the type of service indicated and compatible with crack isolation membrane.

B. Concrete Slab Primer: Non-staining type recommended by the tile manufacturer.

C. Leveling Compound: Latex/Portland cement flash patching and leveling compound

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. H.B. Fuller (No. DSP-520H)
   b. Laticrete (No. 226 with 3701 admixture)
   c. Mapei
   d. Sika
   e. Ardex
   f. Custom Building Products
   g. Or approved equal

D. Edging Strips: 1/8" thick, homogeneous vinyl or rubber composition, tapered or bullnose edge, color as selected by the Commissioner from manufacturer's standards.

E. Transition Strips: See Section 05 70 00, Ornamental Metals.

F. Crack Isolation Membrane:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. National Applied Construction (ECB 75)

b. Mapei
c. Laticrete
d. Or approved equal

G. Finish

1. Floor Polish: Provide protective, liquid floor-polish products recommended by floor tile manufacturer.

PART III - EXECUTION

3.1 EXECUTION REQUIREMENTS

A. Refer to DDC General Conditions for execution requirements.

3.2 CONDITION OF SURFACES

A. Allowable Variations in Substrate Levels (Floors): ± 1/8" in 10'-0" distance and 1/4" total maximum variation from levels shown.

B. Grind or fill concrete substrates as required to comply with allowable variation.

3.3 PREPARATION

A. Prepare substrates according to floor tile manufacturer's written instructions to ensure adhesion of resilient products.

B. Concrete Substrates: Prepare according to ASTM F 710.

1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.

2. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by floor tile manufacturer. Do not use solvents.

3. Alkalinity and Adhesion Testing: Perform tests recommended by floor tile manufacturer. Proceed with installation only after substrate alkalinity falls within range on pH scale recommended by manufacturer in writing, but not less than 5 or more than 9 pH.

4. Moisture Testing: Proceed with installation only after substrates pass testing according to floor tile manufacturer's written recommendations, but not less stringent than the following:

   a. Perform anhydrous calcium chloride test according to ASTM F 1869. Proceed with installation only after substrates have maximum moisture-vapor-emission rate of 3 lb. of water/1000 sq. ft. in 24 hours.
   b. Perform relative humidity test using in situ probes according to ASTM F 2170. Proceed with installation only after substrates have a maximum 75 percent relative humidity level.

C. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound; remove bumps and ridges to produce a uniform and smooth substrate.

D. Do not install floor tiles until they are the same temperature as the space where they are to be installed.

1. At least 48 hours in advance of installation, move resilient floor tile and installation materials into spaces where they will be installed.

E. Immediately before installation, sweep and vacuum clean substrates to be covered by resilient floor tile.

F. Apply crack isolation membrane.

3.4 INSTALLATION

A. Place tile units with adhesive cement in strict compliance with the manufacturer's recommendations. Butt tile units tightly to vertical surfaces, thresholds, nosings and edgings. Scribe around obstructions and to produce neat joints, laid tight, even and in straight, parallel lines. Extend tile units into toe spaces, door reveals, and into closet and similar openings.

B. Preserve reference markers, holes, or openings that are in place or plainly marked for future cutting by repeating on the finish tile as marked in the subfloor. Use chalk or other non-permanent marking devices.

C. Lay tile from center marks established with principal walls, discounting minor off-sets, so that tile at opposite edges of the room are of equal width. Adjust as necessary to avoid use of cut widths less than 1/2 tile at room perimeters. Lay tile square to room axis, unless otherwise shown.

D. Match tiles for color and pattern by using tile from cartons in the same sequence as manufactured and packaged. Cut tile neatly to and around all fixtures. Broken, cracked, chipped or deformed tile is not acceptable.

E. Tightly cement tile to sub-base without open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks through tile, or other surface imperfections.

F. Lay tile with grain in all tile running in the same direction unless indicated otherwise on drawings.

G. Place resilient edge strips tightly butted to tile and secure with adhesive. Provide edging strips at all unprotected edges of tile, unless otherwise shown.

H. Bases: In all spaces where base is indicated, install bases tight to walls, partitions, columns, built-in cabinets, etc., without gaps at top or bulges at bottom, with tight joints and flush edges, with molded corner pieces at internal and external corners. Provide end stops adjacent to flush type door frames and where base does not terminate against an adjacent surface. Keep base in full contact with walls until adhesive sets.

3.5 FINISHING

A. Finishing: After completion of the project and just prior to the final inspection of the work, thoroughly clean tile floors and accessories. Remove soil, adhesive, and blemishes from floor tile surfaces before applying liquid floor polish. Apply two (2) coats of floor polish.

END OF SECTION 09 65 00

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SECTION 09 90 00
Painting and Finishing

PART I - GENERAL

1.1 RELATED DOCUMENTS

A. The following documents apply to all required work for the Project: (1) the Contract Drawings, (2) the Specifications, (3) the General Conditions, (4) the Addendum and (5) the Contract (City of New York Standard Construction Contract).

B. LEED / Environmentally Preferable Purchase (EPP) General Requirements:

1. Refer to DDC General Conditions and the Addendum to the General Conditions

2. LEED requirements apply to all Phase II work with the exception of the Existing Building scope. EPP requirements apply to the project's Existing Building scope only.

1.2 SUMMARY

A. Section includes:

1. Prime painting unprimed surfaces to be painted under this Section.

2. Painting all items furnished with a prime coat of paint, including touching up of or repairing of abraded, damaged or rusted prime coats.

3. Painting all ferrous metal (except stainless steel) exposed to view.

4. Painting all galvanized ferrous metals exposed to view.

5. Painting interior concrete block exposed to view.

6. Painting gypsum drywall exposed to view.

7. Sealing concrete floors.

8. Epoxy wall coating.

9. Painting of wood exposed to view, except items which are specified to be painted or finished under other Sections of these specifications. Back painting of all wood in contact with concrete, masonry or other moisture areas.

10. Painting pipes, pipe coverings, conduit, ducts, insulation, hangers, supports and other mechanical and electrical items and equipment exposed to view.

11. Painting surfaces above, behind or below grilles, gratings, diffusers, louvers, lighting fixtures, and the like, which are exposed to view through these items.

12. Incidental painting and touching up as required to produce proper finish for painted surfaces, including touching up of factory finished items.

13. Painting of any surface not specifically mentioned to be painted herein or on drawings, but for which painting is obviously necessary to complete the job, or work which comes within the intent of these specifications, shall be included as though specified.

B. Related Sections

1. Gypsum Drywall - Section 09 29 00.

2. Shop priming is required on some, but not all of the items scheduled to be field painted. Refer to other Sections of work for complete description.

3. Shop Coat on Machinery and Equipment: Refer to the Sections under which various items of manufactured equipment with factory applied shop prime coats are furnished. All items of equipment furnished with prime coat finish shall be finish painted under this Section.

4. Color Coding of Mechanical Piping and Electrical Conduits

a. Identification for Plumbing Piping and Equipment - Section 22 05 53.
b. Identification for HVAC Piping and Equipment - Section 23 05 53.
c. Identification for Electrical Systems - Section 26 05 53.
d. Color Coding consists of an adhesive tape system and is in addition to painting of piping and conduits under this Section, as specified above.

1.3 MATERIALS AND EQUIPMENT NOT TO BE PAINTED

A. Factory-finished toilet partitions.

B. Factory-finished acoustical tile.

C. Non-ferrous metals, except for items specified and/or indicated to be painted.

D. Finished hardware, excepting hardware that is factory primed.

E. Surfaces not to be painted shall be left completely free of droppings and accidentally applied materials resulting from the work of this Section.

1.4 QUALITY ASSURANCE

A. Refer to DDC General Conditions Section 01 40 00 "Quality Requirements".

B. Job Mock-Up

1. In addition to the samples specified herein to be submitted for approval, apply in the field, at their final location, each type and color of approved paint materials, applied 10 feet wide, floor to ceiling of wall surfaces, before proceeding with the remainder of the work, for approval by the Commissioner. Paint mock-ups to include door and frame assembly.

2. These applications when approved will establish the quality and workmanship for the work of this Section.

3. Repaint individual areas which are not approved, as determined by the Commissioner, until approval is received. Assume at least two paint mock-ups of each color and gloss for approval.

C. Qualification of Painters: Use only qualified painters for the mixing and application of paint on exposed surfaces.

D. Paint Coordination: Provide finish coats which are compatible with the prime paints used. Provide barrier coats over incompatible primers or remove and re-prime as required.

1.5 SUBMITTAL PROCEDURES

A. Refer to DDC General Conditions Section 01 33 00 "Submittal Procedures".

1.6 SUBMITTALS

A. Materials List: Submit a complete list of materials proposed to be furnished and installed under this portion of the work.

B. Samples

1. Samples for Initial Selection: Accompanying the materials list, submit samples of the full range of colors available in each of the proposed products.

2. Samples for Verification: Submit samples of each of the selected colors and glosses painted onto 8-1/2" x 11" x 1/4" thick material; whenever possible, the material for Samples shall be the same material as that on which the coating will be applied in the work.

1.7 JOB CONDITIONS

A. Apply water-based paints only when the temperature of surfaces to be painted and the surrounding air temperatures are between 50 degrees F. and 90 degrees F., unless otherwise permitted by the paint manufacturer's printed instructions.

B. Apply solvent-thinned paints only when the temperature of surfaces to be painted and the surrounding air temperatures are between 45 degrees F. and 95 degrees F. unless otherwise permitted by the paint manufacturer's printed instructions.

C. Do not apply paint in snow, rain, fog or mist; or when the relative humidity exceeds eighty-five (85) percent; or to damp or wet surfaces; unless otherwise permitted by the paint manufacturer's printed instructions.

D. Painting may be continued during inclement weather only if the areas and surfaces to be painted are enclosed and heated within the temperature limits specified by the paint manufacturer during application and drying periods.

PART II - PRODUCTS

2.1 PAINT MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Benjamin Moore (Moore)
2. PPG Paints (PPG)
3. Sherwin Williams (S-W)
4. Or approved equal

B. Comply with number of coats and required minimum mil thicknesses as specified herein.

2.2 MATERIALS

A. Provide undercoat paint produced by the same manufacturer as the finish coats. Use only thinners approved by the paint manufacturer, and use only to recommended limits.

B. Colors and Glosses: All colors and glosses shall be as selected by the Commissioner. Certain colors will require paint manufacturer to prepare special factory mixes to match colors selected by the Commissioner. Color schedule (with gloss) shall be furnished by the Commissioner.

C. Coloring Pigment: Products of or furnished by the manufacturer of the paint or enamel approved for the work.

D. Linseed Oil: Raw or boiled, as required, of approved manufacture, per ASTM D 234 and D 260, respectively.

E. Turpentine: Pure distilled gum spirits of turpentine, per ASTM D 13.

F. Shellac: Pure gum shellac (white or orange) cut in pure denatured alcohol using not less than four (4) lbs. of gum per gallon of alcohol.

G. Driers, Putty, Spackling Compound, Patching Plaster, etc.: Best quality, of approved manufacture.

H. Heat Resistant Paint: Where required, use heat resistant paint when applying paint to heating lines and equipment.

2.3 GENERAL STANDARDS

A. Painting materials shall bear identifying labels on the containers with the manufacturer's instructions printed thereon.

B. Paint shall not be badly settled, caked or thickened in the container, shall be readily dispersed with a paddle to a smooth consistency and shall have excellent application properties.

C. Paint shall arrive on the job color-mixed except for tinting of undercoats and possible thinning.

D. All thinning and tinting materials shall be as recommended by the manufacturer for the particular material thinned or tinted.

2.4 SCHEDULE OF FINISHES

A. High Performance Coating On Exterior Galvanized Ferrous Metals

1. First Coat:

a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1). "27 Typoxy" or "N69 Epoxoline II" by Tnemec
2). "Intergard 345" by International Protective Coatings;
3). "Carboguard 893 SG" or "Carboguard 888" by Carboline

4). "Devran 203 WB Epoxy Primer" by Akzo
5). Epoxy Mastic Coating V 160 Series by Cortech/Moore
6). "Recoatable Epoxy Primer 867-45" by Sherwin Williams
7). Or approved equal.

2. Second Coat:

a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1). "V73 Endura Shield" or "1074/1075"
2). Tnemec; "Interthane 870UHS" or "990 UHS" by International Protective Coatings
3). "Carbothane 133 LH" by Carboline
4). "Devthane 379UH Aliphatic Vizethne" by Akzo;
5). Acrylic Aliphatic Urethane V 500 (Gloss) or V 510 (Semi-Gloss) by Corotech/Moore
6). "Hi-Solids Urethane B65-300/350" by Sherwin Williams
7). Or approved equal

B. High Performance Coating On Exterior Non-Galvanized Ferrous Metals

1. Prime Coat:

a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1). "Tneme-Zinc 90/97" by Tnemec
2). "Interzinc 52" or "315" by International Protective Coatings
3). "Carbozinc 859, Class B" by Carboline
4). "Cathacoat 302V Reinforced Inorganic Zinc Primer" by Akzo
5). Organic Zinc Rich Primer V 170 by Corotech/Moore
6). "Zinc Clad II Plus Inorganic Zinc Rich Coating B69V212" by Sherwin Williams
7). Or approved equal

2. Second Coat:

a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1). "27 Typoxy" or "N69 Epoxoline II" by Tnemec
2). "Intergard 345" by International Protective Coatings
3). "Carboguard 893 SG" or "Carboguard 888" by Carboline
4). "Bar-Rust 231V Multi Purpose Epoxy Mastic" by Akzo
5). Epoxy Mastic Coating V 160 Series by Corotech/Moore
6). "Macropoxy 646 I.C. Epoxy B58-600" by Sherwin Williams
7). Or approved equal.

3. Third Coat:

a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1). "V73 Endura Shield" or "1074/1075" by Tnemec
2). "Interthane 870UHS" or "990 UHS" by International Protective Coatings

3). "Carbothane 133 LH" by Carboline
4). "Devthane 379 UH Aliphatic Urethane" by Akzo
5). Acrylic Aliphatic Urethane V 500 (Gloss) or V 510 (Semi-Gloss) by Corotech/Moore
6). "Hi-Solids Polyurethane B65-300/350" by Sherwin Williams
7). Or approved equal.

C. Interior Ferrous Metal

1. Semi-Gloss Finish/Latex

a. Primer:
1). 1 coat Moore Ultra Spec-HP Acrylic Metal Primer (HP04)
2). 1 coat PPG Devflex 4020 PF DTM Primer/Flat Finish
3). 1 coat S-W Pro-Industrial Pro-Cryl Universal Primer B66-3100 Series
4). or approved equal

b. First Coat:
1). 1 coat Moore Ultra Spec HP DTM Acrylic Semi-Gloss (HP29)
2). 1 coat PPG Pitt Glaze WB1 Pre-Catalyzed Semi-Gloss Epoxy 16-510
3). 1 coat S-W Pro Industrial Acrylic Semi-Gloss, B66-650 Series
4). or approved equal

c. Second Coat:
1). 1 coat Moore Ultra Spec HP DTM Acrylic Semi-Gloss (HP29)
2). 1 coat PPG Pitt Glaze WB1 Pre-Catalyzed Semi-Gloss Epoxy 16-510
3). 1 coat S-W Pro Industrial Acrylic Semi-Gloss, B66-650 Series
4). or approved equal

d. Total DFT not less than: 4.0 mils

D. Interior Concrete Block

1. Semi-Gloss Finish/Vinyl Acrylic Latex over Filler

a. Block Filler:
1). 1 coat Moore Ultra Spec Masonry Int./Ext. High Build Block Filler (571)
2). 1 coat PPG Speedhide HI Fill Latex Block Filler 6-15XI
3). 1 coat S-W Pro Industrial Heavy-Duty Block Filler, B42-150
4). or approved equal

b. First Coat:
1). 1 coat Moore Ultra Spec 500 Interior Latex Gloss (N540)
2). 1 coat PPG Speedhide Zero Interior Semi-Gloss Latex, 6-4510XI Series
3). 1 coat S-W ProMar 200 Zero VOC Interior Latex Semi-Gloss, B31-2600 Series
4). or approved equal

c. Second Coat:
1). 1 coat Moore Ultra Spec 500 Interior Latex Gloss (N540)
2). 1 coat PPG Speedhide Zero Interior Semi-Gloss Latex, 6-4510XI Series
3). 1 coat S-W ProMar 200 Zero VOC Interior Latex Semi-Gloss, B31-2600 Series
4). or approved equal

d. Total DFT not less than: 10.7 mils

E. Interior Drywall

1. Flat Finish/Vinyl Acrylic Latex

a. Primer:
   1). 1 coat Moore Ultra Spec 500 Interior Latex Primer (N534)
   2). 1 coat PPG Speedhide Zero Interior Latex Primer 6-4900XI
   3). 1 coat S-W ProMar 200 Zero VOC Interior Latex Primer, B28-2600
   4). or approved equal
b. First Coat:
   1). 1 coat Moore Ultra Spec 500 Latex Flat (N536)
   2). 1 coat PPG Speedhide Zero Interior Latex Flat 6-4110XI
   3). 1 coat S-W ProMar 200 Zero VOC Interior Latex Flat, B30-12600 Series
   4). or approved equal
c. Second Coat:
   1). 1 coat Moore Ultra Spec 500 Latex Flat (N536)
   2). 1 coat PPG Speedhide Zero Interior Latex Flat 6-4110XI
   3). 1 coat S-W ProMar 200 Zero VOC Interior Latex Flat, B30-12600 Series
   4). or approved equal
d. Total DFT not less than: 3.6 mils

2. Eggshell Finish/Vinyl Acrylic Latex

a. Primer:
   1). 1 coat Moore Ultra Spec 500 Interior Latex Primer (N534)
   2). 1 coat PPG Speedhide Zero Interior Latex Primer 6-4900XI
   3). 1 coat S-W ProMar 200 Zero VOC Interior Latex Primer, B28-2600
   4). or approved equal
b. First Coat:
   1). 1 coat Moore Ultra Spec 500 Interior Latex Eggshell (N538)
   2). 1 coat PPG Speedhide Zero Interior Latex Eggshell 6-4310XI
   3). 1 coat S-W ProMar 200 Zero VOC Interior Latex Eg-Shel, B20-1900 Series
   4). or approved equal
c. Second Coat:
   1). 1 coat Moore Ultra Spec 500 Interior Latex Eggshell (N538)
   2). 1 coat PPG Speedhide Zero Interior Latex Eggshell 6-4310XI
   3). 1 coat S-W ProMar 200 Zero VOC Interior Latex Eg-Shel, B20-1900 Series
   4). or approved equal
d. Total DFT not less than: 3.8 mils

F. Interior Painted Wood

1. Satin Finish/Latex

a. Primer:
   1). 1 coat Moore Advance Waterborne Int. Alkyd Primer (790)
   2). 1 coat PPG Seal Grip Interior Primer/Finish 17-951
   3). 1 coat S-W Multi-Purpose Latex Primer/Sealer B51 Series
   4). or approved equal

b. First Coat:
   1). 1 coat Moore Advance Waterborne Int. Alkyd Satin (792)
   2). 1 coat PPG Speedhide Zero Interior Latex Satin, 6-4410XI
   3). 1 coat S-W ProMar 200 Zero VOC Interior Latex Eg-Shel, B20-1900 Series
   4). or approved equal
c. Second Coat:
   1). 1 coat Moore Advance Waterborne Int. Alkyd Satin (792)
   2). 1 coat PPG Speedhide Zero Interior Latex Satin, 6-4410XI
   3). 1 coat S-W ProMar 200 Zero VOC Interior Latex Eg-Shel, B20-1900 Series
   4). or approved equal
d. Total DFT not less than: 4.0 mils

2. Semi-Gloss Finish/Latex

a. Primer:
   1). 1 coat Moore Advance Waterborne Int. Alkyd Primer (790)
   2). 1 coat PPG Seal Grip Interior Primer/Finish 17-951
   3). 1 coat S-W Multi-Purpose Latex Primer/Sealer B51 Series
   4). or approved equal
b. First Coat:
   1). 1 coat Moore Advance Waterborne Int. Alkyd (793)
   2). 1 coat PPG Speedhide Zero Interior Semi-Gloss Latex, 6-4510XI
   3). 1 coat S-W ProMar 200 Zero VOC Interior Latex Semi-Gloss, B31-2600 Series
   4). or approved equal
c. Second Coat:
   1). 1 coat Moore Advance Waterborne Int. Alkyd (793)
   2). 1 coat PPG Speedhide Zero Interior Semi-Gloss Latex, 6-4510XI
   3). 1 coat S-W ProMar 200 Zero VOC Interior Latex Semi-Gloss, B31-2600 Series
   4). or approved equal
d. Total DFT not less than: 3.8 mils

G. Concrete Floor Sealer

1. Clear Sealer (SC-01): Water-based, low-VOC acrylic sealer

a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1). "Everclear VOX" as manufactured by Euclid Chemical Company
   2). "V-Seal 101" as manufactured by V-Seal
   3). Penetrating sealer by Seal-Krete
   4). Or approved equal.

2. Opaque Sealer (SC-02): As selected by Commissioner.

H. Epoxy Wall Paint:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   1). Tnemec

2). Benjamin Moore
3). Sherwin Williams
4). Or approved equal

2. Drywall Surfaces

a. Primer: 1 coat 201 "Epoxoprime", 5-7 mils DFT
b. First Coat: 1 coat Series 280 "Tneme Glaze, 6-10 mils DFT
c. Second Coat: 1 coat 1080/1081 "Endura-Shield WB" 2-3 mils DFT

3. Masonry Surfaces

a. Primer: 1 coat 130 "Envirofill", 60-80 sq. ft./gallon
b. First Coat: 1 coat Series 280 "Tneme Glaze", 6-10 mils DFT
c. Second Coat: 1 coat "Endura-Shield WB" 2-3 mils DFT

2.5 PIPING AND MECHANICAL EQUIPMENT EXPOSED TO VIEW

A. Paint all exposed piping, conduits, ductwork and mechanical and electrical equipment. Use heat resisting paint when applied to heating lines and equipment. The Contractor is cautioned not to paint or otherwise disturb moving parts in the mechanical systems. Mask or otherwise protect all parts as required to prevent damage.

B. Exposed Uncovered Ductwork, Piping, Hangers and Equipment: Latex Enamel Undercoater and one (1) coat Acrylic Latex Flat.

C. Exposed Covered Piping, Duct Work and Equipment: Primer/Sealer and one (1) coat Acrylic Latex Flat.

D. Panel Boards, Grilles and Exposed Surfaces of Electrical Equipment: Latex Enamel Undercoater and two (2) coats Latex Semi-Gloss.

E. Equipment or Apparatus with Factory-Applied Paint: Refinish any damaged surfaces to match original finish. Do not paint over name plates and labels.

F. All surfaces of insulation and all other work to be painted shall be wiped or washed clean before any painting is started.

G. All conduit, boxes, distribution boxes, light and power panels, hangers, clamps, etc., are included where painting is required.

H. All items of Mechanical and Electrical trades which are furnished painted under their respective Contracts shall be carefully coordinated with the work of this Section so as to leave no doubt as to what items are scheduled to be painted under this Section.

PART III - EXECUTION

3.1 EXECUTION REQUIREMENTS

A. Refer to DDC General Conditions for execution requirements.

3.2 GENERAL WORKMANSHIP REQUIREMENTS

A. Application may be by brush or roller. Spray application only upon acceptance from the Commissioner in writing.

B. Remove and protect hardware, accessories, device plates, lighting fixtures, and factory finished work, and similar items, or provide ample in place protection. Upon completion of each space, carefully replace all removed items by workmen skilled in the trades involved.

C. Remove electrical panel box covers and doors before painting walls. Paint separately and reinstall after all paint is dry.

D. All materials shall be applied under adequate illumination, evenly spread and flowed on smoothly to avoid runs, sags, holidays, brush marks, air bubbles and excessive roller stipple.

E. Coverage and hide shall be complete. When color, stain, dirt or undercoats show through final coat of paint, the surface shall be covered by additional coats until the paint film is of uniform finish, color, appearance and coverage.

F. Do not apply paint behind frameless mirrors that use mastic for adhering to wall surface.

3.3 PREPARATION OF SURFACES

A. Metal Surfaces

1. Weld Fluxes: Remove weld fluxes, splatters, and alkali contaminants from metal surfaces in an approved manner and leave surface ready to receive painting.

2. Bare Metal: Thoroughly clean off all foreign matter such as grease, rust, scale and dirt before priming coat is applied. Clean surfaces, where solder flux has been used, with benzene. Clean surfaces by flushing with mineral spirits. For aluminum surfaces, wipe down with an oil free solvent prior to application of any pre-treatment.

   a. Bare metal to receive high performance coating specified herein must be blast cleaned SSPC SP-6 prior to application if field applied primer; coordinate with steel trades furnishing ferrous metals to receive this coating to ensure that this cleaning method is followed.

3. Shop Primed Metal: Clean off foreign matter as specified for "Bare Metal." Prime bare, rusted, abraded and marred surfaces with approved primer after proper cleaning of surfaces. Sandpaper all rough surfaces smooth.

4. Galvanized Metal: Prepare surface as per the requirements of ASTM D 6386.

5. Metal Filler: Fill dents, cracks, hollow places, open joints and other irregularities in metal work to be painted with an approved metal filler suitable for the purpose and meeting the requirements of the related Section of work; after setting, sand to a smooth, hard finish, flush with adjoining surface.

B. Gypsum Drywall Surfaces: Scrape off all projections and splatters, spackles all holes or depressions, including taped and spackled joints, sand smooth. Conform to standards established in Section 09 29 00, Gypsum Drywall.

C. Wood Surfaces: Sand to remove all roughness, loose edges, slivers, or splinters and then brush to remove dust. Wash off grease or dirt with an approved cleaner. Fill all cracks, splits, nail holes, screw holes, and surface defects with putty after the priming coat has been applied. Putty shall be brought up flush with the surface and sanded smooth and touched-up with primer when dry.

D. Block Masonry Surfaces: Thoroughly clean off all grit, grease, dirt mortar drippings or splatters, and other foreign matter. Remove nibs or projections from masonry surfaces. Fill cracks, holes or voids with Portland cement grout, and bag surface so that it has approximately the same texture as the adjacent masonry surface.

E. Testing for Moisture Content: Contractor shall test all masonry and drywall surfaces for moisture content using a reliable electronic moisture meter. Contractor shall also test latex type fillers for moisture content before application of top coats of paint. Do not apply any paint or sealer to any surface or to latex type filler where the moisture content exceeds seven (7) percent as measured by the electronic moisture meter.

F. Touch-Up: Prime paint all patched portions in addition to all other specified coats.

3.4 MATERIALS PREPARATION

A. Mix and prepare painting materials in strict accordance with the manufacturer's directions.

B. Stir all materials before application to produce a mixture of uniform density, and as required during the application of the materials. Do not stir any film which may form on the surface into the material. Remove the film and, if necessary, strain the material before using.

C. Tint each undercoat a lighter shade to facilitate identification of each coat where multiple coats of the same material are to be applied. Tint undercoats to match the color of the finish coat, but provide sufficient difference in shade of undercoats to distinguish each separate coat.

3.5 APPLICATION

A. General: Apply paint by brush or roller in accordance with the manufacturer's directions. Use brushes best suited for the type of material being applied. Use rollers of carpet, velvet back, or high pile sheep's wool as recommended by the paint manufacturer for material and texture required.

1. The number of coats and paint film thickness required is the same regardless of the application method. Do not apply succeeding coats until the previous coat has completely dried. Sand between each enamel or varnish coat application with fine sandpaper, or rub surfaces with pumice stone where required to produce an even, smooth surface in accordance with the coating manufacturer's directions.

2. Apply additional coats when undercoats, stains, or other conditions show through the final coat of paint, until the paint film is of uniform finish, color and appearance. Ensure that all surfaces, including edges, corners, crevices, welds, and exposed fasteners receive a film thickness equivalent to that of flat surfaces.

3. Paint surfaces behind movable equipment and furniture the same as similar exposed surfaces. Paint surfaces behind permanently fixed equipment or furniture with prime coat only.

   a. "Exposed surfaces" is defined as those areas visible when permanent or built-in fixtures, convector covers, covers for finned tube radiation, grilles, etc., are in place in areas scheduled to be painted.

4. Paint interior surfaces of ducts, where visible through registers or grilles, with a flat, non-specular black paint, before final installation of equipment.

5. Paint the back sides of access panels, removable or hinged covers to match the exposed surfaces.

6. Finish doors on tops, bottoms, and side edges the same as the faces, unless otherwise indicated.

7. Enamel finish applied to wood or metal shall be sanded with fine sandpaper and then cleaned between coats to produce an even surface.

8. Paste wood filler applied on open grained wood after beginning to flatten, shall be wiped across the grain of the wood, then with a circular motion, to secure a smooth, filled, clean surface with filler remaining in open grain only. After overnight dry, sand surface with the grain until smooth before applying specified coat.

B. Prime Coats: Re-coat primed and sealed walls and ceilings where there is evidence of suction spots or unsealed areas in first coat, to ensure a finish coat with no burn-through or other defects due to insufficient sealing.

C. Pigmented (Opaque) Finishes: Completely cover to provide an opaque, smooth surface of uniform finish, color, appearance and coverage.

D. Touching-Up of Factory Finishes: Unless otherwise specified or shown, materials with a factory finish shall not be painted at the project site. To touch up, the Contractor shall use the factory finished material manufacturer's recommended paint materials to repair abraded, chipped, or otherwise defective surfaces.

END OF SECTION 09 90 00

SECTION 10 14 00
Signage

PART I - GENERAL

1.1 RELATED DOCUMENTS

A. The following documents apply to all required work for the Project: (1) the Contract Drawings, (2) the Specifications, (3) the General Conditions, (4) the Addendum and (5) the Contract (City of New York Standard Construction Contract).

B. LEED General Requirements:

1. Refer to DDC General Conditions

   a. Section 01 33 00 "Submittal Procedures"
   b. Section 01 81 13.04 "Sustainable Design Requirements for LEED v4 Buildings"
   c. Section 01 81 13.13 "Volatile Organic Compound Limits for Adhesives, Sealants, Paints and Coatings for LEED Buildings"
   d. Section 01 81 19 "Indoor Air Quality Requirements for LEED Buildings"

C. Related Sections:

1. 03 30 00 - Architectural Cast-In-Place Concrete
2. 03 45 00 - Architectural Pre-Cast Concrete
3. 08 45 19 - Polycarbonate Wall System

1.2 SUMMARY

A. Section includes:

1. Signage product & performance requirements
2. Interior panel sign requirements
3. Dimensional letter requirements
4. Field applied vinyl-character sign requirements

1.3 SUBMITTAL PROCEDURES

A. Refer to DDC General Conditions Section 01 33 00 "Submittal Procedures".

1.4 SUBMITTALS

A. Product Data: Submit manufacturer's technical data and installation instructions for each type of signage required, including: construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of unit.

B. Samples: Submit samples of each type of signage showing finishes, colors, surface textures and qualities of manufacture and design of each sign component including graphics and method of attachment

C. Full-scale mockups: Submit full-scale mockup of cast concrete channel signage prior to final production (refer to part 2.8 for details), consisting of a 12" x 12" x 4" section of the larger cast concrete facade, with inset channels created with a form liner as specified in part 2.8. Refer to the signage drawings and elevations of the salt shed facade graphics for details on the sizing, depth, shape, and spacing of inset channels.

D. Shop Drawings: Submit shop drawings for fabrication and erection of signage. Include plans, elevations, and large scale details of sign wording and lettering layout. Show anchorage and accessory items. Furnish location template drawings for items supported or anchored to permanent construction. Include large-scale sections of typical members and other components. Show mounting methods, grounds, mounting heights, layout spacing, reinforcement, accessories, and installation details.

1.5 QUALITY ASSURANCE

A. Refer to DDC General Conditions Section 01 40 00 "Quality Requirements".

B. Installer Qualifications: For actual installation of signage, use only personnel who are experienced and thoroughly familiar with the manufacturer's recommended methods of installation.

C. Source Limitations: Obtain each sign type through one source, from a single manufacturer regulatory requirements: comply with ADA.

1.6 PROJECT CONDITIONS

A. Field Measurements: Where sizes of signs are determined by dimension of surfaces on which they are installed, verify dimensions by field measurement before fabrication and indicate measurements on shop drawings

PART II - PRODUCTS

2.1 MATERIALS

A. Basis-of-Design Product: Subject to compliance with requirements provide translucent vinyl film by 3M Crystal Glass Finishes Dusted Crystal Film or comparable product by one of the following:

1). Oracal
2). Avery Dennison
3). Or approved equal

2. Performance Requirements:

a. Usage: Interior/Exterior
b. Shading Coefficient: 0.93%
c. Visible light reflectance: 79%
d. Visible light transmittance: 85%
e. Solar heat transmittance: 76%

f. Solar heat absorbance: 17%

B. Basis-of-Design Product: Subject to compliance with requirements provide reflective vinyl film by 3M Scotchlite Reflective Graphic Film or comparable product by one of the following:

1). Oracal
2). Avery Dennison
3). Or approved equal

2. Performance Requirements:

a. 7-mil, flexible, enclosed lens, retroreflective;
b. Temperature range after application: -30 to +200°F (-34 to +93°C) (not for extended periods of time at the extremes);
c. Surface type: flat, with and without rivets, moderate curves
d. Substrate type: aluminum, Fiberglass Reinforced Plywood (FRP)
e. Paint Graphic orientation: Vertical only;
f. Application method: Dry;
g. Application temperature: air and substrate; Flat without rivets: 50–85°F (10–29°C);
h. Flat with rivets: 55–85°F (15–29°C)

C. Basis -of-Design Product: Subject to compliance with requirements, provide automotive-grade exterior paint by Matthews Satin MAP or comparable product by one of the following:

1). Sherwin Williams
2). RAL
3). Or approved equal

2. Performance Requirements:

a. Usage: Interior/Exterior
b. Volume Solids by Weight: 42–61%
c. Volume Solids (RTS) 33–47%

3. Theoretical Coverage (1mil @ 100% transfer efficiency) 426–520 sq. ft. /RTS gal.

4. Gloss: 15°-20° w/60° meter

D. Basis-of-Design Product: Subject to compliance with requirements, provide colored acrylic by Acrylite GP or comparable product by one of the following:

1). 3Form
2). Lucite
3). Or approved equal

2. Acrylic used for "DSNY" dimensional channels on salt shed facade. Refer to signage drawings and elevations for dimensions, mounting height, building faces, and alignment details.

3. Performance Requirements:

a. Color: frosted white (translucent)

b. Finish: matte
c. Mounting: Field-applied to polycarbonate salt shed facade with VHB adhesive, aligning to inset vertical channels in site-cast concrete base to complete "DSNY" letters. Channels comprised of fewest possible acrylic sections to reduce seams; all seams 90° butt-joints; fabricator to provide seam diagram prior to fabrication to verify alignment with all horizontal seams to architectural details of facade. At edge conditions where channels require mounting across vertical seam of two polycarbonate panels, channels to receive partially-backed VHB adhesive for attachment to only one polycarbonate panel with greater available surface area for adhesion; fabricator to verify durability of adhesive hold given the available surface area

E. Basis-of-Design Product: Subject to compliance with requirements provide a tinted lens LED traffic signal by EOI Group 8" LED Traffic Signal or comparable product by one of the following:

1). Econolite
2). GE Lighting
3). Or approved equal

2. Performance Requirements:

a. Operation Temperature Range: -40°C to + 74°C
b. Operation Voltage from 80 to 135 VAC RMS
c. Luminous intensity and color conforms with ITE VTCSH-LED
d. Dominant Wavelengths: Red (625), Green (500)

2.2 INTERIOR PANEL SIGNS

A. Typography

1. Type Style: Copy shall be a true, clean, accurate reproduction of typeface shown on drawings. All content as indicated in Sign Message Schedule. Letter spacing to comply with typical sign type drawings.

2. Arrows, Symbols and Logo Art: To be provided in style, sizes, colors and spacing as shown in drawings

3. Braille: Grade 2

4. Translations: Grade 2 Braille copy and any second language text, as noted in contract drawings on Sign Message Schedule, is responsibility of the sign manufacturer

B. Project Colors and Finishes

1. Typography: refer to typical sign type drawings and elevations

2. Colors: refer to typical sign type drawings and elevations

2.3 DIMENSIONAL LETTERS

A. Cutout Characters

1. Characters with uniform faces; square-cut, smooth, eased edges; precisely formed lines and profiles. Comply with requirements indicated for finish, style and size

2. Material, height, typeface, and finish: as indicated on typical sign type drawings and elevations

2.4 PRECAST / CIP CONCRETE CAST RELIEF CHANNELS

A. Parallel channels to be inset into vertical concrete architectural faces with inserted form-liners at the time of casting. Refer to signage drawings and elevations for channel dimensions, spacing, and depth.

B. Form liners to be produced from solid plastic, urethane, wood, or similarly-rigid material to create uniform, sharp reveals in concrete face. Liner to be prepared for clean removal following concrete cast, via tapered return faces and liner release solution as needed.

C. Production process -

1. Formwork panels to be delivered to fabricator's manufacturing facility.

2. Fabricator to mechanically attach form liner channels to individual formwork panels with screwed connections through back of formwork panels to prevent visible attachments on interior side of form and liner channels or movement of channels at the time of concrete casting.

3. All channels to be installed with precise alignment for consistency with design intent of vertical lines as specified in signage drawings and elevations.

4. Fabricator to create key diagram for assembly of formwork panels into correct arrangement for visual combination of channels into "DSNY" letters.

5. Fabricator to ship formwork panels with installed liner channels back to concrete contractor for shop and site assembly of precast and site cast forms, respectively.

6. Fabricator to supervise and approve re-assembly of lined formwork panels into correct arrangement, and supervise removal of lined formwork panels following concrete cast.

2.5 ADHESIVE VINYL CHARACTER LETTERING

1. Refer to typical sign type drawings and elevations for vinyl colors, finishes, application surfaces, style, and material sheet sizes.

2.6 PAINTED FENCE GRAPHIC

A. Refer to typical sign type drawings and elevations for graphic layout, paint colors, size, location, and fence structural layout.

B. Graphic to be masked onto front and return sides of metal fence slats, and painted in field by signage fabricator.

2.7 GROUND-INLAID METAL GRAPHICS

A. Refer to typical sign type drawings and ground diagram for graphic layout, material, size, and location.

B. Fabricator to manufacture metal channels as specified in signage drawing before providing channels to concrete contractor for installation in sidewalk surface.

C. Fabricator to site supervise installation of metal channels into correct arrangement as specified in signage drawings, for inlay installation with visible faces of channels flush with sidewalk surface.

2.8 FREESTANDING SIGNAGE TOTEMS

A. Refer to typical sign type drawings and elevations for graphic layouts, paint colors, materials, size, and locations of each signage totem.

B. Fabricator responsible for verifying size and depth requirements for below-grade concrete foundation for each signage totem; fabricator to install all foundations.

PART III – EXECUTION

3.1 EXECUTION REQUIREMENTS

A. Refer to DDC General Conditions for execution requirements.

3.2 INSTALLATION

A. Install units and components at the locations directed by the Commissioner, securely mounted with concealed theft-resistant fasteners. Attach to substrates in accordance with the manufacturer's instructions.

B. Install level, plumb, and at the proper height. Cooperate with other trades for installation of sign units to finish surfaces. Repair or replace damaged units as directed by the Commissioner.

C. Dimensional Letters and Numbers: Mount letters and numbers using standard fastening methods recommended by the manufacturer for letter form, type of mounting, wall construction, and condition of exposure indicated and in accordance with approved shop drawings. Provide heavy paper template to establish letter spacing and to locate holes for fasteners. No visible adhesive shall be exposed or seep around letters.

D. Field-Applied, Vinyl Character Signs: Clean and dry substrate. Align sign characters in final position before removing release liner. Remove release liner in stages, and apply and firmly press characters into final position. Press from the middle outward to obtain good bond without blisters or fishmouths. Remove carrier film without disturbing applied vinyl film.

END OF SECTION 10 14 00

SECTION 10 21 13
Toilet Compartments

PART I - GENERAL

1.1 RELATED DOCUMENTS

A. The following documents apply to all required work for the Project: (1) the Contract Drawings, (2) the Specifications, (3) the General Conditions, (4) the Addendum and (5) the Contract (City of New York Standard Construction Contract).

B. LEED General Requirements:

1. Refer to DDC General Conditions

   a. Section 01 33 00 "Submittal Procedures"
   b. Section 01 81 13.04 "Sustainable Design Requirements for LEED v4 Buildings"

1.2 SUMMARY

A. Section includes:

1. Floor-mounted, overhead-braced, toilet partitions.
2. Wall-mounted urinal screens.
3. Hardware and accessories.

B. Related Sections

1. Unit Masonry - Section 04 20 00.
2. Gypsum Drywall - Section 09 29 00.
3. Ceramic Tiling - Section 09 30 13.
4. Toilet Accessories - Section 10 28 13.

1.3 QUALITY ASSURANCE

A. Refer to DDC General Conditions Section 01 40 00 "Quality Requirements".

1.4 SUBMITTAL PROCEDURES

A. Refer to DDC General Conditions Section 01 33 00 "Submittal Procedures".

1.5 SUBMITTALS

A. Product Data: Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.

B. Shop Drawings

1. Include plans, elevations, sections, details, and attachment details.
2. Show locations of cutouts for compartment-mounted toilet accessories.
3. Show locations of centerlines of toilet fixtures.
4. Show locations of floor drains.
5. Show overhead support or bracing locations.

C. Samples for Initial Selection: Manufacturer's standard color sheets, showing full range of available colors for each type of toilet compartment material indicated.

1. Include samples of hardware and accessories involving material and color selection.

D. Samples for Verification: Actual sample of finished products for each type of toilet compartment indicated.

1. Size: 6" x 6", of same thickness indicated for Work.
2. Include each type of hardware and accessory.

PART II - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire Performance: Tested in accordance with, and pass the acceptance criteria of, NFPA 286.

B. Regulatory Requirements: Comply with applicable provisions in 2014 New York City Building Code for toilet compartments designated as accessible.

2.2 MANUFACTURERS

A. Toilet Compartments: Floor Anchored Overhead Braced Solid Plastic Partitions

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. ASI Global Partitions
2. Ampco
3. Hadrian
4. General Partitions
5. Or approved equal

C. Provide wall-mounted urinal screens of same material as toilet partitions.

2.3 COMPONENTS

A. Door, Panel, Screen, and Pilaster Construction: Solid, high-density polyethylene (HDPE) panel material, not less than 1 inch thick, seamless, with eased edges, no-sightline system, and with homogenous color and pattern throughout thickness of material.

1. Integral Hinges: Configure doors and pilasters to receive integral hinges.
2. Heat-Sink Strip: Manufacturer's standard continuous, extruded-aluminum or stainless steel strip fastened to exposed bottom edges of solid-plastic components to hinder malicious combustion.
3. Color and Pattern: See Finish Schedule.

B. Pilaster Shoes: Manufacturer's standard design; stainless steel.

C. Urinal-Screen Post: Manufacturer's standard post design of material matching the thickness and construction of pilasters; with shoe matching that on the pilaster.

D. Brackets (Fittings):

1. Full-Height (Continuous) Type: Manufacturer's standard design; clear-anodized extruded aluminum.

2.4 HARDWARE AND ACCESSORIES

A. Hardware and Accessories: Manufacturer's standard design, heavy-duty operating hardware and accessories.

1. Hinges: Manufacturer's minimum 0.062-inch- thick stainless continuous, cam type that swings to a closed or partially open position, allowing emergency access by lifting door. Mount with through bolts.
2. Latch and Keeper: Manufacturer's heavy-duty, surface-mounted, cast-stainless steel latch unit, designed to resist damage due to slamming, with combination rubber-faced door strike and keeper, and with provision for emergency access. Provide units that comply with regulatory requirements for accessibility at compartments designated as accessible. Mount with through bolts.
3. Coat Hook: Manufacturer's heavy-duty combination cast-stainless steel hook and rubber-tipped bumper, sized to prevent inswinging door from hitting compartment-mounted accessories. Mount with through bolts.
4. Door Bumper: Manufacturer's heavy-duty, rubber-tipped, cast-stainless steel bumper at outswinging doors. Mount with through bolts.
5. Door Pull: Manufacturer's heavy-duty, cast-stainless steel pull at outswinging doors that complies with regulatory requirements for accessibility. Provide units on both sides of doors at compartments designated as accessible. Mount with through bolts.

B. Overhead Bracing: Manufacturer's standard continuous, extruded-aluminum head rail with antigrip profile and in manufacturer's standard finish.

C. Anchorages and Fasteners: Manufacturer's standard exposed fasteners of stainless steel, finished to match the items they are securing, with theft-resistant-type heads. Provide sex-type bolts for through-bolt applications. For concealed anchors, use stainless steel, hot-dip galvanized steel, or other rust-resistant, protective-coated steel compatible with related materials.

2.5 FABRICATION

A. Fabrication, General: Fabricate toilet compartment components to sizes indicated. Coordinate requirements and provide cutouts for through-partition toilet accessories where required for attachment of toilet accessories.

B. Overhead-Braced Units: Provide manufacturer's standard corrosion-resistant supports, leveling mechanism, and anchors at pilasters to suit floor conditions. Provide shoes at pilasters to conceal supports and leveling mechanism.

C. Urinal-Screen Posts: Provide manufacturer's standard corrosion-resistant anchoring assemblies with leveling adjustment nuts at bottoms of posts. Provide shoes at posts to conceal anchorage.

D. Door Size and Swings: Unless otherwise indicated, provide 24-inch-wide, inswinging doors for standard toilet compartments and 36-inch-wide, outswinging doors with a minimum 32-inch-wide, clear opening for compartments designated as accessible.

PART III - EXECUTION

3.1 EXECUTION REQUIREMENTS

A. Refer to DDC General Conditions for execution requirements.

3.2 INSTALLATION

A. General: Comply with manufacturer's written installation instructions. Install units rigid, straight, level, and plumb. Secure units in position with manufacturer's recommended anchoring devices.

1. Maximum Clearances:

   a. Pilasters and Panels: 1/2 inch.
   b. Panels and Walls: 1 inch.

2. Full-Height (Continuous) Brackets: Secure panels to walls and to pilasters with full-height brackets.

   a. Locate bracket fasteners, so holes for wall anchors occur in masonry or tile joints.
   b. Align brackets at pilasters with brackets at walls.

B. Overhead-Braced Units: Secure pilasters to floor and level, plumb, and tighten. Set pilasters with anchors penetrating not less than 1-3/4 inches into structural floor unless otherwise indicated in manufacturer's written instructions. Secure continuous head rail to each pilaster with no fewer than two fasteners. Hang doors to align tops of doors with tops of panels and adjust, so tops of doors are parallel with overhead brace when doors are in closed position.

C. Urinal Screens: Attach with anchoring devices to suit supporting structure. Set units level and plumb, rigid, and secured to resist lateral impact.

3.3 ADJUSTING

A. Hardware Adjustment: Adjust and lubricate hardware according to hardware manufacturer's written instructions for proper operation. Set hinges on inswinging doors to hold doors open approximately 30 degrees from closed position when unlatched. Set hinges on outswinging doors to return doors to fully closed position.

END OF SECTION 10 21 13

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SECTION 10 21 16
Shower Compartments

PART I - GENERAL

1.1 RELATED DOCUMENTS

A. The following documents apply to all required work for the Project: (1) the Contract Drawings, (2) the Specifications, (3) the General Conditions, (4) the Addendum and (5) the Contract (City of New York Standard Construction Contract).

B. LEED General Requirements:

1. Refer to DDC General Conditions

   a. Section 01 33 00 "Submittal Procedures"
   b. Section 01 81 13.04 "Sustainable Design Requirements for LEED v4 Buildings"

1.2 SUMMARY

A. Section includes:

1. Floor-mounted, overhead-braced, shower compartments.

2. Shower curtains and curtain hooks.

B. Related Sections

1. Plumbing Fixtures - Section 22 40 00, for shower receptors.

1.3 QUALITY ASSURANCE

A. Refer to DDC General Conditions Section 01 40 00 "Quality Requirements".

1.4 SUBMITTAL PROCEDURES

A. Refer to DDC General Conditions Section 01 33 00 "Submittal Procedures".

1.5 SUBMITTALS

A. Product Data: Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.

B. Shop Drawings

1. Include plans, elevations, sections, details, and attachment details.

2. Show locations of cutouts for compartment-mounted accessories.

3. Show locations of centerlines of drains.

4. Show overhead support or bracing locations.

C. Samples for Initial Selection: Manufacturer's standard color sheets, showing full range of available colors for each type of toilet compartment material indicated.

1. Include samples of hardware and accessories involving material and color selection.

D. Samples for Verification: Actual sample of finished products for each type of toilet compartment indicated.

1. Size: 6" x 6", of same thickness indicated for Work.

2. Include each type of hardware and accessory.

3. Curtain Fabric: 12" x 12" swatch or larger as required to show complete pattern repeat, from dye lot used for the Work, with specified treatments applied. Mark top and face of material.

PART II - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire Performance: Tested in accordance with, and pass the acceptance criteria of, NFPA 286.

B. Regulatory Requirements: Comply with applicable provisions in 2014 New York City Building Code for shower and dressing compartments designated as accessible.

2.2 MANUFACTURERS

A. Shower Compartments: Floor Anchored Overhead Braced Solid Plastic Partitions

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. ASI Global Partitions
   b. Ampco
   c. Hadrian
   d. General Partitions
   e. Or approved equal

B. Provide partitions with integral seating and accessories as follows:

1. Shower curtains shall be constructed from vinyl and shall be 42" wide by 72" high.

2. Shower hooks shall be aluminum with a self-lubricating derlin slide.

2.3 COMPONENTS

A. Panel and Pilaster Construction: Solid, high-density polyethylene (HDPE) panel material, not less than 1 inch thick, seamless, with eased edges, no-sightline system, and with homogenous color and pattern throughout thickness of material.

1. Integral Hinges: Configure doors and pilasters to receive integral hinges.

2. Heat-Sink Strip: Manufacturer's standard continuous, extruded-aluminum or stainless steel strip fastened to exposed bottom edges of solid-plastic components to hinder malicious combustion.

3. Color and Pattern: See Finish Schedule.

B. Door Construction: Match panels.

C. Pilaster Shoes: Manufacturer's standard design; stainless steel.

D. Brackets (Fittings):

1. Full-Height (Continuous) Type: Manufacturer's standard design; clear-anodized extruded aluminum.

2.4 ACCESSORIES

A. Door Hardware and Accessories: Manufacturer's standard design, heavy-duty operating hardware and accessories.

1. Material: Stainless steel.

2. Hinges: Manufacturer's standard, continuous, cam type that swings to a closed or partially open position, allowing emergency access by lifting door.

3. Latch and Keeper: Manufacturer's standard, surface-mounted latch unit designed for emergency access and with combination rubber-faced door strike and keeper. Provide units that comply with regulatory requirements for accessibility at compartments designated as accessible.

4. Clothing Hooks: Manufacturer's standard clothing hooks in each dressing compartment; include one combination hook and rubber-tipped bumper at inswinging doors, sized to prevent door from hitting wall panel or compartment-mounted accessories.

5. Door Bumper: Manufacturer's standard, rubber-tipped bumper at outswinging doors.

6. Door Pull: Manufacturer's standard unit at outswinging doors that complies with regulatory requirements for accessibility. Provide units on both sides of doors at compartments designated as accessible.

B. Overhead Bracing: Manufacturer's standard continuous, extruded-aluminum head rail with antigrip profile and in manufacturer's standard finish.

C. Head Rail with Hooks: Manufacturer's standard, continuous, extruded-aluminum head rail or cap with curtain hooks running in concealed track; with antigrip profile; in manufacturer's standard finish.

D. Curtain: Flame-resistant, polyester-reinforced vinyl fabric that is stain resistant, self-sanitizing, antistatic, and antimicrobial; launderable to a temperature of not less than 90 deg F; color and pattern as selected by the Commissioner.

E. Seating: Manufacturer's standard panel-mounted benches.

1. Material: Solid phenolic.

2. Operation: Folding.

3. Color: See Finish Schedule.

F. Anchorages and Fasteners: Manufacturer's standard, exposed fasteners of stainless steel, chrome-plated steel, or solid brass, finished to match the items they are securing; with theft-resistant-type heads. Provide sex-type bolts for through-bolt applications. For concealed anchors, use stainless steel, hot-dip galvanized steel, or other rust-resistant, protective-coated steel.

2.5 FABRICATION

A. Overhead-Braced Compartments: Manufacturer's standard, corrosion-resistant supports, leveling method, and anchors at pilasters and walls to suit floor and wall conditions. Provide shoes at pilasters to conceal supports and leveling method.

B. Door Size and Swings: Unless otherwise indicated, provide 24-inch-wide, inswinging doors for standard toilet compartments and 36-inch-wide, outswinging doors with a minimum 32-inch-wide, clear opening for compartments designated as accessible.

PART III - EXECUTION

3.1 EXECUTION REQUIREMENTS

A. Refer to DDC General Conditions for execution requirements.

3.2 INSTALLATION

A. General: Comply with manufacturer's written installation instructions. Install units rigid, straight, level, and plumb. Secure units in position with manufacturer's recommended anchoring devices.

1. Maximum Clearances:

   a. Pilasters and Panels: 1/2 inch.
   b. Panels and Walls: 1 inch.

2. Full-Height (Continuous) Brackets: Secure panels to walls and to pilasters with full-height brackets.

   a. Locate bracket fasteners, so holes for wall anchors occur in masonry or tile joints.
   b. Align brackets at pilasters with brackets at walls.

B. Overhead-Braced Units: Secure pilasters to floor and level, plumb, and tighten. Set pilasters with anchors penetrating not less than 1-3/4 inches into structural floor unless otherwise indicated in manufacturer's written instructions. Secure continuous head rail to each pilaster with no fewer than two fasteners. Hang doors to align tops of doors with tops of panels and adjust, so tops of doors are parallel with overhead brace when doors are in closed position.

C. Curtains: Install curtains to specified length and verify that they hang vertically without stress points or diagonal folds.

3.3 ADJUSTING

A. Curtain Adjustment: After hanging curtains, test and adjust each track or rod to produce unencumbered, smooth operation. Steam and dress down curtains as required to produce crease- and wrinkle-free installation. Remove and replace curtains that are stained or soiled or that have stress points or diagonal folds.

B. Hardware Adjustment: Adjust and lubricate hardware according to hardware manufacturer's written instructions for proper operation. Set hinges on in-swinging doors to hold doors open approximately 30 degrees from closed position when unlatched. Set hinges on out-swinging doors to return doors to fully closed position.

END OF SECTION 10 21 16

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SECTION 10 26 00
Corner Guards

PART I - GENERAL

1.1 RELATED DOCUMENTS

A. The following documents apply to all required work for the Project: (1) the Contract Drawings, (2) the Specifications, (3) the General Conditions, (4) the Addendum and (5) the Contract (City of New York Standard Construction Contract).

B. LEED General Requirements:

1. Refer to DDC General Conditions

a. Section 01 33 00 "Submittal Procedures"
b. Section 01 74 19 "Construction Waste Management and Disposal"
c. Section 01 81 13.04 "Sustainable Design Requirements for LEED v4 Buildings"

1.2 SUMMARY

A. Section includes corner guards.

B. Related Sections

1. Gypsum Drywall - Section 09 29 00.

1.3 QUALITY ASSURANCE

A. Refer to DDC General Conditions Section 01 40 00 "Quality Requirements".

1.4 SUBMITTAL PROCEDURES

A. Refer to DDC General Conditions Section 01 33 00 "Submittal Procedures".

1.5 SUBMITTALS

A. Product Data: For each type of product.

B. Samples: 12" long.

PART II - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Surface Burning Characteristics: Comply with ASTM E84 or UL 723; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Flame-Spread Index: 25 or less.

2. Smoke-Developed Index: 450 or less.

2.2 CORNER GUARDS

A. Surface-Mounted, Stainless Steel Corner Guards: Fabricated as one piece with formed edges; fabricated with 90-degree turn to match wall condition, 4 feet, unless otherwise indicated.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Pawling Corp., 15 Charles Colman Blvd., Pawling, New York 12564-1188.
   b. American Floor Products Co. Inc., One AFCO Center, 7300 Westmore Road, P.O. Box 1467, Rockville, MD 20850.
   c. Model WCGT-1/8 (3-1/2 inch legs) by Wilkinson Co. Inc., 1530 Commerce Drive, Stow, Ohio 44224.
   d. K.J. Miller Corporation, 22711 County Road 14 East, Elkhart, IN 46516
   e. Or approved equal

2. Wing Size: Nominal 3/4" by 3/4 inch.

3. Thickness: Minimum 16 gauge

4. Fasteners:

   a. Stainless steel tamper resistant screws.
   b. Screw Anchors, tubula, lead coated, braided fiber.

2.3 MATERIALS

A. Stainless Steel

PART III - EXECUTION

3.1 EXECUTION REQUIREMENTS

A. Refer to DDC General Conditions for execution requirements.

3.2 INSTALLATION

A. Install corner guards according to manufacturer's written instructions, level, plumb, and true to line without distortions.

END OF SECTION 10 26 00

SECTION 10 28 13
Toilet Accessories

PART I - GENERAL

1.1 RELATED DOCUMENTS

A. The following documents apply to all required work for the Project: (1) the Contract Drawings, (2) the Specifications, (3) the General Conditions, (4) the Addendum and (5) the Contract (City of New York Standard Construction Contract).

B. LEED General Requirements:

1. Refer to DDC General Conditions

   a. Section 01 33 00 "Submittal Procedures"
   b. Section 01 81 13.04 "Sustainable Design Requirements for LEED v4 Buildings"

1.2 SUMMARY

A. Section includes toilet accessories.

B. Related Sections

1. Unit Masonry - Section 04 20 00.
2. Gypsum Drywall - Section 09 29 00.
3. Ceramic Tiling - Section 09 30 13.
4. Toilet Partitions - Section 10 21 13.

1.3 QUALITY ASSURANCE

A. Refer to DDC General Conditions Section 01 40 00 "Quality Requirements".

B. Inserts and Anchorages: Furnish inserts and anchoring devices which must be set in concrete or built into masonry.

C. Accessory Locations: Coordinate accessory locations with other work to avoid interference and to ensure proper operation and servicing of accessory units. Accessories shall be installed at heights in compliance with 2014 New York City Building Code.

D. Products: Unless otherwise noted, provide products of same manufacturer for each type of unit and for units exposed in same areas.

1.4 SUBMITTAL PROCEDURES

A. Refer to DDC General Conditions Section 01 33 00 "Submittal Procedures".

1.5 SUBMITTALS

A. Product Data: Submit manufacturer's technical data, catalog cuts and installation instructions for each toilet accessory.

B. Setting Drawings: Provide setting drawings, templates, instructions, and directions for installation of anchorage devices in other work

C. Submit schedule of accessories indicating quantity and location of each item.

PART II - PRODUCTS

2.1 MATERIALS

A. Stainless Steel: AISI Type 302/304, with polished No. 4 finish, 22 gauge minimum, unless otherwise indicated.

B. Brass: ASTM B 19 flat products; ASTM B 16, rods, shapes, forgings, and flat products with finished edges; or ASTM B 30, castings.

C. Galvanized Steel Sheet: ASTM A 653, G60.

D. Chromium Plating: Nickel and chromium electro-deposited on base metal, ASTM B 456, Type SC 2.

E. Mirrors: ASTM C 1503, mirror glazing quality, clear glass mirrors, nominal 1/4" thick.

2.2 FASTENING DEVICES

A. Exposed Fasteners: Theft-proof type, chrome plated, or stainless steel; match finishes on which they are being used.

B. Concealed Fasteners: Galvanized (ASTM A 123) or cadmium plated.

C. No exposed fastening devices permitted on exposed frames.

D. For metal stud drywall partitions, provide ten (10) gauge galvanized sheet concealed anchor plates for securing surface mounted accessories.

2.3 FABRICATION

A. General: Stamped names or labels on exposed faces of toilet accessory units are not permitted. Unobtrusive labels on surfaces not exposed to view are acceptable. Where locks are required for a particular type of toilet accessory, provide same keying throughout project. Furnish two keys for each lock.

B. Surface-Mounted Toilet Accessories, General: Fabricate units with tight seams and joints, exposed edges rolled. Hang doors or access panels with continuous stainless steel piano hinge. Provide concealed anchorage.

C. Recessed Toilet Accessories, General: Fabricate units of all welded construction, without mitered corners. Hang doors of access panels with full-length stainless steel piano hinge. Provide anchorage that is fully concealed when unit is closed.

2.4 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following
1. Bobrick Washroom Equipment Co.
2. American Specialities, Inc. (ASI)
3. Bradley Corp.
4. Or approved equal

B. Products: See Toilet Accessory Schedule.

PART III - EXECUTION

3.1 EXECUTION REQUIREMENTS

A. Refer to DDC General Conditions for execution requirements.

3.2 PREPARATION

A. Accessories that are to be partition mounted shall be closely coordinated with other trades, so that the necessary reinforcing is provided to receive the accessories.

B. Furnish templates and setting drawings and anchor plates required for the proper installation of the accessories at gypsum drywall and masonry partitions. Coordinate the work to ensure that base plates and anchoring frames are in the proper position to secure the accessories.

C. Verify by measurements taken at the job site those dimensions affecting the work. Bring field dimensions that are at variance with those on the approved shop drawings to the attention of the Commissioner. Obtain decision regarding corrective measures before the start of fabrication of items affected.

3.3 INSTALLATION

A. Install accessories at locations indicated on the drawings, using skilled mechanics, in a plumb, level and secure manner.

B. Concealed anchor assemblies for gypsum drywall partitions shall be securely anchored to metal studs to accommodate accessories. Assemblies shall consist of plates and/or angles tack welded to studs.

C. Secure accessories in place, at their designated locations by means of theft-proof concealed set screws, so as to render removing of the accessory with a screwdriver impossible.

D. Unless otherwise indicated, accessories shall conform to heights from the finished floor as shown on the drawings. Where locations are not indicated, such locations shall be as directed by the Commissioner.

E. Installed accessories shall operate quietly and smoothly for use intended. Doors and operating hardware shall function without binding or unnecessary friction. Dispenser type accessories shall be keyed alike. Prior to final acceptance, master key and one duplicate key shall be given to the Commissioner.

F. The Commissioner shall be the sole judge of workmanship. Workmanship shall be of the highest quality. Open joints, weld marks, poor connections, etc., will not be permitted. The Commissioner has the right to reject any accessory if he feels the workmanship is below the standards of this project.

G. Grab bars shall be installed so that they can support a three hundred (300) lb. load for five minutes per ASTM F 446.

END OF SECTION 10 28 13

SECTION 10 44 16
Fire Extinguisher Cabinets

PART I - GENERAL

1.1 RELATED DOCUMENTS

A. The following documents apply to all required work for the Project: (1) the Contract Drawings, (2) the Specifications, (3) the General Conditions, (4) the Addendum and (5) the Contract (City of New York Standard Construction Contract).

B. LEED General Requirements:

1. Refer to DDC General Conditions

a. Section 01 33 00 "Submittal Procedures"
b. Section 01 81 13.04 "Sustainable Design Requirements for LEED v4 Buildings"

1.2 SUMMARY

A. Section includes fire extinguisher cabinets.

B. Related Sections

1. Gypsum Drywall - Section 09 29 00.

1.3 QUALITY ASSURANCE

A. Refer to DDC General Conditions Section 01 40 00 "Quality Requirements".

1.4 SUBMITTAL PROCEDURES

A. Refer to DDC General Conditions Section 01 33 00 "Submittal Procedures".

1.5 SUBMITTALS

A. Product Data: Submit manufacturer's technical data and installation instructions for fire extinguisher cabinets. Include roughing-in dimensions, and details showing mounting methods, relationships to surrounding construction, door hardware, cabinet type and materials, trim style and door construction, style and materials. Where color selections by the Commissioner are required, include color charts showing full range of manufacturer's standard colors and designs available.

B. Samples: Submit samples, 6" square, of each required finish. Prepare samples on metal of same gauge as metal to be used in the work.

PART II - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products of one of the following:

1. Larsen's Mfg. Co.
2. J. L. Industries
3. Potter Roemer
4. Allenco
5. Or approved equal

2.2 CABINETS

A. Type and Style: Fire extinguisher cabinets shall be Type 304 stainless steel with No. 4 finish, surface mounted, semi-recessed and recessed as indicated, with plexiglass panel. Recessed units shall be sized to fit within the partition or wall depth. Provide fire rated cabinets within fire rated partitions.

PART III - EXECUTION

3.1 EXECUTION REQUIREMENTS

A. Refer to DDC General Conditions for execution requirements.

3.2 INSTALLATION

A. Install items included in this Section in locations indicated and at heights to comply with 2014 New York City Building Code.

1. Prepare recesses in walls for fire extinguisher cabinets as required by type and size of cabinet and style of trim and to comply with manufacturer's instructions.

2. Securely fasten fire extinguisher cabinets to structure, square and plumb, to comply with manufacturer's instructions.

3.3 IDENTIFICATION

A. Identify fire extinguisher cabinet with lettering spelling "FIRE EXTINGUISHER" painted on door by silk-screen process. Provide lettering on door as selected by Commissioner from manufacturer's standard letter sizes, styles, colors and layouts.

END OF SECTION 10 44 16

SECTION 10 51 13
Metal Lockers

PART I - GENERAL

1.1 RELATED DOCUMENTS

A. The following documents apply to all required work for the Project: (1) the Contract Documents, (2) the Specifications, (3) the General Conditions, (4) the Addenda, and (5) the Contract (City of New York Standard Construction Contract).

B. LEED General Requirements:

1. Refer to DDC General Conditions

a. Section 01 33 00 "Submittal Procedures"
b. Section 01 81 13.04 "Sustainable Design Requirements for LEED v4 Buildings"

1.2 SUMMARY

A. Section includes:

1. Steel wardrobe lockers.

2. Locker room benches.

3. Trim, closures, anchors and accessories.

1.3 QUALITY ASSURANCE

A. Refer to DDC General Conditions Section 01 40 00 "Quality Requirements".

B. Qualifications of Installers: For installation of lockers, use only personnel who are experienced in the skills involved and who are completely familiar with the manufacturer's recommended methods of installation.

C. Uniformity: Provide each locker as produced by a single manufacturer, including necessary mounting accessories, fittings and fastenings.

1.4 SUBMITTAL PROCEDURES

A. Refer to DDC General Conditions Section 01 33 00 "Submittal Procedures".

1.5 SUBMITTALS

A. Shop Drawings: Before any materials of this Section are delivered to the job site, submit complete shop drawings, technical data and installation instructions to the Commissioner. Shop drawing must show method of installation, fillers, trim and accessories. Include locker sequencing information.

B. Samples: Submit 6" x 6" samples of manufacturer's standard finish.

PART II - PRODUCTS

2.1 METAL LOCKERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Republic Storage Systems, LLC
   2. ASI Storage Solutions
   3. Corcraft
   4. Penco Products
   5. Or approved equal

B. Basic locker shall be 36" wide by 18" deep double door with center vertical partition to segregate wet from dry, with two doors and hat shelf. Locker shall be minimum 72" high, mounted to floor with recessed cove base.

   1. Lockers on West Side of Building: 15" wide by 18" deep by 72" high.

   2. Lockers on East Side of Building: 18" wide by 18" deep by 72" high.

C. Lockers shall be air evacuated with ventilation to rear plenum connected to through-floor exhaust.

D. The outside top of the lockers shall preclude storage on top of the lockers; provide continuous sloped tops unless otherwise indicated.

2.2 MATERIALS

A. Sheet Steel: Mild cold-rolled and leveled steel, free from buckle, scale, and surface imperfections.

2.3 FABRICATION, GENERAL

A. Construction: Fabricate lockers square, rigid, and without warp, with metal faces flat and free of dents or distortion. Make all exposed metal edges safe to touch. Weld or rivet connections; bolted connections not permitted. Grind exposed welds flush. Do not expose rivet heads on fronts of locker doors or frames.

B. Finishing: Chemically pretreat metal with degreasing and phosphatizing process. Apply baked-on enamel finish to all surfaces, exposed and concealed, except plates and non-ferrous metal.

   1. Color: See Finish Schedule. Concealed parts may be manufacturer's standard neutral color.

C. Door Frames: Frames shall be 16 gauge formed in a channel shape. Vertical members shall have additional flange to provide a continuous door strike. Cross frame members shall also be 16 gauge channel shaped, including intermediate cross frames on double and triple tier lockers.

D. Doors: Doors shall be 16 gauge, with louvers for ventilation; channel shaped on both the lock and hinge side, with angle formations across the top and bottom.

E. Body: Bottoms shall be 16 gauge. Tops, sides, backs, and shelves shall be 24 gauge. Bolt spacing shall not exceed 9" o.c.

F. Hinges: Hinges shall be full length 16 gauge continuous piano type riveted to both door and frame.

G. Handles: Handles shall be one-piece 20 gauge deep drawn stainless steel cup designed to accommodate locks.

H. Latching: Lifting trigger shall be 14 gauge steel, attached to the latching channel. The trigger shall have a padlock eye for use with 9/32" diameter padlock shackle. Doors to have latch clip engaging frame at three points on doors over 42" high and two points on all other doors. Locking device to be positive automatic type, whereby locker door may be locked when open, then closed without unlocking. A rubber silencer shall be firmly secured to the frame at each latch hook.

2.4 LOCKER ACCESSORIES

A. Equipment: Furnish each locker with hat shelf, hang rod, and not less than 2 single-prong wall hooks.

B. Number Plates: Manufacturer's standard etched, embossed, or stamped, non-ferrous metal number plates with numerals not less than 3/8" high. Number lockers in sequence as directed by Commissioner. Attach plates to each locker door, near top, centered, with at least 2 fasteners of same finish as number plate.

C. Continuous Sloping Tops: Not less than 20 ga. sheet steel, approximately 25 degree pitch, in lengths as long as practicable but not less than 4 lockers. Provide closures at ends. Finish to match lockers, unless otherwise indicated.

D. Filler Panels: Provide filler panels where required of not less than 16 ga. steel sheet, factory-fabricated and finished to match locker units.

2.5 LOCKER ROOM BENCHES

A. Manufacturer's standard units with 1-1/4" thick (minimum) hardwood top with rounded corners and edges, in sizes as shown on drawings. Overall assembly shall be 17-1/2" high. Provide steel pedestal supports not more than 6'-0" o.c., with provisions for concealed fastening to floor and securing to bench. Provide all anchorages. Apply manufacturer's standard clear lacquer-sealer coating to bench tops and baked enamel finish to pedestals.

PART III - EXECUTION

3.1 EXECUTION REQUIREMENTS

A. Refer to DDC General Conditions for execution requirements.

3.2 INSTALLATION

A. Install metal lockers at locations shown in accordance with manufacturer's instructions for plumb, level, rigid and flush installation.

B. Space fastenings 36" o.c. and apply through back-up reinforcing plates where necessary to avoid metal distortion; conceal all fasteners.

C. Install trim, sloping top units, and metal filler panels using concealed fasteners to provide flush, hairline joints against adjacent surfaces.

D. Install benches to comply with manufacturer's instructions in such a manner that they resist a 200 lb. load applied laterally to benches.

3.3 ADJUSTING

A. Adjust doors and latches to operate easily without binding. Verify that integral locking devices are operating properly.

END OF SECTION 10 51 13

SECTION 10 75 00
Flagpoles

PART I - GENERAL

1.1 RELATED DOCUMENTS

A. The following documents apply to all required work for the Project: (1) the Contract Drawings, (2) the Specifications, (3) the General Conditions, (4) the Addendum and (5) the Contract (City of New York Standard Construction Contract).

B. LEED General Requirements:

1. Refer to DDC General Conditions

a. Section 01 33 00 "Submittal Procedures"
b. Section 01 81 13.04 "Sustainable Design Requirements for LEED v4 Buildings"

1.2 SUMMARY

A. Section includes flagpoles.

B. Related Sections

1. Cast-in-Place Concrete - Section 03 30 00.

1.3 QUALITY ASSURANCE

A. Refer to DDC General Conditions Section 01 40 00 "Quality Requirements".

B. Manufacturing Standards: Provide each flagpole as a complete unit produced by a single manufacturer, including fittings, accessories, bases and anchorage devices.

C. Design Criteria: Provide flagpoles and installations constructed to withstand a 90 mph wind velocity minimum when flying flag of appropriate size. Use heavier pipe sizes if required for flagpole type and height shown.

D. Pole Construction: Construct pole and ship to site in one piece, if possible. If more that one piece is necessary, provide snug-fitting, precision joints with self-aligning, internal splicing sleeve arrangement for weather-tight, hairline field joints.

1.4 SUBMITTAL PROCEDURES

A. Refer to DDC General Conditions Section 01 33 00 "Submittal Procedures".

1.5 SUBMITTALS

A. Product Data: Submit manufacturer's technical data and installation instructions for each type of flagpole required.

B. Shop Drawings: Submit shop drawings of flagpoles and bases, showing general layout, jointing and complete anchoring and supporting systems.

C. Samples: Submit samples of each finished metal for flagpoles, and accessories as may be required.

PART II - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Aabec Pole Div., Morgan-Francis Co.
2. Acme Flagpole, Div., Lingo Inc.
3. American Flagpole, Div. of Kearney-National
4. Concord Industries, Inc.
5. Or approved equal

2.2 FLAGPOLE MATERIALS

A. Provide cone tapered aluminum flagpoles fabricated from seamless extruded tubing complying with ASTM B241, alloy 6063-T6, having a minimum wall thickness of 3/16" (0.1875"), tensile strength not less than 35,000 psi and a yield of 30,000 psi. Heat-treat and age-harden flagpoles after fabrication.

B. Flagpole units shall have internal halyard system conforming to the following:

1. 35' exposed high, 7" butt, 4" top diameter, in wall thickness of .188, ground set.

2. Finish: Class 1 finish compying with AA M32-C22-A41 (Clear Anodized)

3. Ball: 4" diameter, seamless, aluminum, 14 ga., to match pole finish.

4. Truck: Extra heavy, non-fouling, ball-bearing, revolving truck, heavy duty; finish to match pole finish.

5. Winch Assembly: For raising and lowering flag, heavy duty winch assembly shall have bronze drum and hardened steel gear. Mount winch on galvanized steel frame within flagpole. Shaft of winch shall finish flush with outside face of pole through 1" (max.) diameter hole. Provide aluminum plug for winch shaft hole; plug to screw in, to finish flush with pole and to have same finish as pole. Provide removable winch handle. Provide access door in flagpole opposite winch. Access door to finish flush with pole, have same finish as pole, have concealed stainless steel hinges and lock, have stainless steel cylinder lock flush with door, and have hairline joints between door and pole.

6. Halyard: Provide one concealed, continuous 3/16" min. diameter stainless steel aircraft type cable. Halyard shall run concealed within pole from winch to top of pole, and then exposed over sheave and extend down outside of pole for sufficient length to properly fit flag. Flag end of halyard shall have two white neoprene-covered bronze swivel snaps, spaced for flag size. At bottom of flag end of halyard, provide rubber coated weight and Teflon-coated stainless steel rope sling around pole.

7. Foundation Tube: Provide 16 ga. min. galvanized corrugated steel tube, or 12 ga. rolled steel tube, sized to suit flagpole and installation. Furnish complete with welded steel bottom base and support plate, lightning ground spike, and steel centering wedges, all welded construction. Provide loose

hardwood wedges at top for plumbing pole after erection. Galvanize steel parts after assembly, including foundation tube.

8. Cast-Metal Shoe Base: Made from aluminum with same finish and color as flagpoles for anchor-bolt mounting.

PART III - EXECUTION

3.1 EXECUTION REQUIREMENTS

A. Refer to DDC General Conditions for execution requirements.

3.2 INSTALLATION

A. Excavation: Excavate for foundation concrete to neat clean lines in undisturbed soil. Provide forms where required due to unstable soil conditions. Remove wood, loose soil, rubbish and other foreign matter from excavation, and moisten earth before replacing concrete.

B. Concrete: Provide concrete composed of Portland cement, coarse aggregate, fine aggregate and water, mixed in proportions to attain 28-day compressive strength of not less than 3000 psi. Use not less than 5 sacks of Portland cement, complying with ASTM C150, per cu. yd. of wet concrete.

1. Place concrete immediately after mixing. Perform chuting to avoid segregation of mix. Compact concrete in place by use of vibrators to consolidate.

C. Flagpole Installation: Install flagpoles plumb and in compliance with final shop drawings and manufacturer's instructions.

1. Provide positive lightning ground for each flagpole installation.

2. Paint portions of ground-set flagpole below grade with heavy coat of bituminous paint.

3. At time of erection, remove all protective wrappings.

END OF SECTION 10 75 00

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SECTION 11 11 36
Vehicle Charging Equipment

PART I - GENERAL

1.1 RELATED DOCUMENTS

A. The following documents apply to all required work for the Project: (1) the Contract Drawings, (2) the Specifications, (3) the General Conditions, (4) the Addendum and (5) the Contract (City of New York Standard Construction Contract).

1.2 SUMMARY

A. Section includes

1. Vehicle charging stations.
2. Cord and cord management kit.

1.3 QUALITY ASSURANCE

A. Refer to DDC General Conditions Section 01 40 00 "Quality Requirements".

B. Use adequate numbers of skilled workmen who are experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this Section.

1.4 SUBMITTALS

A. Refer to DDC General Conditions Section 01 33 00 "Submittal Procedures".

B. Shop Drawings: Provide shop drawings in sufficient detail to show fabrication, installation, anchorage, and interface of the work of this Section with the work of adjacent trades.

C. Product Data

1. Materials list of items proposed to be provided under this Section.
2. Manufacturer's specifications and other data needed to prove compliance with the specified requirements.
3. Manufacturer's recommended installation procedures.

PART II - PRODUCTS

2.1 MANUFACTURERS

A. Vehicle Charging Equipment: Provide units with two stations, dual pedestal mount and 18' cord and cord management system.

1. Quantity: As per Drawings

B. Basis-of-Design Product: Subject to compliance with requirements, provide ChargePoint, Inc.; CPF25-L18-CMK6-PD-Dual or comparable product by one of the following:

1. ChargePoint, Inc.
2. Clipper Creek
3. Leviton
4. Or approved equal.

PART III - EXECUTION

3.1 EXECUTION REQUIREMENTS

A. Refer to DDC General Conditions for execution requirements.

3.2 INSTALLATION

A. Coordinate as required with other trades to ensure proper and adequate provision in the work of those trades for interface with the work of this Section.

B. Install the work of this Section in strict accordance with the original design, the approved Shop Drawings, the New York City Building Code, and the manufacturer's recommended installation procedures.

END OF SECTION 11 11 36

SECTION 11 24 00
Suspended Maintenance and Fall Protection

PART I - GENERAL

1.1 RELATED DOCUMENTS

A. The following documents apply to all required work for the Project: (1) the Contract Drawings, (2) the Specifications, (3) the General Conditions, (4) the Addendum and (5) the Contract (City of New York Standard Construction Contract).

B. LEED General Requirements:

1. Refer to DDC General Conditions

   a. Section 01 33 00 "Submittal Procedures"
   b. Section 01 81 13.04 "Sustainable Design Requirements for LEED v4 Buildings"

1.2 SUMMARY

A. Section includes:

1. The supply and installation of tie-back anchors for building maintenance.

2. Tie-back anchors secured horizontally through roofing to underlying structure and vertically to exposed structural steel members.

B. Related Sections

1. Thermoplastic Membrane Roofing – Section 07 20 00.

2. Façade Sheet Metal Flashing - Section 07 62 01.

3. Roof Specialties and Accessories - Section 07 71 00

4. Exterior Joint Sealants - Section 07 92 01.

1.3 SCOPE OF WORK

A. Provide a tie-back system as shown on the drawings.

1.4 SUBMITTAL PROCEDURES

A. Refer to DDC General Conditions Section 01 33 00 "Submittal Procedures".

1.5 SUBMITTALS

A. Submit shop drawings showing complete layout and configuration of system, equipment locations and all other components and accessories. Shop drawings shall be reviewed by the Commissioner complete with calculations. The shop drawing shall include installation and rigging instruction and all necessary restrictive and non-restrictive working usage notes and general safety notes.

B. Provide a safety inspection log book for yearly inspections.

C. Clearly indicate design and fabrication details, hardware and installation details.

D. Include all necessary restrictive and non-restrictive working usage notes and general safety notes.

E. Contractor to engage a Structural Engineer licensed in the State of New York to prepare calculations and drawings. Calculations and drawings shall be signed and sealed by this Engineer.

1.6 QUALITY ASSURANCE

A. Refer to DDC General Conditions Section 01 40 00 "Quality Requirements".

1.7 STANDARDS & CODES

A. Federal OSHA standard 1910.66, subpart D (Walking and Working Surfaces)

B. Appendix C to 1910.66 Personal Fall Arrest Systems.

C. Department of Labor Memorandum to Regional Administrators for Descent control Devices, by Patricia K. Clark, directorate of Compliance Programs.

D. Comply with the requirements of the AISC publication: "Load and Resistance Factor Design Specification for Structural Steel Buildings", the AISI publication: "Specification for Design of Cold-Formed Steel Structural Members (1986 &1989 Addendum)" and the Aluminum Association's publication: "Specification for Aluminum Structures".

E. Welding shall comply with "AWS D1.1 "Structural Welding Code-Steel" and shall be performed by welders qualified to work in the state which the project is being completed.

Comply with the Aluminum Association publication No.30: "Specification for Aluminum Structures", and with AWS D1.2-90 "Structural Welding Code- Aluminum".

PART II - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Anchoring system shall be capable of resisting without fracture or pull out with a force of 5,000 lbs. applied in any direction

B. Safety anchoring eye shall be make of not less than 3/4 inch diameter material or equivalent with an eye opening not less than 1.5 inch diameter or equivalent. The anchor eye shall be made of stainless steel or other corrosion resistant material. Bolts and connecting hardware shall be made of stainless steel or hot dipped galvanized material.

C. All steel bases shall be hot dipped galvanized mild steel.

D. Deformed threads of all safety anchor studs behind nuts after nuts have been tightened.

E. Multiple cast in place anchors studs shall be made of hot dipped galvanized mild steel. Single insert

anchor stud securement bolt must be made of stainless steel.

F. Drilled concrete anchors shall only be adhesive epoxy anchors manufactured by U- pat or Hilti. Mechanical fasteners should not be used. If adhesive securement is considered 100% of the inserts are to be tested 5,000 lbs.

G. Weldment roof anchors must be attached to steel that is large enough to accept a 4 inch diameter tube complete with 100% weld. The structure or a plate must be provided to accept this anchor and must be a minimum 5 inches wide.

H. All wall anchors must be properly flashed into the surface to which they are applied.

I. All roof anchors must be properly roofed in. All stand-alone metal roof anchors must be directly flashed into the roofing in a manner compatibly with the existing roofing. Flashings for metal roof anchors are to be spun aluminum and seamless. Top of anchor to be sealed with mastic tape and heat shrink rubberized membrane. Rubber gaskets, worm gears, grommets and pitch pans must not be used.

2.2 MANUFACTURERS

A. Subject to compliance with requirements, provide products by one of the following:
   1). HighRise Systems, Inc.
   2). Pro-Bel Enterprises Limited
   3). Tractel Group
   4). Spider Engineered Systems Group, a Division of SafeWorks, LLC
   5). Or approved equal

PART III - EXECUTION

3.1 EXECUTION REQUIREMENTS

A. Refer to DDC General Conditions for execution requirements.

3.2 EXAMINATION

A. Examine job conditions before commencement of work. Commencement of work will denote acceptance of existing conditions unless the client has been notified in writing of unacceptable conditions prior to commencement.

B. Faults occurring in the work completed under this Section of the Specification due to the acceptance of incorrect conditions of existing work will be rectified at no cost to the owner.

3.3 INSTALLATION

A. Install life line anchors and davit bases and arms, according to shop drawing(s), the Specifications, the manufacturer's instructions.

B. Provide all items to be installed. Provide handling, installation instructions, anchorage information, roughing-in dimensions, templates and service requirements for completion of the work of this Section.

Assist or supervise, or both, the setting of anchorage devices when handled by others. Provide advice and assistance with respect to construction of other work related to products specified in this section.

C. Install all work true, level, tightly fitted, and flush to adjacent surfaces where required for installation.

D. Provide anchorage and mounting devices required for the installation of each product.

3.4 ADJUSTMENT AND FINAL INSPECTION

A. Verify that all work done under this section has been completed correctly and that all installed products function properly. Adjust items where necessary to ensure satisfactory operation.

B. Complete the inspection log book to certify system for use.

END OF SECTION 11 24 00

SECTION 11 91 01
Wooden Pallets

PART I - GENERAL

1.1 RELATED DOCUMENTS

A. The following documents apply to all required work for the Project: (1) the Contract Drawings, (2) the Specifications, (3) the General Conditions, (4) the Addendum and (5) the Contract (City of New York Standard Construction Contract).

B. LEED General Requirements:

1. Refer to DDC General Conditions

a. Section 01 33 00 "Submittal Procedures"
b. Section 01 74 19 "Construction Waste Management and Disposal"
c. Section 01 81 13.04 "Sustainable Design Requirements for LEED v4 Buildings"

1.2 SUMMARY

A. Section includes:

1. Furnishing and delivery of wood pallets for:

a. New Building (A1)
b. Existing Building (A2)
c. Site Parking

B. Related Sections:

1. Division 05 Metals for attachment plates and other preparations for fastening.

1.3 SUBMITTAL PROCEDURES

A. Refer to DDC General Conditions Section 01 33 00 "Submittal Procedures".

1.4 SUBMITTALS

A. Product Data: Submit manufacturer's specifications and product data for wood pallets.

B. Shop Drawings: Submit shop drawings indicating pallet class, category, type, style, species of wood, grade of engineered wood components, and fasteners used. Include dimensioned plans, elevations and large-scale details.

C. Samples: Provide one full sized sample of complete pallet assembly to verify compatibility with metal snow plow racks.

1. Obtain Resident Engineer's approval of the sample before start of Work.

2. Approved sample may become part of the complete Work.

Wood Pallet Quality Assurance Labels and Certificates: NWPCA Quality Assurance Program, Specified Pallets, Engineered for Quality labels.

1.5 QUALITY ASSURANCE

A. Refer to DDC General Conditions Section 01 40 00 "Quality Requirements".

PART II - PRODUCTS

2.1 WOODEN PALLETS:

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1). Acme Pallet Company, New York, NY
   2). Berry Industrial Group, Inc., Nyack, NY
   3). Cutler Brothers Box & Lumber Co., Fairview, NJ
   4). Delisa Pallet Corporation, Newark, NJ
   5). General Pallet LLC, Flemington, NJ
   6). McNeilly Wood Products, Inc. Campbell Hall, NY
   7). Pallets Unlimited, Inc., New Hyde Park, NY
   8). Or approved equal

B. Pallets for the storage of snow plow blades shall meet the following requirements:
   1). Class: Stringer Pallet.
   2). Category: "M" Multiple use.
   3). Type: Partial four-way entry.
   4). Style: Double Deck Face, flush, non-reversible.
   5). Load Capacity: 1800 pounds.
   6). Materials: Mixed hardwoods. No softwoods will be permitted.
   7). Dimensions: As indicated on Drawings. Top and bottom panels shall be a minimum of 3/4-inch thick plywood rated "Exposure 1." Interior depth shall be 4-inches.

PART III - EXECUTION

3.1 EXECUTION REQUIREMENTS

A. Refer to DDC General Conditions for execution requirements.

3.2 DELIVERY

A. Deliver pallets to job site at a location designated by the Resident Engineer.

B. Pallets shall be delivered no sooner than the date of Substantial Completion and no later than the completion of the final punch list.

END OF SECTION 10 75 00

SECTION 12 48 23
Entrance Floor Grids

PART I - GENERAL

1.1 RELATED DOCUMENTS

A. The following documents apply to all required work for the Project: (1) the Contract Drawings, (2) the Specifications, (3) the General Conditions, (4) the Addendum and (5) the Contract (City of New York Standard Construction Contract).

B. LEED General Requirements:

1. Refer to DDC General Conditions

a. Section 01 33 00 "Submittal Procedures"
b. Section 01 81 13.04 "Sustainable Design Requirements for LEED v4 Buildings"

1.2 SUMMARY

A. Section includes entrance floor grids.

B. Related Sections

1. Cast-in-Place Concrete - Section 03 30 00.

1.3 SUBMITTAL PROCEDURES

A. Refer to DDC General Conditions Section 01 33 00 "Submittal Procedures".

1.4 SUBMITTALS

A. Product Data: Submit manufacturer's specifications and installation instructions for entrance floor grid. Include methods of installation for each type of substrate.

B. Samples: Submit samples for each type and finish of exposed entrance floor grid, frames and accessories required. Provide 12" square samples of entrance floor grid materials and 12" lengths of frame members.

C. Shop Drawings: Submit shop drawings for all portions of the Work. Include plans, elevations, sections, and details of screen panels and accessories:

1. Show screen profiles, angles, spacing of wires, unit dimensions related to wall openings and construction, assembly length, interface dimensions for mating slots or other interfaces, materials of construction and assembly weight.

1.5 QUALITY ASSURANCE

A. Refer to DDC General Conditions Section 01 40 00 "Quality Requirements".

PART II - PRODUCTS

2.1 ENTRANCE FLOOR GRID ASSEMBLY

A. Basis of Design: Subject to compliance with requirements, provide stainless steel floor grate "Johnson 130 Vee Wire" by Johnson Screens or comparable product by one of the following:

1). "KD98" by Kadee Industries,
2). "Wedgewire 130 V" by Hendrick
3). Or approved equal

2. All screen surface wire, support bars, frame structure and associated components shall be fabricated from Type 316 stainless steel in 5/8" depth.

3. Flat screen surface wires shall be 0.13" x 0.25" electronically welded and spaced 0.13" apart. Surface wire, support beam and frame structure shall be an all-welded matrix designed to provide specified strength with minimal interference with through screen flow pattern. Support bars shall be 0.074" x 1" rod on 1" centers. When completed, screen panels should be flat within 1/4 inch when one corner is held flat. Diagonal measurements of panel should be within 3/8" of each other.

4. Slot Size: Screen slot size shall be .13" (50% open area), Slot size shall be controlled and continuously monitored during manufacture.

5. Grid Frame: SSA - Stainless Steel Angle Frame shall be Type 316 stainless steel, sized to fit recess with 1/8" exposed surface as indicated on drawings.

6. Lock Down Mechanism: Hidden Lock Down tabs shall be hidden device to secure grille to concrete substrate, made from Type 316 stainless steel.

7. Finish: See Finish Schedule.

B. Unit must withstand 500 lb. wheel loads (load applied to solid 5" x 2" wide polyurethane wheel, 1000 passes without damage).

C. Unit shall have a continuous stainless steel welded edge banding.

D. Provide stainless steel frames and aluminum drip pan as noted on drawings.

E. Accessories: Provide hidden locking devices to prevent warping and rattling. Furnish number of lock downs as recommended by manufacturer.

F. Waterproof membrane beneath entrance floor grid.

PART III - EXECUTION

3.1 EXECUTION REQUIREMENTS

A. Refer to DDC General Conditions for execution requirements.

3.2 INSTALLATION

A. Install entrance floor grid frames within recess in cementitious underlayment, to be flush with top surface of adjacent finish flooring.

B. Protection: Upon completion of frame installation, provide temporary filler of plywood or fiberboard in entrance floor grid recesses, and cover frames with plywood protective flooring.

C. Install entrance floor grid in frame and anchor with hidden lock downs.

END OF SECTION 12 48 23

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SECTION 14 24 00
Hydraulic Elevators

PART I - GENERAL

1.1 RELATED DOCUMENTS

A. The following documents apply to all required work for the Project: (1) the Contract Drawings, (2) the Specifications, (3) the General Conditions, (4) the Addendum and (5) the Contract (City of New York Standard Construction Contract).

B. LEED / Environmentally Preferable Purchase (EPP) General Requirements:

a. Refer to DDC General Conditions and the Addendum to the General Conditions
b. LEED requirements apply to all Phase II work with the exception of the Existing Building scope. EPP requirements apply to the project's Existing Building scope only.

1.2 SUMMARY

A. Section includes:

1. Machine-roomed hydraulic passenger elevators:

a. New Building (A1):
1). Duplex Passenger Elevators: Cars PE1 and PE2.
2). Single Passenger Elevator: Car PE3.

b. Existing Building (A2):
1). Single Passenger Elevator: Car PE4.

B. Related Sections

1. Division 03 Concrete for setting sleeves, inserts and anchoring devices in concrete.

2. Division 05 Metals for attachment plates, angle brackets and other preparation of structural steel for fastening to and supporting guide-rail brackets, divider beams, hoist beam, pit ladders, and structural-steel shapes for subsills.

3. Division 09 Finishes for field painting of elevator pit and shaft.

4. Division 22 Plumbing for sump pumps, sumps, and sump covers in elevator pits.

5. Division 26 Electrical for electrical service for elevators to and including fused disconnect switches at machine room door or in control space and standby power source, transfer switch, connection from auxiliary contacts in transfer switch to controller, and emergency voice/fire alarm communication systems for smoke detectors and tie-ins to elevator controllers.

6. Division 27 Communications for telephone service for elevators and two-way emergency communication service.

1.3 SUBMITTAL PROCEDURES

A. Refer to DDC General Conditions Section 01 33 00 "Submittal Procedures".

1.4 SUBMITTALS

A. Product Data: Include capacities, sizes, performances, operations, safety features, finishes, and similar information. Include product data for car enclosures; hoistway entrances; and operation, control, and signal systems.

B. Shop Drawings: Include plans, elevations, sections, and large-scale details indicating service at each landing; coordination with building structure; relationships with other construction; and locations of equipment.

1. Include large-scale layout of car-control station and standby-power operation control panel.

2. Indicate maximum dynamic and static loads imposed on building structure at points of support as well as maximum and average power demands.

C. Samples for Initial Selection: For finishes involving color selection.

D. Samples for Verification: For exposed car, hoistway door and frame, and signal equipment finishes, 3-inch-square Samples of sheet materials and 4-inch lengths of running trim members.

E. Qualification Data: For Installer.

F. Manufacturer Certificates: Signed by elevator manufacturer, certifying that hoistway and pit layout and dimensions, as shown on Drawings, and electrical service including standby-power generator if shown and specified, are adequate for elevator system being provided.

G. Sample Warranty: For special warranty.

H. Operation and Maintenance Data:

1. For elevators to include in emergency, operation, and maintenance manuals.

2. Submit manufacturer's/installer's standard operation and maintenance manual, in accordance with ASME A17.1/CSA B44.

I. Inspection and Acceptance Certificates and Operating Permits: As required by New York City Department of Buildings Elevator Inspections and Tests for normal, unrestricted elevator use.

1.5 QUALITY ASSURANCE

A. Refer to DDC General Conditions Section 01 40 00 "Quality Requirements".

1.6 DELIVERY, STORAGE, AND HANDLING:

A. Deliver, store, and handle materials, components and equipment in manufacturer's protective packaging. Store materials, components, and equipment off of ground, under cover, and in a dry location.

1.7 COORDINATION:

A. Coordinate installation of sleeves, block outs, elevator equipment with integral anchors, and other items that are embedded in concrete or masonry for elevator equipment. Furnish templates, sleeves, elevator equipment with integral anchors, and installation instructions and deliver to Project site in time for installation.

B. Coordinate locations and dimensions of other work specified in other Sections that relates to hydraulic elevators, including pit ladders; sumps and floor drains in pits; entrance subsills; electrical service; and electrical outlets, lights, and switches in hoistways and pits.

1.8 WARRANTY:

A. Manufacturer's Special Warranty: Manufacturer agrees to repair, restore, or replace elevator work that fails in materials or workmanship within specified warranty period. Failures include, but are not limited to, operation or control system failure, including excessive malfunctions; performances below specified ratings; excessive wear; unusual deterioration or aging of materials or finishes; unsafe conditions; need for excessive maintenance; abnormal noise or vibration; and similar unusual, unexpected, and unsatisfactory conditions.

B. Warranty Period

1. One year from date of Substantial Completion.

PART II - PRODUCTS

2.1 HYDRAULIC ELEVATOR MANUFACTURERS:

A. Basis-of-Design Product: Subject to compliance with requirements, provide ThyssenKrupp Elevator; Endura Twinpost Above-Ground Holeless Hydraulic Elevator or comparable product by one of the following:

1). Otis Elevator Co.
2). Schindler Elevator Corp.
3). Or approved equal

B. Source Limitations: Obtain elevators from single manufacturer. Major elevator components, including pump-and-tank units, plunger-cylinder assemblies, controllers, signal fixtures, door operators, car frames, cars, and entrances, shall be manufactured by single manufacturer.

2.2 PERFORMANCE REQUIREMENTS:

A. Regulatory Requirements: Comply with ASME A17.1/CSA B44.

B. Accessibility Requirements: Comply with Section 407 in the United States Department of Justice's "2010 ADA Standards for Accessible Design" and with ICC A117.1.

2.3 HYDRAULIC ELEVATOR SCHEDULE:

A. Duplex Elevator PE1 and PE2 (New Building)

1. Loading Class: Passenger
2. Type: Holeless, beside-the-car, telescoping, dual cylinder
3. Application: Machine-room-less.
4. Speed: Not less than 100 fpm but up to 150 fpm
5. Capacity: 3,500 lbs
6. Stops / Openings: 2 stops / 2 openings.
7. Landings: 2 front.
8. Operation System: Duplex automatic operation.
9. Auxiliary Operation:
    a. Independent Service.
    b. Maintenance Service.
    c. Inspection Service.
    d. Firefighter's Emergency Service.
    e. Emergency Power.
    f. Standby-power operation.
    g. Standby-power lowering.
    h. Automatic dispatching of loaded car.
    i. Nuisance call cancel.
    j. Automatic operation of lights and ventilation fans.
10. Car Enclosures:
    a. Inside Clear: 6'-8" width by 5'-5" depth.
    b. Inside Height: Not less than 7'-4" to underside of ceiling.
    c. Ambulatory Accessible Compliant: Required.
    d. Front Walls (Return Panels): Satin stainless steel, No. 4 finish with integral car door frames.
    e. Car Fixtures: Satin stainless steel, No. 4 finish.
    f. Side and Rear Wall Panels: Satin stainless steel, No. 4 finish.
    g. Reveals: Satin stainless steel, No. 4 finish.
    h. Door Faces (Interior): Satin stainless steel, No. 4 finish.
    i. Door Sills: Nickel silver.
    j. Ceiling: Satin stainless steel, No. 4 finish.
    k. Handrails: 1/4 by 2 inches, rectangular stain stainless steel, No. 4 finish, at rear of car.
    l. Floor: Prepared to receive resilient tile flooring specified in Section 096500 – Resilient Tile Flooring. See Finish Schedule and Drawings.
11. Hoistway / Entrances:
    a. Entrance Size: 3'-6" wide x 7'-0" high, verify.
    b. Door Operation: Single-speed side sliding.

c. Frames: Satin stainless steel, No. 4 finish.
d. Doors: Satin stainless steel, No. 4 finish.
e. Sills: Nickel silver.
f. Hall Fixtures: Satin stainless steel, No. 4 finish.

12. Additional Requirements:

a. Provide inspection certificate in each car, mounted under acrylic cover with frame made from stainless steel, No. 4 finish.
b. Provide hooks for protective pads in all cars and two complete sets of full-height protective pads.
c. Remote machine room for each elevator, see Drawings.

B. Elevator PE3 (New Building):

1. Loading Class: Passenger.

2. Type: Holeless, beside-the-car, telescoping, dual cylinder.

3. Application: Machine-room-less.

4. Speed: Not less than 100 fpm but up to 150 fpm.

5. Capacity: 3,500 lbs.

6. Stops / Openings: 3 stops / 3 openings.

7. Landings: 3 front.

8. Operation System: Single automatic operation.

9. Auxiliary Operation:

a. Independent Service.
b. Maintenance Service.
c. Inspection Service.
d. Firefighter's Emergency Service.
e. Emergency Power.
f. Standby-power operation.
g. Standby-power lowering.
h. Automatic dispatching of loaded car.
i. Nuisance call cancel.
j. Automatic operation of lights and ventilation fans.

C. Elevator PE4 (Existing Building):

1. Loading Class: Passenger.

2. Type: Holeless, beside-the-car, telescoping, dual cylinder.

3. Application: Machine-room-less.

4. Speed: Not less than 100 fpm but up to 150 fpm.

5. Capacity: 3,500 lbs.

6. Stops / Openings: 3 stops / 3 openings.

7. Landings: 2 front, 1 rear.

8. Operation System: Single automatic operation.

9. Auxiliary Operation:

    a. Independent Service.
    b. Maintenance Service.
    c. Inspection Service.
    d. Firefighter's Emergency Service.
    e. Emergency Power.
    f. Standby-power operation.
    g. Standby-power lowering.
    h. Automatic dispatching of loaded car.
    i. Nuisance call cancel.
    j. Automatic operation of lights and ventilation fans.

10. Car Enclosures:

    a. Inside Clear: 6'-8" width by 5'-5" depth.
    b. Inside Height: Not less than 7'-4" to underside of ceiling.
    c. Ambulatory Accessible Compliant: Not Required.
    d. Front Walls (Return Panels): Satin stainless steel, No. 4 finish with integral car door frames.
    e. Car Fixtures: Satin stainless steel, No. 4 finish.
    f. Side and Rear Wall Panels: Satin stainless steel, No. 4 finish.
    g. Reveals: Satin stainless steel, No. 4 finish.
    h. Door Faces (Interior): Satin stainless steel, No. 4 finish.
    i. Door Sills: Nickel silver.
    j. Ceiling: Satin stainless steel, No. 4 finish.
    k. Handrails: 1/4 by 2 inches, rectangular stain stainless steel, No. 4 finish, on sides and rear of car.
    l. Floor: Prepared to receive resilient tile flooring specified in Section 096500 – Resilient Tile Flooring. See Finish Schedule and Drawings.

11. Hoistway / Entrances:

    a. Entrance Size: 3'-6" wide x 7'-0" high, verify.
    b. Door Operation: Single-speed side sliding.
    c. Frames: Satin stainless steel, No. 4 finish.
    d. Doors: Satin stainless steel, No. 4 finish.
    e. Sills: Nickel silver.
    f. Hall Fixtures: Satin stainless steel, No. 4 finish.

12. Additional Requirements:

a. Provide inspection certificate in each car, mounted under acrylic cover with frame made from stainless steel, No. 4 finish.
b. Provide hooks for protective pads in all cars and two complete sets of full-height protective pads.
c. Adjacent machine room, see Drawings.

D. Source Limitations: Obtain elevators from single manufacturer. Major elevator components, including pump-and-tank units, plunger-cylinder assemblies, controllers, signal fixtures, door operators, car frames, cars, and entrances, shall be manufactured by single manufacturer.

2.4 SYSTEM AND COMPONENTS:

A. Pump Units: Positive-displacement type with a maximum of 10 percent variation between no load and full load and with minimum pulsations.

1. Pump shall be submersible type with submersible squirrel-cage induction motor, and shall be suspended inside oil tank from vibration isolation mounts.

2. Motor shall have wye-delta or solid-state starting.

B. Hydraulic Silencers: System shall have hydraulic silencer containing pulsation-absorbing material in blowout-proof housing at pump unit.

C. Piping: Size, type, and weight of piping as recommended by elevator manufacturer, with flexible connectors to minimize sound and vibration transmissions from power unit.

D. Hydraulic Fluid: Elevator manufacturer's standard fire-resistant fluid with additives as needed to prevent oxidation of fluid, corrosion of cylinder and other components, and other adverse effects.

E. Inserts: Furnish required concrete and masonry inserts and similar anchorage devices for installing guide rails, machinery, and other components of elevator work. Device installation is specified in another Section.

F. Guides: Polymer-coated, nonlubricated sliding guides or sliding guides with guide-rail lubricators. Provide guides at top and bottom of car frame.

2.5 OPERATION SYSTEMS:

A. General: Provide manufacturer's standard microprocessor operation system as required to provide type of operation indicated.

B. Auxiliary Operations:

1. Single-Car Standby-Power Operation: On activation of standby power, car is returned to a designated floor and parked with doors open. Car can be manually put in service on standby power, either for return operation or for regular operation, by switches in control panel located at main lobby. Manual operation causes automatic operation to cease.

2. Automatic Operation of Lights and Fan: When elevator is stopped and unoccupied with doors closed, lighting, ventilation fan, and cab displays are de-energized after 5 minutes and are re-energized before car doors open.

C. Security Features: Security features shall not affect emergency firefighters' service.

D. Keyswitch Operation: Push buttons are activated and deactivated by security keyswitches at car-control stations. Key is removable in either position.

1. Duplex Elevators PE1 and PE2 (New Building): None.

2. Elevator PE3 (New Building): Roof access is denied except by keyswitch operation.

3. Elevator PE4 (Existing Building): None.

2.6 DOOR-REOPENING DEVICES:

A. Infrared Array: Provide door-reopening device with uniform array of 36 or more microprocessor-controlled, infrared light beams projecting across car entrance. Interruption of one or more light beams shall cause doors to stop and reopen.

2.7 CAR ENCLOSURES:

A. General: Provide steel-framed car enclosures with nonremovable wall panels, with car roof, access doors, power door operators, and ventilation.

1. Provide standard railings complying with ASME A17.1/CSA B44 on car tops where required by ASME A17.1/CSA B44.

B. Materials and Finishes: Manufacturer's standards, but not less than the following:

1. Subfloor: Exterior, underlayment-grade plywood, not less than 5/8-inch nominal thickness.

2. Wall Panels: Flush, formed-metal construction; fabricated from stainless-steel sheet.

3. Fabricate car with recesses and cutouts for signal equipment.

4. Fabricate car door frame integrally with front wall of car.

5. Stainless-Steel Doors: Flush, hollow-metal construction; fabricated from stainless-steel sheet.

6. Sills: Extruded or machined metal, with grooved surface, 1/4 inch thick.

7. Metal Ceiling: Flush panels, with six low-voltage LED downlights in each panel.

8. Light Fixture Efficiency: Not less than 35 lumens/W.

9. Ventilation Fan Efficiency: Not less than 3.0 cfm/W.

2.8 HOISTWAY ENTRANCES:

A. Hoistway Entrance Assemblies: Manufacturer's standard horizontal-sliding, door-and-frame hoistway entrances complete with track systems, hardware, sills, and accessories. Frame size and profile shall accommodate hoistway wall.

B. Fire-Rated Hoistway Entrance Assemblies: Door-and-frame assemblies shall comply with NFPA 80 and be listed and labeled by a testing and inspecting agency acceptable to New York City Department of Buildings Elevator Inspections and Tests based on testing at as close-to-neutral pressure as possible according to NFPA 252 or UL 10B.

1. Fire-Protection Rating: 1-1/2 hours.

C. Materials and Fabrication: Manufacturer's standards, but not less than the following:

1. Steel Subframes: Formed from cold- or hot-rolled steel sheet, with factory-applied enamel or powder-coat finish or rust-resistant primer. Fabricate to receive applied finishes indicated.

2. Stainless-Steel Frames: Formed from stainless-steel sheet.

3. Stainless-Steel Doors: Flush, hollow-metal construction; fabricated from stainless-steel sheet.

4. Sills: Extruded or machined metal, with grooved surface, 1/4 inch thick.

2.9 SIGNAL EQUIPMENT

A. General: Provide hall-call and car-call buttons that light when activated and remain lit until call has been fulfilled. Provide buttons and lighted elements illuminated with LEDs.

B. Car-Control Stations: Provide manufacturer's standard car-control stations. Mount in return panel adjacent to car door unless otherwise indicated. Mark buttons and switches for required use or function. Use both tactile symbols and Braille.

1. Provide "No Smoking" sign matching car-control station, either integral with car-control station or mounted adjacent to it, with text and graphics as required by New York City Department of Buildings Elevator Inspections and Tests.

C. Emergency Communication System: Two-way voice communication system, with visible signal, which dials preprogrammed number of monitoring station and does not require handset use. System is contained in flush-mounted cabinet, with identification, instructions for use, and battery backup power supply.

1. Firefighters' Two-Way Telephone Communication Service: Provide telephone jack in each car and required conductors in traveling cable for firefighters' two-way telephone communication service.

D. Car Position Indicator: Provide illuminated, digital-type car position indicator, located above car door. Also, provide audible signal to indicate to passengers that car is either stopping at or passing each of the floors served. Include travel direction arrows if not provided in car-control station.

E. Hall Push-Button Stations: Provide one hall push-button station at each landing.

1. Provide units with flat faceplate for mounting with body of unit recessed in wall.

2. Equip units with buttons for calling elevator and for indicating applicable direction of travel.

F. Hall Lanterns: Units with illuminated arrows; however, provide single arrow at terminal landings. Provide the following:

1. Manufacturer's standard wall-mounted units, for mounting above entrance frames.

    a. Units mounted in both car door jambs.

G. Hall Annunciator: With each hall lantern, provide audible signals indicating car arrival and direction of travel. Signals sound once for up and twice for down.

1. At manufacturer's option, audible signals may be placed on cars.

H. Hall Position Indicators: Provide illuminated, digital-display-type position indicators, located above each hoistway entrance at ground floor.

I. Standby-Power Elevator Selector Switches: Provide switches, as required by ASME A17.1/CSA B44, where indicated. Adjacent to switches, provide illuminated signal that indicates when normal power supply has failed.

J. Emergency Pictorial Signs: Fabricate from materials matching hall push-button stations, with text and graphics as required by New York City Department of Buildings Elevator Inspections and Tests, indicating that in case of fire, elevators are out of service and exits should be used instead. Provide one sign at each hall push-button station unless otherwise indicated.

PART III - EXECUTION

3.1 EXECUTION REQUIREMENTS

A. Refer to DDC General Conditions for execution requirements.

3.2 EXAMINATION

A. Examine elevator areas, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work. Verify critical dimensions and examine supporting structure and other conditions under which elevator work is to be installed:

1. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.

2. Proceed with installation only after unsatisfactory conditions have been corrected.

3.3 INSTALLATION

A. Install cylinder plumb and accurately centered for elevator car position and travel. Anchor securely in place, supported at pit floor and braced at intervals as needed to maintain alignment. Anchor cylinder guides at spacing needed to maintain alignment and avoid overstressing guides.

B. Welded Construction: Provide welded connections for installing elevator work where bolted connections are not required for subsequent removal or for normal operation, adjustment, inspection, maintenance, and replacement of worn parts. Comply with AWS workmanship and welding operator qualification standards.

C. Sound Isolation: Mount rotating and vibrating equipment on vibration-isolating mounts to minimize vibration transmission to structure and structure-borne noise due to elevator system.

D. Lubricate operating parts of systems as recommended by manufacturer.

E. Alignment: Coordinate installation of hoistway entrances with installation of elevator guide rails for accurate alignment of entrances with car. Where possible, delay installation of sills and frames until car is operable in shaft. Reduce clearances to minimum, safe, workable dimension at each landing.

F. Leveling Tolerance: 1/4 inch, up or down, regardless of load and travel direction.

G. Set sills flush with finished floor surface at landing. Fill space under sill solidly with nonshrink, nonmetallic grout.

H. Locate hall signal equipment for elevators as indicated on Drawings.

3.4 FIELD QUALITY CONTROL

A. Acceptance Testing: On completion of elevator installation and before permitting elevator use (either temporary or permanent), perform acceptance tests as required and recommended by ASME A17.1/CSA B44 and by New York City Department of Buildings Elevator Inspections and Tests.

B. Advise the Commissioner in advance of dates and times that tests are to be performed on elevators

3.5 PROTECTION

A. Temporary Use: Limit temporary use for construction purposes to one elevator. Comply with the following requirements for elevator used for construction purposes:

1. Provide car with temporary enclosure, either within finished car or in place of finished car, to protect finishes from damage.

2. Provide strippable protective film on entrance and car doors and frames.

3. Provide padded wood bumpers on entrance door frames covering jambs and frame faces.

4. Provide other protective coverings, barriers, devices, signs, and procedures as needed to protect elevator and elevator equipment.

5. Do not load elevators beyond their rated weight capacity.

6. Provide full maintenance service during construction. Include preventive maintenance, repair or replacement of worn or defective components, lubrication, cleanup, and adjustment as necessary for proper elevator operation at rated speed and capacity. Provide parts and supplies same as those used in the manufacture and installation of original equipment.

7. Restore damaged work, if any, so no evidence remains of correction. Return items that cannot be refinished in the field to the shop, make required repairs and refinish entire unit, or provide new units as required

3.6 DEMONSTRATION:

A. Engage a factory-authorized service representative to instruct the City of New York's maintenance personnel to operate, adjust, and maintain elevators.

B. Check operation of each elevator with the City of New York's personnel present before date of Substantial Completion and again not more than one month before end of warranty period. Determine that operation systems and devices are functioning properly.

3.7 GUARANTEE SERVICE:

A. Initial Guarantee Service: Beginning at Substantial Completion, maintenance service shall include 12 months' full maintenance by skilled employees of elevator Installer. Include monthly preventive maintenance, repair or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper elevator operation. Parts and supplies shall be manufacturer's authorized replacement parts and supplies.

B. Perform maintenance during normal working hours.

1. Include 24-hour-per-day, 7-day-per-week emergency callback service with response time of two hours or less.

END OF SECTION 14 24 00

SECTION 14 60 50
Single Girder Crane

PART I - GENERAL

1.1 RELATED DOCUMENTS

A. The following documents apply to all required work for the Project: (1) the Contract Drawings, (2) the Specifications, (3) the General Conditions, (4) the Addendum and (5) the Contract (City of New York Standard Construction Contract).

B. LEED General Requirements:

1. Refer to DDC General Conditions

   a. Section 01 33 00 "Submittal Procedures"
   b. Section 01 74 19 "Construction Waste Management and Disposal"
   c. Section 01 81 13.04 "Sustainable Design Requirements for LEED v4 Buildings"
   d. Section 01 81 13.13 "Volatile Organic Compound Limits for Adhesives, Sealants, Paints and Coatings for LEED Buildings"
   e. Section 01 81 19 "Indoor Air Quality Requirements for LEED Buildings"

1.2 SUMMARY

A. Work Included: The Work of this Section shall include but not be limited to the following:

1. Motorized overhead under running single girder crane.

B. Related Sections

1. Structural Steel - Section 05 12 00.
2. Steel Joist Framing - Section 05 21 00.
3. Miscellaneous Metals – Section 05 50 00
4. HVAC – Division 23
5. Electrical – Division 26

1.3 QUALITY ASSURANCE

A. Refer to DDC General Conditions Section 01 40 00 "Quality Requirements".

1.4 SUBMITTAL PROCEDURES

A. Refer to DDC General Conditions Section 01 33 00 "Submittal Procedures".

1.5 SUBMITTALS

A. Manufacturer's data for the following:

1. Overhead crane assembly including data on, motors, trolley, main hoist, runway and electrical requirements.

B. Shop drawings for overhead crane showing plan layout, elevations, cross-sections, service run-spaces, location and type of motors and service fittings, together with indication of associated service supply connections required.

1. Include details and location of anchorages and fitting to runway beams.

2. Include layout of units with relation to surrounding walls, doors, windows, lighting and air-conditioning fixtures, ductwork and junction boxes.

3. Coordinate shop drawings with other trades whose work affects and is in the vicinity of overhead crane.

4. Provide roughing-in drawings for mechanical and electrical services.

1.6 PRODUCT HANDLING

A. Coordinate delivery of overhead crane with installation of structural runway beams.

PART II – PRODUCTS

2.1 MOTORIZED OVERHEAD CRANE

A. Selected Manufacturer/Product: Provide Overhead Under Running Crane with factory painted finish.

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. American Crane and Equipment Corporation
2. Deshazo
3. G.W. Becker
4. Or approved equal

C. Performance Requirements

1. Capacity: 3 tons, unless otherwise indicated.

2. Crane Span: 60'-0", approximately.

3. Longitudinal Travel of Crane: 220'-0", approximately

4. Girder Type: Standard wide flange structural shapes, to include I-beams.

5. Cross Conducter Type: Flat cable festoon.

6. End Truck Type: Steel Channel type construction for underhung design. Equipped with rail sweeps to allow for decelerating/stopping of the crane assembly and single-flanged wheels and axles.

7. Type of Drive: Dual, Geared motor

8. Motors: Two, AC squirrel cage motor, continuous duty, Class f insulation.

9. Brakes: DC disc type.

10. Controls: Heavy duty electrical components housed within a control panel meeting requirements of NEMA 12.

11. Options: Provide optional design features selected by the Commissioner from submitted manufacturer's data to include, but not be limited to warning light and horn.

PART III - EXECUTION

3.1 EXECUTION REQUIREMENTS

A. Refer to DDC General Conditions for execution requirements.

3.2 INSTALLATION

A. General: Install specialty equipment plumb, level, aligned, rigid, and securely anchored to building, in proper location, in accordance with manufacturer's instructions and approved shop (layout) drawings.

B. Coordinate sequence of work with mechanical and electrical trades.

3.3 FIELD QUALITY CONTROL

A. Field Test: Field test each unit after completion of installation to verify proper operation and structural capability of overhead single girder crane. Perform load test in compliance with OSHA 1910.179 Section (K) testing (2) Rated Load Test.

3.4 ADJUST AND CLEAN

A. Moving Parts: Carefully check and adjust moving parts to ensure smooth and accurate operation.

B. Clean exposed components of girder crane to be free from dirt, dust grime and other visible surface imperfections.

C. Damaged Work: Repair any item of component of the crane assembly to be of equal quality to new undamaged work, or replace with new units, as deemed acceptable to the Commissioner.

END OF SECTION 14 60 50

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SECTION 210500
Common Work Results for Fire Suppression

PART 1 - GENERAL

1.1. RELATED DOCUMENTS

A. The following documents apply to all required work for the Project: (1) the Contract Drawings, (2) the Specifications, (3) the General Conditions, (4) the Addendum and (5) the Contract (City of New York Standard Construction Contract).

B. LEED General Requirements:

1. Refer to DDC General Conditions

a. Section 01 33 00 "Submittal Procedures."

1.2. SUMMARY

A. This Section includes the following:

1. Piping materials and installation instructions common to most piping systems.
2. Mechanical sleeve seals.
3. Sleeves.
4. Escutcheons.
5. Grout.
6. Fire-suppression equipment and piping demolition.
7. Equipment installation requirements common to equipment sections.
8. Painting and finishing.
9. Concrete bases.
10. Supports and anchorages.

B. Related Sections:

1. Section 033000 "Cast in-Place Concrete" for concrete work coordination and concrete base.
2. Section 051200 "Structure Steel" for erection of metal supports and anchorages.
3. Section 053100 "Metal Decking" for erection of metal supports and anchorages.
4. Section 078413 "Firestops and Smokeseals" for firestop materials.
5. Section 076201 "Sheet Metal Flashing" for flashing.
6. Section 079200 "Interior Joint Sealants" for materials and installation.
7. Section 083113 "Access Doors" for Access panels and doors specifications.

1.3. DEFINITIONS

A. Finished Spaces: Spaces other than mechanical and electrical equipment rooms, furred spaces, pipe chases, unheated spaces immediately below roof, spaces above ceilings, unexcavated spaces, crawlspaces, and tunnels.

B. Exposed, Interior Installations: Exposed to view indoors. Examples include finished occupied spaces and mechanical equipment rooms.

C. Exposed, Exterior Installations: Exposed to view outdoors or subject to outdoor ambient temperatures and weather conditions. Examples include rooftop locations.

D. Concealed, Interior Installations: Concealed from view and protected from physical contact by building occupants. Examples include above ceilings and in chases.

E. Concealed, Exterior Installations: Concealed from view and protected from weather conditions and physical contact by building occupants but subject to outdoor ambient temperatures. Examples include installations within unheated shelters.

F. The following are industry abbreviations for plastic materials:

1. CPVC: Chlorinated polyvinyl chloride plastic.

G. The following are industry abbreviations for rubber materials:

1. EPDM: Ethylene-propylene-diene terpolymer rubber.

2. NBR: Acrylonitrile-butadiene rubber.

1.4. SUBMITTALS

A. Refer to DDC General Conditions Section 01 33 00 "Submittal Procedures."

B. Product Data: For the following:

1. Mechanical sleeve seals.

2. Escutcheons.

C. Welding certificates.

1.5. QUALITY ASSURANCE

A. Refer to DDC General Conditions Section 01 40 00 "Quality Requirements."

B. Steel Support Welding: Qualify processes and operators according to AWS D1.1, "Structural Welding Code--Steel."

C. Steel Pipe Welding: Qualify processes and operators according to ASME Boiler and Pressure Vessel Code: Section IX, "Welding and Brazing Qualifications."

1. Comply with provisions in ASME B31 Series, "Code for Pressure Piping."

2. Certify that each welder has passed AWS qualification tests for welding processes involved and that certification is current.

D. Electrical Characteristics for Fire-Suppression Equipment: Equipment of higher electrical characteristics may be furnished provided such proposed equipment is approved in writing and connecting electrical services, circuit breakers, and conduit sizes are appropriately modified. If minimum energy ratings or efficiencies are specified, equipment shall comply with requirements.

1.6. DELIVERY, STORAGE, AND HANDLING

A. Deliver pipes and tubes with factory-applied end caps. Maintain end caps through shipping, storage, and handling to prevent pipe end damage and to prevent entrance of dirt, debris, and moisture.

B. Store plastic pipes protected from direct sunlight. Support to prevent sagging and bending.

1.7. COORDINATION

A. Arrange for pipe spaces, chases, slots, and openings in building structure during progress of construction, to allow for fire-suppression installations.

B. Coordinate installation of required supporting devices and set sleeves in poured-in-place concrete and other structural components as they are constructed.

C. Coordinate requirements for access panels and doors for fire-suppression items requiring access that are concealed behind finished surfaces.

PART 2 - PRODUCTS

2.1. PIPE, TUBE, AND FITTINGS

A. Refer to individual piping sections for pipe, tube, and fitting materials and joining methods.

B. Pipe Threads: ASME B1.20.1 for factory-threaded pipe and pipe fittings.

2.2. JOINING MATERIALS

A. Pipe-Flange Gasket Materials: Suitable for chemical and thermal conditions of piping system contents.

1. ASME B16.21, nonmetallic, flat, asbestos-free, 1/8-inch maximum thickness unless thickness or specific material is indicated.

   a. Full-Face Type: For flat-face, Class 125, cast-iron and cast-bronze flanges.

   b. Narrow-Face Type: For raised-face, Class 250, cast-iron and steel flanges.

2. AWWA C110, rubber, flat face, 1/8 inch thick, unless otherwise indicated; and full-face or ring type, unless otherwise indicated.

B. Flange Bolts and Nuts: ASME B18.2.1, carbon steel, unless otherwise indicated.

C. Plastic, Pipe-Flange Gasket, Bolts, and Nuts: Type and material recommended by piping system manufacturer, unless otherwise indicated.

D. Solder Filler Metals: ASTM B 32, lead-free alloys. Include water-flushable flux according to ASTM B 813.

E. Brazing Filler Metals: AWS A5.8, BCuP Series, copper-phosphorus alloys for general-duty brazing, unless otherwise indicated; and AWS A5.8, BAg1, silver alloy for refrigerant piping, unless otherwise indicated.

F. Welding Filler Metals: Comply with AWS D10.12 for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.

2.3. MECHANICAL SLEEVE SEALS

A. Units in this Article are usually furnished with EPDM sealing elements, plastic pressure plates, and carbon-steel bolts. NBR and silicone sealing elements, carbon- and stainless-steel pressure plates, and stainless-steel bolts are available for special applications.

B. Description: Modular sealing element unit, designed for field assembly, to fill annular space between pipe and sleeve.

1. Manufacturers:

   a. Advance Products & Systems, Inc.

   b. Calpico, Inc.

   c. Metraflex Co.

   d. Pipeline Seal and Insulator, Inc.

   e. Or Approved Equal

2. Sealing Elements: EPDM interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.

3. Pressure Plates: Carbon steel. Include two for each sealing element.

4. Connecting Bolts and Nuts: Carbon steel with corrosion-resistant coating of length required to secure pressure plates to sealing elements. Include one for each sealing element.

2.4. SLEEVES

A. Galvanized-Steel Sheet: 0.0239-inch minimum thickness; round tube closed with welded longitudinal joint.

B. Steel Pipe: ASTM A 53, Type E, Grade B, Schedule 40, galvanized, plain ends.

C. Sleeve in paragraph below is available with many end variations.

D. Cast Iron: Cast or fabricated "wall pipe" equivalent to ductile-iron pressure pipe, with plain ends and integral water stop, unless otherwise indicated.

E. Stack Sleeve Fittings: Manufactured, cast-iron sleeve with integral clamping flange. Include clamping ring and bolts and nuts for membrane flashing.

1. Underdeck Clamp: Clamping ring with set screws.

2. Sleeve is without seepage holes

2.5. ESCUTCHEONS

A. Description: Manufactured wall and ceiling escutcheons and floor plates, with an ID to closely fit around pipe, tube, and insulation of insulated piping and an OD that completely covers opening.

B. One-Piece, Deep-Pattern Type: Deep-drawn, box-shaped brass with polished chrome-plated finish.

C. One-Piece, Cast-Brass Type: With set screw.

1. Finish: Polished chrome-plated.

D. Split-Casting, Cast-Brass Type: With concealed hinge and set screw.

1. Finish: Polished chrome-plated.

E. One-Piece, Stamped-Steel Type: With set screw and chrome-plated finish.

F. Split-Plate, Stamped-Steel Type: With concealed hinge, set screw or spring clips, and chrome-plated finish.

G. One-Piece, Floor-Plate Type: Cast-iron floor plate.

H. Split-Casting, Floor-Plate Type: Cast brass with concealed hinge and set screw.

2.6. GROUT

A. Description: ASTM C 1107, Grade B, non-shrink and nonmetallic, dry hydraulic-cement grout.

1. Characteristics: Post-hardening, volume-adjusting, non-staining, noncorrosive, nongaseous, and recommended for interior and exterior applications.

2. Design Mix: 5000-psi, 28-day compressive strength.

3. Packaging: Premixed and factory packaged.

PART 3 - EXECUTION

3.1. EXECUTION REQUIREMENTS

A. Refer to DDC General Conditions for execution requirements.

3.2. PIPING SYSTEMS - COMMON REQUIREMENTS

A. Install piping according to the following requirements and sections specifying piping systems.

B. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on Coordination Drawings.

C. Install piping in concealed locations, unless otherwise indicated and except in equipment rooms and service areas.

D. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

E. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.

F. Install piping to permit valve servicing.

G. Install piping at indicated slopes.

H. Install piping free of sags and bends.

I. Install fittings for changes in direction and branch connections.

J. Install piping to allow application of insulation.

K. Select system components with pressure rating equal to or greater than system operating pressure.

L. Install escutcheons for penetrations of walls, ceilings, and floors according to the following:

1. New Piping:
    a. Piping with Fitting or Sleeve Protruding from Wall: One-piece, deep-pattern type.
    b. Chrome-Plated Piping: One-piece, cast-brass type with polished chrome-plated finish.
    c. Insulated Piping: One-piece, stamped-steel type with spring clips.
    d. Bare Piping at Wall and Floor Penetrations in Finished Spaces: One-piece, cast-brass type with polished chrome-plated finish.
    e. Bare Piping at Wall and Floor Penetrations in Finished Spaces: One-piece, stamped-steel type.
    f. Bare Piping at Ceiling Penetrations in Finished Spaces: One-piece, cast-brass type with polished chrome-plated finish.
    g. Bare Piping in Unfinished Service Spaces: One-piece, cast-brass type with polished chrome-plated finish.

h. Bare Piping in Equipment Rooms: One-piece, cast-brass type.
i. Bare Piping at Floor Penetrations in Equipment Rooms: One-piece, floor-plate type.

M. Sleeves are not required for core-drilled holes.

N. Permanent sleeves are not required for holes formed by removable PE sleeves.

O. Install sleeves for pipes passing through concrete and masonry walls and concrete floor and roof slabs.

P. Install sleeves for pipes passing through concrete and masonry walls, gypsum-board partitions, and concrete floor and roof slabs.

1. Cut sleeves to length for mounting flush with both surfaces.

a. Exception: Extend sleeves installed in floors of mechanical equipment areas or other wet areas 2 inches above finished floor level. Extend cast-iron sleeve fittings below floor slab as required to secure clamping ring if ring is specified.

2. Install sleeves in new walls and slabs as new walls and slabs are constructed.

3. Install sleeves that are large enough to provide 1/4-inch annular clear space between sleeve and pipe or pipe insulation. Use the following sleeve materials:

a. Steel Pipe Sleeves: For pipes smaller than NPS 6.

b. Steel Sheet Sleeves: For pipes NPS 6 and larger, penetrating gypsum-board partitions.

c. Stack Sleeve Fittings: For pipes penetrating floors with membrane waterproofing. Secure flashing between clamping flanges. Install section of cast-iron soil pipe to extend sleeve to 2 inches above finished floor level. Refer to Section 076200 "Sheet Metal Flashing" for flashing.

1) Seal space outside of sleeve fittings with grout.

4. Except for underground wall penetrations, seal annular space between sleeve and pipe or pipe insulation, using joint sealants appropriate for size, depth, and location of joint. Refer to 079200 Section "Interior Joint Sealants" for materials and installation.

Q. Aboveground, Exterior-Wall Pipe Penetrations: Seal penetrations using sleeves and mechanical sleeve seals. Select sleeve size to allow for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.

1. Install steel pipe for sleeves smaller than 6 inches in diameter.

2. Install cast-iron "wall pipes" for sleeves 6 inches and larger in diameter.

3. Mechanical Sleeve Seal Installation: Select type and number of sealing elements required for pipe material and size. Position pipe in center of sleeve. Assemble mechanical sleeve seals and install in annular space between pipe and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

R. Underground, Exterior-Wall Pipe Penetrations: Install cast-iron "wall pipes" for sleeves. Seal pipe penetrations using mechanical sleeve seals. Select sleeve size to allow for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.

1. Mechanical Sleeve Seal Installation: Select type and number of sealing elements required for pipe material and size. Position pipe in center of sleeve. Assemble mechanical sleeve seals and install in annular space between pipe and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

S. Fire-Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with firestop materials. Refer to 078413 Section "Firestops and Smokeseals."

T. Verify final equipment locations for roughing-in.

3.3. PIPING JOINT CONSTRUCTION

A. Join pipe and fittings according to the following requirements and sections specifying piping systems.

B. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.

C. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.

D. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:

1. Apply appropriate tape or thread compound to external pipe threads unless dry seal threading is specified.

2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.

3. Welded Joints: Construct joints according to AWS D10.12, using qualified processes and welding operators according to Part 1 "Quality Assurance" Article.

4. Flanged Joints: Select appropriate gasket material, size, type, and thickness for service application. Install gasket concentrically positioned. Use suitable lubricants on bolt threads.

3.4. PAINTING

A. Damage and Touchup: Restore marred and damaged factory-painted finishes with materials and procedures to match original factory finish.

B. Paint all systems in accordance with LL 33/2007 and its amendments with sections 903 and 905 of the NYC Building Code.

3.5. CONCRETE BASES

A. Concrete Bases: Anchor equipment to concrete base according to equipment manufacturer's written instructions and according to seismic codes from 2014 NYC Building Code.

1. Construct concrete bases of dimensions indicated, but not less than 4 inches larger in both directions than supported unit.

2. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch (450-mm) centers around the full perimeter of the base.

3. Install epoxy-coated anchor bolts for supported equipment that extend through concrete base, and anchor into structural concrete floor.

4. Place and secure anchorage devices. Use supported equipment manufacturer's setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.

5. Install anchor bolts to elevations required for proper attachment to supported equipment.

6. Install anchor bolts according to anchor-bolt manufacturer's written instructions.

3.6. ERECTION OF METAL SUPPORTS AND ANCHORAGES

A. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor fire-suppression materials and equipment.

B. Field Welding: Comply with AWS D1.1.

C. Erection of wood supports and anchorages

D. Cut, fit, and place wood grounds, nailers, blocking, and anchorages to support, and anchor fire-suppression materials and equipment.

E. Select fastener sizes that will not penetrate members if opposite side will be exposed to view or will receive finish materials. Tighten connections between members. Install fasteners without splitting wood members.

F. Attach to substrates as required to support applied loads.

3.7. GROUTING

A. Mix and install grout for fire-suppression equipment base bearing surfaces, pump and other equipment base plates, and anchors.

B. Clean surfaces that will come into contact with grout.

C. Provide forms as required for placement of grout.

D. Avoid air entrapment during placement of grout.

E. Place grout, completely filling equipment bases.

F. Place grout on concrete bases and provide smooth bearing surface for equipment.

G. Place grout around anchors.

H. Cure placed grout.

END OF SECTION 210500

SECTION 210513
Common Motor Requirements for Fire Suppression Equipment

PART 1 - GENERAL

1.1. RELATED DOCUMENTS

A. The following documents apply to all required work for the Project: (1) the Contract Drawings, (2) the Specifications, (3) the General Conditions, (4) the Addendum and (5) the Contract (City of New York Standard Construction Contract).

B. LEED General Requirements:

1. Refer to DDC Standard Conditions.

a. Section 01 33 00 "Submittal Procedures."

1.2. SUBMITTALS

A. Refer to DDC General Conditions Section 01 33 00 "Submittal Procedures."

1.3. SUMMARY

A. Section includes general requirements for single-phase and polyphase, general-purpose, horizontal, small and medium, squirrel-cage induction motors for use on ac power systems up to 480 V and installed at equipment manufacturer's factory or shipped separately by equipment manufacturer for field installation.

1.4. COORDINATION

A. Coordinate features of motors, installed units, and accessory devices to be compatible with the following:

1. Motor controllers.
2. Torque, speed, and horsepower requirements of the load.
3. Ratings and characteristics of supply circuit and required control sequence.
4. Ambient and environmental conditions of installation location.

1.5. QUALITY ASSURANCE

A. Refer to DDC General Conditions Section 01 40 00 "Quality Requirements."

PART 2 - PRODUCTS

2.1. GENERAL MOTOR REQUIREMENTS

A. Comply with requirements in this Section except when stricter requirements are specified in fire suppression equipment.

B. Comply with NEMA MG 1 unless otherwise indicated.

C. Comply with IEEE 841 for severe-duty motors.

2.2. MOTOR CHARACTERISTICS

A. Duty: Continuous duty at ambient temperature of 40 deg C and at altitude of 3300 feet (1000 m) above sea level.

B. Capacity and Torque Characteristics: Sufficient to start, accelerate, and operate connected loads at designated speeds, at installed altitude and environment, with indicated operating sequence, and without exceeding nameplate ratings or considering service factor.

2.3. POLYPHASE MOTORS

A. Description: NEMA MG 1, Design B, medium induction motor.

B. Efficiency: Energy efficient, as defined in NEMA MG 1.

C. Service Factor: 1.15.

D. Multispeed Motors: Variable torque.

1. For motors with 2:1 speed ratio, consequent pole, single winding.
2. For motors with other than 2:1 speed ratio, separate winding for each speed.

E. Multispeed Motors: Separate winding for each speed.

F. Rotor: Random-wound, squirrel cage.

G. Bearings: Regreasable, shielded, antifriction ball bearings suitable for radial and thrust loading.

H. Temperature Rise: Match insulation rating.

I. Insulation: Class F.

J. Code Letter Designation:

1. Motors 15 HP and Larger: NEMA starting Code F or Code G.
2. Motors Smaller than 15 HP: Manufacturer's standard starting characteristic.

K. Enclosure Material: Cast iron for motor frame sizes 324T and larger; rolled steel for motor frame sizes smaller than 324T.

2.4. POLYPHASE MOTORS WITH ADDITIONAL REQUIREMENTS

A. Motors Used with Reduced-Voltage and Multispeed Controllers: Match wiring connection requirements for controller with required motor leads. Provide terminals in motor terminal box, suited to control method.

B. Motors Used with Variable Frequency Controllers: Ratings, characteristics, and features coordinated with and approved by controller manufacturer.

1. Windings: Copper magnet wire with moisture-resistant insulation varnish, designed and tested to resist transient spikes, high frequencies, and short time rise pulses produced by pulse-width modulated inverters.
2. Energy- and Premium-Efficient Motors: Class B temperature rise; Class F insulation.
3. Inverter-Duty Motors: Class F temperature rise; Class H insulation.
4. Thermal Protection: Comply with NEMA MG 1 requirements for thermally protected motors.

C. Severe-Duty Motors: Comply with IEEE 841, with 1.15 minimum service factor.

2.5. SINGLE-PHASE MOTORS

A. Motors larger than 1/20 hp shall be one of the following, to suit starting torque and requirements of specific motor application:

1. Permanent-split capacitor.
2. Split phase.
3. Capacitor start, inductor run.
4. Capacitor start, capacitor run.

B. Multispeed Motors: Variable-torque, permanent-split-capacitor type.

C. Bearings: Pre-lubricated, antifriction ball bearings or sleeve bearings suitable for radial and thrust loading.

D. Motors 1/20 HP and Smaller: Shaded-pole type.

E. Thermal Protection: Internal protection to automatically open power supply circuit to motor when winding temperature exceeds a safe value calibrated to temperature rating of motor insulation. Thermal-protection device shall automatically reset when motor temperature returns to normal range.

3.1. EXECUTION REQUIREMENTS

A. Refer to DDC General Conditions for execution requirements.

END OF SECTION 210513

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SECTION 210548
Vibration and Seismic Controls for Fire Suppression Piping and Equipment

PART 1 - GENERAL

1.1. RELATED DOCUMENTS

A. The following documents apply to all required work for the Project: (1) the Contract Drawings, (2) the Specifications, (3) the General Conditions, (4) the Addendum and (5) the Contract (City of New York Standard Construction Contract).

B. LEED General Requirements:

1. Refer to DDC General Conditions.

a. Section 01 33 00 "Submittal Procedures."

1.2. SUMMARY

A. This Section includes the following:

1. Isolation pads.
2. Isolation mounts.
3. Restrained elastomeric isolation mounts.
4. Freestanding and restrained spring isolators.
5. Housed spring mounts.
6. Elastomeric hangers.
7. Spring hangers.
8. Spring hangers with vertical-limit stops.
9. Pipe riser resilient supports.
10. Resilient pipe guides.
11. Restrained vibration isolation roof-curb rails.
12. Seismic snubbers.
13. Restraining braces and cables.
14. Steel and inertia, vibration isolation equipment bases.

1.3. DEFINITIONS

A. IBC: International Building Code.

B. ICC-ES: ICC-Evaluation Service.

C. Life Safety Systems:

1. All systems involved with fire protection including sprinkler piping, fire pumps, jockey pumps, fire pump control panels, service water supply piping, water tanks, fire dampers and smoke exhaust systems.
2. All systems involved with and/or connected to emergency power supply transformers and all flow paths to fire protection and/or emergency lighting systems.
3. Fresh air relief systems on emergency control sequence including air handlers, conduit, duct, dampers, etc.

D. Positive Attachment:

1. A positive attachment is defined as a cast-in anchor, a drill-in wedge anchor, a double-sided beam clamp loaded perpendicular to a beam, or a welded or bolted connection to structure. Single sided "C" type beam clamps for support rods of overhead piping, ductwork, fire protection, electrical conduit, bus duct, or cable trays, or any other equipment are not acceptable on this project as seismic anchor points.

E. Transverse Bracing:

1. Restraint(s) applied to limit motion perpendicular to the centerline of the pipe, duct or conduit.

F. Longitudinal Bracing:

1. Restraint(s) applied to limit motion parallel to the centerline of the pipe, duct or conduit.

1.4. GENERAL

A. Seismic Bracing - Applies to all trades as applicable (to withstand 6 forces in shear).

a) The following life safety items shall be seismically braced in accordance with the New York City Code requirements.
b) Fire standpipe system piping throughout.
c) Constant pressure pumps (which fill fire reserve tanks) or fire reserve tank fill pumps solidly anchored to base and with seismic vibration isolation to concrete pad.
d) Tank fill line seismically braced. (From pump to roof tank)
e) Fire water service all piping seismically braced & anchored.
f) Entire sprinkler system seismically braced in accordance with NFPA13, Section 4-14.4.3
g) Roof House tank (and/or suction tank for fire reserve) anchored and internally braced.
h) Emergency lighting fixtures - seismically braced or anchored
i) All fire alarm equipment - solid anchored
j) All emergency conduit and systems.
k) All other life safety equipment - seismically braced and/or anchored.
l) Electric feeders to tank fill pump - embedded or seismically braced.
m) Roof tank controls - Seismically braced.

B. Intent

1. All mechanical equipment, piping and ductwork as noted on the equipment shall be mounted on vibration isolators to prevent the transmission of vibration and mechanically transmitted sound to

the building structure. Vibration isolators shall be selected in accordance with the weight distribution so as to produce reasonably uniform detections. This applies only to life safety equipment and hazardous systems (gas systems)

2. All isolators and isolation materials shall be of the same manufacturer.
3. It is the intent of the seismic portion of this specification to keep all mechanical and electrical building system components in place during a seismic event.
4. All such systems must be installed in strict accordance with seismic codes.
5. Component manufacturer's and building construction standards. Whenever a conflict occurs between the manufacturers or construction standards, the most stringent shall apply.
6. Any variance or non-compliance with these specification requirements shall be corrected by the contractor in an approved manner.
7. Seismic restraints shall be designed in accordance with seismic force levels as detailed in this section.

C. The work in this section applies only to "Life Safety Systems" and includes, the following:

1. Vibration isolation for piping and equipment.
2. Equipment isolation bases.
3. Flexible piping connections.
4. Seismic restraints for isolated equipment.
5. Seismic restraints for non-isolated equipment.
6. Certification of seismic restraint designs and installation supervision.
7. Certification of seismic attachment of housekeeping pads.

D. All fire protection systems defined as life safety systems. Equipment referred to below is typical. (Equipment not listed is still included).

1. Piping
2. Pumps related to Fire Standpipe, Sprinkler

E. Housekeeping Pads

1. Housekeeping pad reinforcement and monolithic pad attachment to the structure details and design shall be prepared by the restraint vendor if not already indicated on the drawings.
2. Housekeeping pads shall be coordinated with restraint vendor and sized to provide a minimum edge distance of ten (10) bolt diameters all around the outermost anchor bolt to allow development of full drill-in wedge anchor ratings. If cast-in anchors are to be used, the housekeeping pads shall be sized to accommodate the ACI requirements for bolt page coverage and embedment.
   a. Supplementary Support Steel
      1) Contractor shall supply supplementary support steel for all equipment, piping, ductwork, etc. including roof-mounted equipment, as required or specified.
   b. Attachments
      1) Contractor shall supply restraint attachment plates cast into housekeeping pads, concrete inserts, double-sided beam clamps, etc. in accordance with the requirements of the vibration vendor's calculations.

1.5. PERFORMANCE REQUIREMENTS

A. Wind-Restraint Loading:

1. Basic Wind Speed: 30 psf.
2. Building Classification Category: Seismic Design Category C.
3. Minimum 10 lb/sq. ft. multiplied by the maximum area of the HVAC component projected on a vertical plane that is normal to the wind direction, and 45 degrees either side of normal.

B. Seismic-Restraint Loading:

1. Site Class as Defined in the New York City Building Code: D.
2. Assigned Seismic Use Group or Building Category as Defined in the New York City Building Code: I.

   a. Component Importance Factor: 1.5.

C. Seismic Force Level as per NYC LL17\95 as Modified UBC Section 2312-1990

1. Seismic Zone #2:
2. "G" Forces for Life Safety Equipment either rigidly or flexibly Mounted

   a. Horizontal G force = 0.6
   b. Vertical G Force = 0.2

1.6. SUBMITTALS

A. Refer to DDC General Conditions Section 01 33 00 "Submittal Procedures".

B. Product Data: For the following:

1. Include rated load, rated deflection, and overload capacity for each vibration isolation device.
2. Illustrate and indicate style, material, strength, fastening provision, and finish for each type and size of seismic-restraint component used.

   a. Tabulate types and sizes of seismic restraints, complete with report numbers and rated strength in tension and shear.
   b. Annotate to indicate application of each product submitted and compliance with requirements.

3. Interlocking Snubbers: Include ratings for horizontal, vertical, and combined loads.

C. Engineering Data Submittal: For vibration isolation and seismic-restraint details indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer licensed in the state of New York responsible for their preparation.

1. Design Calculations: Calculate static and dynamic loading due to equipment weight and operation, seismic and wind forces required to select vibration isolators, seismic and wind) restraints, and for designing vibration isolation bases.

a. Coordinate design calculations with wind load calculations required for equipment mounted outdoors. Comply with all other requirements for equipment mounted outdoors.

2. Riser Supports: Include riser diagrams and calculations showing anticipated expansion and contraction at each support point, initial and final loads on building structure, spring deflection changes, and seismic loads. Include certification that riser system has been examined for excessive stress and that none will exist.

3. Vibration Isolation Base Details: Detail overall dimensions, including anchorages and attachments to structure and to supported equipment. Include auxiliary motor slides and rails, base weights, equipment static loads, power transmission, component misalignment, and cantilever loads.

4. Seismic and Wind-Restraint Details:

a. Design Analysis: To support selection and arrangement of seismic and wind restraints. Include calculations of combined tensile and shear loads.
b. Details: Indicate fabrication and arrangement. Detail attachments of restraints to the restrained items and to the structure. Show attachment locations, methods, and spacings. Identify components, list their strengths, and indicate directions and values of forces transmitted to the structure during seismic events. Indicate association with vibration isolation devices.
c. Coordinate seismic-restraint and vibration isolation details with wind-restraint details required for equipment mounted outdoors. Comply with requirements in other sections for equipment mounted outdoors.
d. Preapproval and Evaluation Documentation: By the NYC Department of Buildings, showing maximum ratings of restraint items and the basis for approval (tests or calculations).

D. Air-Mounting System Performance Certification: Include natural frequency, load, and damping test data performed by an independent agency.

E. Field quality-control test reports.

F.Operation and Maintenance Data: For air-mounting systems to include in operation and maintenance manuals.

1.7. QUALITY ASSURANCE

A. Refer to DDC General Conditions Section 014000 Quality Requirements.

B. Materials and work shall conform to the latest edition of reference specifications specified herein and requirements of the NYC Department of Buildings.

C. Testing Agency Qualifications: An independent agency that is a nationally recognized testing laboratory (NRTL) as defined by OSHA in 29 CFR 1910.7, and that is acceptable to The Commissioner.

D. Comply with seismic-restraint requirements in the IBC unless requirements in this Section are more stringent.

E. Seismic-restraint devices shall have horizontal and vertical load testing and analysis and shall bear anchorage preapproval by ICC-ES, showing maximum seismic-restraint ratings. Ratings based on independent testing are preferred to ratings based on calculations. If preapproved ratings are not available, submittals based on independent testing are preferred. Calculations (including combining shear and tensile loads) to support seismic-restraint designs must be signed and sealed by a qualified professional engineer licensed in the state of New York.

F.Codes and Standards

1. New York City LL17/95 2.UBC Section 2312-1990
2. New York City Building Code

PART 2 - PRODUCTS

2.0. VIBRATION ISOLATORS

A. Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include the following:

1. Ace Mountings Co., Inc.
2. Amber/Booth Company, Inc.
3. California Dynamics Corporation.
4. Isolation Technology, Inc.
5. Kinetics Noise Control.
6. Mason Industries.
7. Vibration Eliminator Co., Inc.
8. Vibration Isolation.
9. Vibration Mountings & Controls, Inc.
10. Or Approved Equal

B. Pads: Arranged in single or multiple layers of sufficient stiffness for uniform loading over pad area, molded with a nonslip pattern and galvanized-steel baseplates, and factory cut to sizes that match requirements of supported equipment.

1. Resilient Material: Oil- and water-resistant neoprene.

C. Mounts: Double-deflection type, with molded, oil-resistant rubber, hermetically sealed compressed fiberglass, or neoprene isolator elements with factory-drilled, encapsulated top plate for bolting to equipment and with baseplate for bolting to structure. Color-code or otherwise identify to indicate capacity range.

1. Materials: Cast-ductile-iron or welded steel housing containing two separate and opposing, oil-resistant rubber or neoprene elements that prevent central threaded element and attachment hardware from contacting the housing during normal operation.
2. Neoprene: Shock-absorbing materials compounded according to the standard for bridge-bearing neoprene as defined by AASHTO.

D. Restrained Mounts: All-directional mountings with seismic restraint.

1. Materials: Cast-ductile-iron or welded steel housing containing two separate and opposing, oil-resistant rubber or neoprene elements that prevent central threaded element and attachment hardware from contacting the housing during normal operation.
2. Neoprene: Shock-absorbing materials compounded according to the standard for bridge-bearing neoprene as defined by AASHTO.

E. Spring Isolators: Freestanding, laterally stable, open-spring isolators.

1. Outside Spring Diameter: Not less than 80 percent of the compressed height of the spring at rated load.
2. Minimum Additional Travel: 50 percent of the required deflection at rated load.
3. Lateral Stiffness: More than 80 percent of rated vertical stiffness.
4. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.
5. Baseplates: Factory drilled for bolting to structure and bonded to 1/4-inch- thick, rubber isolator pad attached to baseplate underside. Baseplates shall limit floor load to 500 psig.
6. Top Plate and Adjustment Bolt: Threaded top plate with adjustment bolt and cap screw to fasten and level equipment.

F. Restrained Spring Isolators: Freestanding, steel, open-spring isolators with seismic or limit-stop restraint.

1. Housing: Steel with resilient vertical-limit stops to prevent spring extension due to weight being removed; factory-drilled baseplate bonded to 1/4-inch- thick, neoprene or rubber isolator pad attached to baseplate underside; and adjustable equipment mounting and leveling bolt that acts as blocking during installation.
2. Restraint: Seismic or limit stop as required for equipment.
3. Outside Spring Diameter: Not less than 80 percent of the compressed height of the spring at rated load.
4. Minimum Additional Travel: 50 percent of the required deflection at rated load.
5. Lateral Stiffness: More than 80 percent of rated vertical stiffness.
6. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.

G. Housed Spring Mounts: Housed spring isolator with integral seismic snubbers.

1. Housing: Ductile-iron or steel housing to provide all-directional seismic restraint.
2. Base: Factory drilled for bolting to structure.
3. Snubbers: Vertically adjustable to allow a maximum of 1/4-inch travel up or down before contacting a resilient collar.

H. Elastomeric Hangers: Single or double-deflection type, fitted with molded, oil-resistant elastomeric isolator elements bonded to steel housings with threaded connections for hanger rods. Color-code or otherwise identify to indicate capacity range.

I. Spring Hangers: Combination coil-spring and elastomeric-insert hanger with spring and insert in compression.

1. Frame: Steel, fabricated for connection to threaded hanger rods and to allow for a maximum of 30 degrees of angular hanger-rod misalignment without binding or reducing isolation efficiency.
2. Outside Spring Diameter: Not less than 80 percent of the compressed height of the spring at rated load.
3. Minimum Additional Travel: 50 percent of the required deflection at rated load.
4. Lateral Stiffness: More than 80 percent of rated vertical stiffness.
5. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.
6. Elastomeric Element: Molded, oil-resistant rubber or neoprene. Steel-washer-reinforced cup to support spring and bushing projecting through bottom of frame.
7. Self-centering hanger rod cap to ensure concentricity between hanger rod and support spring coil.

J. Spring Hangers with Vertical-Limit Stop: Combination coil-spring and elastomeric-insert hanger with spring and insert in compression and with a vertical-limit stop.

1. Frame: Steel, fabricated for connection to threaded hanger rods and to allow for a maximum of 30 degrees of angular hanger-rod misalignment without binding or reducing isolation efficiency.
2. Outside Spring Diameter: Not less than 80 percent of the compressed height of the spring at rated load.
3. Minimum Additional Travel: 50 percent of the required deflection at rated load.
4. Lateral Stiffness: More than 80 percent of rated vertical stiffness.
5. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.
6. Elastomeric Element: Molded, oil-resistant rubber or neoprene.
7. Adjustable Vertical Stop: Steel washer with neoprene washer "up-stop" on lower threaded rod.
8. Self-centering hanger rod cap to ensure concentricity between hanger rod and support spring coil.

K. Pipe Riser Resilient Support: All-directional, acoustical pipe anchor consisting of 2 steel tubes separated by a minimum of 1/2-inch- thick neoprene. Include steel and neoprene vertical-limit stops arranged to prevent vertical travel in both directions. Design support for a maximum load on the isolation material of 500 psig and for equal resistance in all directions.

L. Resilient Pipe Guides: Telescopic arrangement of 2 steel tubes or post and sleeve arrangement separated by a minimum of 1/2-inch- thick neoprene. Where clearances are not readily visible, a factory-set guide height with a shear pin to allow vertical motion due to pipe expansion and contraction shall be fitted. Shear pin shall be removable and reinsertable to allow for selection of pipe movement. Guides shall be capable of motion to meet location requirements.

2.1. VIBRATION ISOLATION EQUIPMENT BASES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Amber/Booth Company, Inc.
2. California Dynamics Corporation.
3. Isolation Technology, Inc.
4. Kinetics Noise Control.
5. Mason Industries.

6. Vibration Eliminator Co., Inc.
7. Vibration Isolation.
8. Vibration Mountings & Controls, Inc.
9. Or Approved Equal

B. Steel Base : Factory-fabricated, welded, structural-steel bases and rails.

1. Design Requirements: Lowest possible mounting height with not less than 1-inch clearance above the floor. Include equipment anchor bolts and auxiliary motor slide bases or rails.

   a. Include supports for suction and discharge elbows for pumps.

2. Structural Steel: Steel shapes, plates, and bars complying with ASTM A 36/A 36M. Bases shall have shape to accommodate supported equipment.
3. Support Brackets: Factory-welded steel brackets on frame for outrigger isolation mountings and to provide for anchor bolts and equipment support.

C. Inertia Base: Factory-fabricated, welded, structural-steel bases and rails ready for placement of cast-in-place concrete.

1. Design Requirements: Lowest possible mounting height with not less than 1-inch clearance above the floor. Include equipment anchor bolts and auxiliary motor slide bases or rails.

   a. Include supports for suction and discharge elbows for pumps.

2. Structural Steel: Steel shapes, plates, and bars complying with ASTM A 36/A 36M. Bases shall have shape to accommodate supported equipment.
3. Support Brackets: Factory-welded steel brackets on frame for outrigger isolation mountings and to provide for anchor bolts and equipment support.
4. Fabrication: Fabricate steel templates to hold equipment anchor-bolt sleeves and anchors in place during placement of concrete. Obtain anchor-bolt templates from supported equipment manufacturer.

2.2. SEISMIC-RESTRAINT DEVICES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Amber/Booth Company, Inc.
2. California Dynamics Corporation.
3. Cooper B-Line, Inc.; a division of Cooper Industries.
4. Hilti, Inc.
5. Kinetics Noise Control.
6. Loos & Co.; Cableware Division.
7. Mason Industries.
8. TOLCO Incorporated; a brand of NIBCO INC.
9. Unistrut; Tyco International, Ltd.
10. Or Approved Equal

B. General Requirements for Restraint Components: Rated strengths, features, and applications shall be as defined in reports by an agency acceptable to the Commissioner.

1. Structural Safety Factor: Allowable strength in tension, shear, and pullout force of components shall be at least four times the maximum seismic forces to which they will be subjected.

C. Snubbers: Factory fabricated using welded structural-steel shapes and plates, anchor bolts, and replaceable resilient isolation washers and bushings.

1. Anchor bolts for attaching to concrete shall be seismic-rated, drill-in, and stud-wedge or female-wedge type.
2. Resilient Isolation Washers and Bushings: Oil- and water-resistant neoprene.
3. Maximum 1/4-inch air gap, and minimum 1/4-inch- thick resilient cushion.

D. Channel Support System: MFMA-3, shop- or field-fabricated support assembly made of slotted steel channels with accessories for attachment to braced component at one end and to building structure at the other end and other matching components and with corrosion-resistant coating; and rated in tension, compression, and torsion forces.

E. Restraint Cables: ASTM A 603 galvanized-steel cables with end connections made of steel assemblies with thimbles, brackets, swivel, and bolts designed for restraining cable service; and with a minimum of two clamping bolts for cable engagement.

F.Hanger Rod Stiffener: Reinforcing steel angle clamped to hanger rod.

G. Bushings for Floor-Mounted Equipment Anchor Bolts: Neoprene bushings designed for rigid equipment mountings, and matched to type and size of anchor bolts and studs.

H. Bushing Assemblies for Wall-Mounted Equipment Anchorage: Assemblies of neoprene elements and steel sleeves designed for rigid equipment mountings, and matched to type and size of attachment devices used.

I. Resilient Isolation Washers and Bushings: One-piece, molded, oil- and water-resistant neoprene, with a flat washer face.

J. Mechanical Anchor Bolts: Drilled-in and stud-wedge or female-wedge type in zinc-coated steel for interior applications and stainless steel for exterior applications. Select anchor bolts with strength required for anchor and as tested according to ASTM E 488. Minimum length of eight times diameter.

K. Adhesive Anchor Bolts: Drilled-in and capsule anchor system containing polyvinyl or urethane methacrylate-based resin and accelerator, or injected polymer or hybrid mortar adhesive. Provide anchor bolts and hardware with zinc-coated steel for interior applications and stainless steel for exterior applications. Select anchor bolts with strength required for anchor and as tested according to ASTM E 488.

2.3. FACTORY FINISHES

A. Finish: Manufacturer's standard prime-coat finish ready for field painting.

PART 3 - EXECUTION

3.1. EXECUTION REQUIREMENTS

A. Refer to DDC General Conditions for execution requirements.

3.2. EXAMINATION

A. Examine areas and equipment to receive vibration isolation and seismic and wind control devices for compliance with requirements for installation tolerances and other conditions affecting performance.

B. Examine roughing-in of reinforcement and cast-in-place anchors to verify actual locations before installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.3. GENERAL

A. All vibration isolators and seismic restraint systems must be installed in strict accordance with the manufacturers written instructions and all certified submittal data.

B. Installation of vibration isolators and seismic restraints must not cause any change of position of equipment, piping or ductwork resulting in stresses or misalignment.

C. No rigid connections between equipment and the building structure shall be made that degrades the noise and vibration control system herein specified.

D. Coordinate work with other trades to avoid rigid contact with the building.

E. Correct all installations which are deemed defective in workmanship and materials at no cost to the City of New York.

F.Overstressing of the building structure must not occur because of overhead support of equipment. Contractor must submit loads to the structural engineer of record for approval. Generally bracing may occur from:

1. Flanges of structural beams.
2. Upper truss cords in bar joist construction.
3. Cast in place inserts or wedge type drill-in concrete anchors.

G. Cable restraints shall be installed slightly slack to avoid short circuiting the isolated suspended equipment, piping or conduit.

H. Cable assemblies are installed taut on non-isolated systems. Seismic solid braces may be used in place of cables on rigidly attached systems only.

I. At locations where restraints are located, the support rods must be braced when necessary to accept compressive loads with braces.

J. At all locations where restraints are attached to pipe clevises, the clevis cross bolt must be reinforced with braces.

K. Drill-in concrete anchors shall be used for ceiling and wall installation and specification female wedge type for floor mounted equipment.

L. Vibration isolation manufacturer shall furnish integral structural steel bases as required. Independent steel rails are not permitted on this project.

M. Hand built elastomeric expansion joints may be used when pipe sizes exceed 24".

N. Where piping passes through walls, floors or ceilings the vibration isolation manufacturer shall provide wall seals.

O. Air handling equipment and centrifugal fans shall be protected against excessive displacement which results from high air thrust in relation to the equipment weight.

P.Locate isolation hangers as near to the overhead support structure as possible.

3.4. APPLICATIONS

A. Multiple Pipe Supports: Secure pipes to trapeze member with clamps approved for application.

B. Hanger Rod Stiffeners: Install hanger rod stiffeners where indicated or scheduled on Drawings to receive them and where required to prevent buckling of hanger rods due to seismic forces.

C. Strength of Support and Seismic-Restraint Assemblies: Where not indicated, select sizes of components so strength will be adequate to carry present and future static and seismic loads within specified loading limits.

3.5. VIBRATION-CONTROL AND SEISMIC-RESTRAINT DEVICE INSTALLATION

A. Comply with requirements in Section 077100 "Roof Specialties and Accessories" for installation of roof curbs, equipment supports, and roof penetrations.

B. Piping Restraints:

1. Comply with requirements in MSS SP-127.
2. Space lateral supports a maximum of 40 feet o.c., and longitudinal supports a maximum of 80 feet o.c.
3. Brace a change of direction longer than 12 feet.

C. Install cables so they do not bend across edges of adjacent equipment or building structure.

D. Install seismic-restraint devices using methods approved by an agency acceptable to the Commissioner providing required submittals for component.

E. Install bushing assemblies for anchor bolts for floor-mounted equipment, arranged to provide resilient media between anchor bolt and mounting hole in concrete base.

F. Install bushing assemblies for mounting bolts for wall-mounted equipment, arranged to provide resilient media where equipment or equipment-mounting channels are attached to wall.

G. Attachment to Structure: If specific attachment is not indicated, anchor bracing to structure at flanges of beams, at upper truss chords of bar joists, or at concrete members.

H. Drilled-in Anchors:

1. Identify position of reinforcing steel and other embedded items prior to drilling holes for anchors. Do not damage existing reinforcing or embedded items during coring or drilling. Notify the Commissioner if reinforcing steel or other embedded items are encountered during drilling. Locate and avoid prestressed tendons, electrical and telecommunications conduit, and gas lines.
2. Do not drill holes in concrete or masonry until concrete, mortar, or grout has achieved full design strength.
3. Wedge Anchors: Protect threads from damage during anchor installation. Heavy-duty sleeve anchors shall be installed with sleeve fully engaged in the structural element to which anchor is to be fastened.
4. Adhesive Anchors: Clean holes to remove loose material and drilling dust prior to installation of adhesive. Place adhesive in holes proceeding from the bottom of the hole and progressing toward the surface in such a manner as to avoid introduction of air pockets in the adhesive.
5. Set anchors to manufacturer's recommended torque, using a torque wrench.
6. Install zinc-coated steel anchors for interior and stainless-steel anchors for exterior applications.

3.6. ACCOMMODATION OF DIFFERENTIAL SEISMIC MOTION

A. Install flexible connections in piping where they cross seismic joints, where adjacent sections or branches are supported by different structural elements, and where the connections terminate with connection to equipment that is anchored to a different structural element from the one supporting the connections as they approach equipment. Comply with requirements covering hydronic piping for piping flexible connections.

3.7. FIELD QUALITY CONTROL

A. Tests and Inspections:

1. Provide evidence of recent calibration of test equipment by a testing agency acceptable to the Commissioner.
2. Schedule test with Commissioner, before connecting anchorage device to restrained component (unless post connection testing has been approved), and with at least seven days' advance notice.
3. Obtain Commissioner's approval before transmitting test loads to structure. Provide temporary load-spreading members.
4. Test at least four of each type and size of installed anchors and fasteners selected by Commissioner.
5. Test to 90 percent of rated proof load of device.
6. Measure isolator restraint clearance.

7. Measure isolator deflection.
8. Verify snubber minimum clearances.
9. If a device fails test, modify all installations of same type and retest until satisfactory results are achieved.

B. Remove and replace malfunctioning units and retest as specified above.

C. Prepare test and inspection reports.

3.8. ADJUSTING

A. Adjust isolators after piping system is at operating weight.

B. Adjust limit stops on restrained spring isolators to mount equipment at normal operating height. After equipment installation is complete, adjust limit stops so they are out of contact during normal operation.

C. Adjust active height of spring isolators.

D. Adjust restraints to permit free movement of equipment within normal mode of operation.

3.9. VIBRATION ISOLATION OF PIPING

A. Horizontal pipe isolation: The first three pipe hangers in the main lines near the mechanical equipment shall be as described in section 210513, part 3.5. 1.1 hangers must also be used in all transverse braced isolated locations. Brace hanger rods with SRC clamps. Horizontal runs in all other locations throughout the building shall be isolated by hangers as described in. Floor supported piping shall rest on isolators as described in. Heat exchanger's and expansion tanks are considered part of the piping run. The first three isolators from the isolated equipment will have the same static deflection as specified for the mounting under the connected equipment. If piping is connected to equipment located in basements and hangs from ceilings under occupied spaces the first three hangers shall have 0.75" deflection for pipe sizes up to and including 3",1 1/2" deflection for pipe sizes up to and including 6", and 2 1/2" deflection thereafter. Hangers shall be located as close to the overhead structure as practical. Where piping connects to mechanical equipment install expansion joints or stainless hoses if expansion joint is not suitable for the service.

B. Riser isolation: Risers shall be suspended from hangers or supported by mountings, anchored with anchors, and guided with sliding guides. Steel springs shall be a minimum of 0.75" except in those expansion locations where additional deflection is required to limit load changes to + 25% of the initial load. Submittals must include riser diagrams and calculations showing anticipated expansion and contraction at each support point. Initial and final loads on the building structure. Spring deflection changes and seismic loads. Submittal data shall include certification that the riser system has been examined for excessive stresses and that none will exist in the proposed design.

C. Seismic Restraint of Piping

1. Seismically restrain all piping listed as a. b or c below. Use cables if isolated. Restraints may be used on unisolated piping.

a. Gas piping that is 1" I.D. or larger.
b. Piping located in boiler rooms, mechanical equipment rooms, and refrigeration equipment rooms that is 1-1 /4" I.D. and larger.
c. All other piping 2-1/2" diameter and larger.

2. Transverse piping restraints shall be at 40' maximum spacing for all pipe sizes, except where lesser spacing is required to limit anchorage loads.
3. Longitudinal restraints shall be at 80' maximum spacing for all pipe sizes, except where lesser spacing as required to limit anchorage loads.
4. Where thermal expansion is a consideration, guides and anchors may be used as transverse and longitudinal restraints provided they have a capacity equal to or greater than the restraint loads in addition to the loads induced by expansion or contraction.
5. For fuel oil and all gas piping transverse restraints must be at 20' maximum and longitudinal restraints at 40' maximum spacing.
6. Transverse restraint for one pipe section may also act as a longitudinal restraint for a pipe section of the same size connected perpendicular to it if the restraint is installed within 24" of the elbow or TEE or combined stresses are within allowable limits at longer distances.
7. Hold down clamps must be used to attach pipe to all trapeze members before applying restraints in a manner similar to clevis supports.
8. Branch lines may not be used to restrain main lines.
9. Cast iron pipe of all types, glass pipe and any other pipes joined with a four band shield and clamp assembly in Zones 2B, 3 and 4 shall be braced as in sections 3.02.C.2 and 3. For Zones 0, 1 and 2A, 2 band clamps may be used with reduced spacings of 1/2 of those listed in sections 3.7.C.2 and 3.

D. All fire protection piping shall be braced in accordance with NFPA 13.

E. All fire protection equipment is considered life safety equipment and shall be seismically restrained using the seismic force levels for life safety equipment in table 1.06-1.if higher levels is shown.

3.10. VIBRATION CONTROL SCHEDULE

A. Installation

1. At each equipment location, provide the required deflection under the imposed load and produce uniform loading and deflection even when equipment weight is not evenly distributed. Jack bases into position and wedge in place before spring loading; leveling bolts shall not be used as jacking screws. After equipment is in place and springs are loaded through leveling bolts, remove wedges and jacks. Isolators shall be suitable for the lowest operating speed of the equipment.
2. Where the floor is waterproofed or finished with waterproof cement, install vibration isolation in such manner that the waterproofing is not damaged.
3. Isolation equipment shall be in accordance with the following table unless noted otherwise in these specifications:

Lowest RPM	Min. Deflection (in.)	Efficiency %	Type
1750 & Over	.25	95	Single Neoprene in-shear
1200-1749	.50	95	Double Neoprene in-shear

1100-1199	.75	95	Spring
570-999	1.25	90-95	Spring
330-519	1.5	80-90	Spring
Up to 329	3.5	80	Spring

4. Slab above Grade

   a. Seismically rated spring mounts with a minimum static defection of 1" are required, no matter if the residence are located above or below the boilers.
   b. Piping to be seismically braced to the building structure. Isolation hangers shall be installed in addition to the bracing to attenuate structure borne energy.

END OF SECTION 210548

SECTION 21 08 00
COMMISSIONING OF FIRE SUPPRESSION SYSTEM

PART I - GENERAL

1.1 RELATED DOCUMENTS

A. The following documents apply to all required work for the project: (1) the contract drawings, (2) the Specifications, (3) the General Conditions, (4) the Addendum and (5) the Contract (City of New York Standard Construction Contract).

1.2 SUMMARY

A. This section includes commissioning process requirements for Fire Suppression systems, assemblies, and equipment.

B. Related Sections:

1. Refer to DDC General Conditions for general commissioning process description.

1.3 DESCRIPTION

A. Commissioning: Commissioning is a systematic process of ensuring that all building systems, including the mechanical and electrical systems, have been installed in the prescribed manner, are functionally checked and capable of being operated and maintained to perform with the design intent and have documentation to support proper installation and operation. The Commissioning Agent (CxA) shall provide the City of New York with an unbiased, objective view of the system's installation, operation, and performance. This process does not eliminate or reduce the responsibility of the Contractor to provide a complete design or installing Sub-Contractors to provide a finished product. Commissioning is intended to enhance the quality of each system installation, startup, and transfer to beneficial use by the City of New York.

B. Commissioning during the construction phase is intended to achieve the following specific objectives, according to the Contract Documents:

1. Verify that applicable equipment and systems are installed according to the manufacturer's recommendations and to industry accepted minimum standards and that they receive adequate operational checkout by installing Sub-Contractors.
2. Verify and document proper performance of equipment and systems.
3. Verify that Operation & Maintenance documentation is complete and transferred to City of New York.
4. Verify that the City of New York's operating personnel are adequately instructed.
5. Perform a post occupancy review with O&M staff within 10 months after Substantial Completion.

C. The Commissioning process shall be a team effort and encompass, as well as coordinate, the traditionally separate functions of system documentation, system installation, equipment startup, control system calibration, testing, and performance checkouts.

D. The CxA will work closely with the construction team, cooperating on and coordinating all Cx activities with the City of New York, Contractor, Sub-Contractors, manufacturers, and equipment suppliers.

E. The Cx process shall not reduce the responsibility of the Contractor to comply with the Contract Documents.

1.4 DEFINITIONS

A. Refer to DDC General Conditions for definitions.

1.5 SUBMITTALS

A. Refer to DDC General Conditions for CxA's role.

B. Refer to DDC General Conditions for specific submittals requirements. In addition, provide the following:

1. Certificates of readiness
2. Certificates of completion of installation, and startup activities.
3. Test reports
4. O&M manuals

1.6 QUALITY ASSURANCE

A. Test Equipment Calibration Requirements: The Contractor will comply with test manufacturer's calibration procedures and intervals. Recalibrate test instruments immediately after instruments have been repaired resulting from being dropped or damaged. Affix calibration tags to test instruments. Furnish calibration records to CxA upon request.

1.7 COORDINATION

A. Refer to DDC General Conditions for requirements pertaining to coordination during the commissioning process.

PART II - PRODUCTS

2.1 TEST EQUIPMENT

A. The Contractor shall ensure that the equipment and system perform startup, initial checkout and functional performance testing as outlined in the DDC General Conditions. For example, the Contractor shall ensure the fire suppression Sub-Contractor provides and installs the Fire Suppression system be responsible for all standard testing equipment for the plumbing system in Division 21. A sufficient quantity of two-way radios shall be provided by the Contractor.

B. Special equipment, tools and instruments (specific to a piece of equipment and only available from vendor) required for testing shall be included in the price to the City of New York and left on site, except for stand-alone data logging equipment that may be used by the CxA.

C. Test equipment and software required by any equipment manufacturer for programming and/or start-up, whether specified or not, shall be provided by the manufacturer of the equipment. The Contractor shall ensure that the manufacturer provide the test equipment, demonstrate its use, and assist in the commissioning process as needed. Test equipment (and software) shall become the property of the City of New York upon completion of the commissioning process.

D. All testing equipment shall be of sufficient quality and accuracy to test and/or measure system performance with the tolerances specified in the Specifications. If not otherwise noted, the following minimum requirements apply: Temperature sensors and digital thermometers shall have a certified calibration within the past year to accuracy of 0.5°F and a resolution of ±0.1°F. Pressure sensors shall have an accuracy of ±2.0% of the value range being measured (not full range of meter) and have been calibrated within the last year.

PART III - EXECUTION

3.1 GENERAL DOCUMENTATION REQUIREMENTS

A. With assistance from the Contractor, the CxA will prepare Pre-Functional Checklists for commissioned components, equipment, and systems.

B. Red-lined Drawings:

1. The Contractor will verify all equipment, systems, instrumentation, wiring and components are shown correctly on red-lined drawings.
2. Preliminary red-lined drawings must be made available to the Commissioning Team for use prior to the start of Functional Performance Testing.
3. Changes, as a result of Functional Testing, must be incorporated into the final as-built drawings, which will be created from the red-lined drawings.
4. The Contractor will create the as-built drawings.

C. Operation and Maintenance Data:

1. The Contractor will provide a copy of O&M literature within 45 days of each submittal acceptance for use during the commissioning process for all commissioned equipment and systems.
2. The CxA will review the O&M literature once for conformance to project requirements.
3. The CxA will receive a copy of the final approved O&M literature once corrections have been made by the Contractor.

D. Demonstration and Instruction:

1. The Contractor will provide demonstration and instruction as required by the specifications for fire suppression systems.
2. A complete instruction plan and schedule must be submitted by the Contractor to the CxA four weeks (4) prior to any instruction.
3. An instruction agenda for each instructing session must be submitted to the CxA one (1) week prior the instructing session.

4. The CxA shall be notified at least 72 hours in advance of scheduled fire pump test so that testing may be observed by the CxA. A copy of the test record shall be provided to the CxA and Commissioner.
5. Engage a Factory-authorized service representative to instruct City of New York's service personnel to adjust, operate, and maintain specialty valves.
6. Engage a Factory-authorized service representative to instruct City of New York's service personnel to adjust, operate, and maintain Fire Pump.
7. Instruct City of New York's service personnel on procedures and schedules for starting and stopping, trouble shooting, servicing, and maintaining units.
8. Review data in O&M Manuals.

3.2 CONTRACTOR RESPONSIBILITIES FOR SUB-CONTRACTOR PERFORMANCE

A. The Contractor shall cause the Sub-Contractor to have the following instruction responsibilities in performing Fire Suppression System work. The commissioning responsibilities are as follows (all references apply to commissioned equipment only):

1. Perform commissioning tests at the direction of the CxA.
2. Attend construction phase coordination meetings.
3. Participate in Fire Suppression systems, assemblies, equipment, and component maintenance orientation and inspection as directed by the CxA.
4. Provide information requested by the CxA for final commissioning documentation.
5. Include requirements for submittal data, operation and maintenance data, and instructing in each purchase order or sub-contract written.
6. Prepare preliminary schedule for Fire Suppression system orientations and inspections, operation and maintenance manual submissions, instructing sessions, flushing and cleaning, pressure testing, equipment start-up, and task completion for the City of New York. Distribute preliminary schedule to commissioning team members.
7. Update schedule as required throughout the construction period.
8. During the startup and initial checkout process, execute the pressure testing of all piping system.
9. Assist the CxA in all Installation and Functional Checks.
10. Provide measuring instruments and logging devices to record test data, and provide data acquisition equipment to record data for the complete range of testing for the required test period.
11. Gather operation and maintenance literature on all equipment, and assemble in binders as required by the specifications. Submit to CxA 45 days after submittal acceptance.
12. Coordinate inspection and testing with the CxA to provide (72) hour advance notice so that the witnessing of equipment and system start-up and testing can begin.
13. Participate in, and schedule vendors and Sub-Contractors to participate in the instruction sessions.
14. Provide written notification to the Commissioner and CxA that the following work has been completed in accordance with the contract documents, and that the equipment, systems, and sub-system are operating as required.

a. Fire Suppression equipment including pumps, piping, and all other equipment furnished under this Division.

b. Automatic sprinkler system.

c. Fire stopping in fire rated construction, including caulking, gasketing and sealing of smoke barriers.

15. The Contractor shall ensure that the equipment suppliers document the performance of his equipment.

16. Provide a complete set of red-lined drawings to the CxA prior to the start of Functional Performance Testing.

17. The Contractor shall ensure equipment Suppliers perform the following tasks:

a. Provide all requested submittal data, including detailed start-up procedures and specific responsibilities of the City of New York, to keep warranties in force.

b. Assist in equipment testing per agreements with the Sub-Contractors.

c. Provide information requested by CxA regarding equipment sequence of operation and testing procedures.

18. Provide instruction to the City of New York service personnel using qualified personnel, as specified.

19. Refer to DDC General Conditions for additional responsibilities.

3.3 CxA'S RESPONSIBILITIES

A. Refer DDC General Conditions for CxA's Responsibilities.

3.4 TESTING PREPARATION

A. Certify in writing to the CxA that Fire Suppression systems, subsystems, and equipment have been installed, tested, calibrated, and started and are operating according to the Contract Documents.

B. Certify in writing to the CxA that Fire Suppression instrumentation and control systems have been completed and calibrated, that they are operating according to the Contract Documents, and that pretest set points have been recorded.

C. Set systems, subsystems, and equipment into operating mode to be tested (e.g., normal shutdown, normal auto position, normal manual position, unoccupied cycle, emergency power, and alarm conditions).

D. Inspect and verify the position of each device and interlock identified on checklists.

E. Check safety cutouts, alarms, and interlocks with smoke control and life-safety systems during each mode of operation.

F. Testing Instrumentation: Install measuring instruments and logging devices to record test data as directed by the CxA.

3.5 GENERAL TESTING REQUIREMENTS

A. Provide technicians, instrumentation, and tools to perform commissioning test at the direction of the CxA.

B. Scope of Fire Protection testing shall include entire Fire Suppression installation. Testing shall include measuring capacities and effectiveness of operational and control functions.

C. Test all operating modes, interlocks, control responses, and responses to abnormal or emergency conditions.

D. The Contractor shall prepare detailed testing plans, procedures, and checklists for Fire Suppression systems, subsystems, and equipment and submit for CxA review.

E. Tests will be performed using design conditions whenever possible.

F. Simulated conditions may need to be imposed using an artificial load when it is not practical to test under design conditions. Before simulating conditions, calibrate testing instruments. Provide equipment to simulate loads. Set simulated conditions as directed by the CxA and document simulated conditions and methods of simulation. After tests, return settings to normal operating conditions.

G. The CxA may direct that set points be altered when simulating conditions is not practical.

H. The CxA may direct that sensor values be altered with a signal generator when design or simulating conditions and altering set points are not practical.

I. If tests cannot be completed because of a deficiency outside the scope of the Fire Suppression system, document the deficiency and report it to the Commissioner. After deficiencies are resolved, reschedule tests.

J. If the testing plan indicates specific seasonal testing, complete appropriate initial performance tests and documentation and schedule seasonal tests.

3.6 FIRE SUPPRESSION SYSTEMS, SUBSYSTEMS, AND EQUIPMENT TESTING PROCEDURES

A. Equipment Testing and Acceptance Procedures: Testing requirements are specified in Division 21. Provide submittals, test data, inspector record, and certifications to the CxA.

B. Fire Suppression Distribution System Testing: Provide technicians, instrumentation, tools, and equipment to test performance of sprinkler distribution systems.

C. The work included in the commissioning process involves a complete and thorough evaluation of the operation and performance of all components, systems, and subsystems in Division 21. The following equipment and systems shall be evaluated:

1. Pumps
2. Piping
3. Sprinkler system

3.7 OPERATION AND MAINTENANCE MANUALS

A. The Operation and Maintenance Manuals shall conform to Contract Documents requirements.

B. Refer to DDC General Conditions for the Contractor and CxA roles in the Operation and Maintenance Manual contribution, review, and approval process.

3.8 INSTRUCTION OF SERVICE PERSONNEL

A. Refer DDC General Conditions for requirements pertaining to instruction.

END OF SECTION 21 08 00

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SECTION 211100
Facility Fire-Suppression Water Service Piping

PART 1 - GENERAL

1.1. RELATED DOCUMENTS

A. The following documents apply to all required work for the Project: (1) the Contract Drawings, (2) the Specifications, (3) the General Conditions, (4) the Addendum and (5) the Contract (City of New York Standard Construction Contract).

1.2. SUMMARY

A. Section includes fire-suppression water-service piping and related components outside the building and service entrance piping through floor into the building.

B. Utility-furnished products include water meters that will be furnished to the site, ready for installation.

C. Related Sections:

1. Section 211200 "Fire-Suppression Standpipes" for fire-suppression standpipes inside the building.
2. Section 211313 "Wet-Pipe Sprinkler Systems" for wet-pipe fire-suppression sprinkler systems inside the building.
3. Section 213113 "Electric-Drive Centrifugal Fire Pumps" for fire pumps, pressure-maintenance pumps and controllers.

1.3. SUBMITTALS

A. Refer to DDC General Conditions Section 01 33 00 "Submittal Procedures."

1.4. QUALITY ASSURANCE

A. Refer to DDC General Conditions Section 01 40 00 "Quality Requirements."

B. Regulatory Requirements:

1. Comply with requirements of utility company supplying water. Include tapping of water mains and backflow prevention.
2. Comply with standards of New York City Building Code for fire-suppression water-service piping, including materials, hose threads, installation, and testing.

C. Piping materials shall bear label, stamp, or other markings of specified testing agency.

D. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a testing agency, and marked for intended location and application.

E. Comply with the "Approval Guide," published by FM Global, or UL's "Fire Protection Equipment Directory" for fire-service-main products.

F. NFPA Compliance: Comply with NFPA 24 for materials, installations, tests, flushing, and valve and hydrant supervision for fire-suppression water-service piping.

1.5. DELIVERY, STORAGE, AND HANDLING

A. Preparation for Transport: Prepare valves, according to the following:

1. Ensure that valves are dry and internally protected against rust and corrosion.
2. Protect valves against damage to threaded ends and flange faces.
3. Set valves in best position for handling. Set valves closed to prevent rattling.

B. During Storage: Use precautions for valves, according to the following:

1. Do not remove end protectors unless necessary for inspection; then reinstall for storage.
2. Protect from weather. Store indoors and maintain temperature higher than ambient dew point temperature. Support off the ground or pavement in watertight enclosures when outdoor storage is necessary.

C. Handling: Use sling to handle valves and fire hydrants if size requires handling by crane or lift. Rig valves to avoid damage to exposed parts. Do not use handwheels or stems as lifting or rigging points.

D. Deliver piping with factory-applied end caps. Maintain end caps through shipping, storage, and handling to prevent pipe-end damage and to prevent entrance of dirt, debris, and moisture.

E. Protect stored piping from moisture and dirt. Elevate above grade. Do not exceed structural capacity of floor when storing inside.

F. Protect flanges, fittings, and specialties from moisture and dirt.

1.6. PROJECT CONDITIONS

A. Interruption of Existing Fire-Suppression Water-Service Piping: Do not interrupt service to facilities occupied by the City of New York or unless permitted under the following conditions and then only after arranging to provide temporary water-distribution service according to requirements indicated:

1. Notify Commissioner no fewer than two days in advance of proposed interruption of service.
2. Do not proceed with interruption of service without Commissioner's written permission.

1.7. COORDINATION

A. Coordinate connection to water main with utility company.

PART 2 - PRODUCTS

2.0. DUCTILE-IRON PIPE AND FITTINGS

A. Ductile-iron pipe is intended for fire-suppression water-service-piping outside the building and underslab within the building.

B. Grooved-Joint, Ductile-Iron Pipe: AWWA C151, with cut, rounded-grooved ends.

C. Mechanical-Joint, Ductile-Iron Pipe: AWWA C151, with mechanical-joint bell and plain spigot end.

D. Push-on-Joint, Ductile-Iron Pipe: AWWA C151, with push-on-joint bell and plain spigot end.

E. Grooved-End, Ductile-Iron Pipe Appurtenances:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Anvil International, Inc.

b. Shurjoint Piping Products.
c. Star Pipe Products.
d. Victaulic Company.
e. Or Approved Equal

2. Grooved-End, Ductile-Iron Fittings: ASTM A 47/A 47M, malleable-iron castings or ASTM A 536, ductile-iron castings with dimensions matching pipe.
3. Grooved-End, Ductile-Iron-Piping Couplings: AWWA C606, for ductile-iron-pipe dimensions. Include ferrous housing sections, gasket suitable for water, and bolts and nuts.

F. Mechanical-Joint, Ductile-Iron Fittings: AWWA C110, ductile- or gray-iron standard pattern or AWWA C153, ductile-iron compact pattern.

1. Glands, Gaskets, and Bolts: AWWA C111, ductile- or gray-iron glands, rubber gaskets, and steel bolts.

G. Push-on-Joint, Ductile-Iron Fittings: AWWA C153, ductile-iron compact pattern.

1. Gaskets: AWWA C111, rubber.

H. Flanges: ASME B16.1, Class 125, cast iron.

2.1. SPECIAL PIPE FITTINGS

A. Ductile-Iron Flexible Expansion Joints:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. EBAA Iron, Inc.
b. ROMAC Industries Inc.
c. Star Pipe Products.
d. Or Approved Equal

2. Description: Compound, ductile-iron fitting with combination of flanged and mechanical-joint ends complying with AWWA C110 or AWWA C153. Include two gasketed ball-joint sections and one or more gasketed sleeve sections. Assemble components for offset and expansion indicated. Include AWWA C111, ductile-iron glands, rubber gaskets, and steel bolts.
3. Pressure Rating: 250 psig minimum.

B. Ductile-Iron Deflection Fittings:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. EBAA Iron, Inc.
b. ROMAC Industries Inc.

c. Star Pipe Products.
d. Or Approved Equal

2. Description: Compound, ductile-iron coupling fitting with sleeve and one or two flexing sections for up to 15-degree deflection, gaskets, and restrained-joint ends complying with AWWA C110 or AWWA C153. Include AWWA C111, ductile-iron glands, rubber gaskets, and steel bolts.
3. Pressure Rating: 250 psig minimum.

2.2. ENCASEMENT FOR PIPING

A. Standard: ASTM A 674 or AWWA C105.

B. Material: Linear low-density PE film of 0.008-inch or High-density, cross-laminated PE film of 0.004-inch minimum thickness.

C. Form: Sheet or tube.

D. Color: Black or natural.

2.3. JOINING MATERIALS

A. Gaskets for Ferrous Piping and Copper-Alloy Tubing: ASME B16.21, asbestos free.

2.4. CURB VALVES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Amcast Industrial Corporation.
2. Ford Meter Box Company, Inc. (The); Pipe Products Division.
3. Jones, James Company.
4. Master Meter, Inc.
5. McDonald, A. Y. Mfg. Co.
6. Mueller Co.; Water Products Division.
7. Red Hed Manufacturing & Supply.
8. Or Approved Equal

B. Curb Valves: Comply with AWWA C800 for high-pressure service-line valves. Valve has bronze body, ground-key plug or ball, wide tee head, and inlet and outlet matching service piping material.

C. Service Boxes for Curb Valves: Similar to AWWA M44 requirements for cast-iron valve boxes. Include cast-iron telescoping top section of length required for depth of burial of valve, plug with lettering "WATER," and bottom section with base that fits over curb valve and with a barrel approximately 3 inches in diameter.

1. Shutoff Rods: Steel; with tee-handle with one pointed end, stem of length to operate deepest buried valve, and slotted end matching curb valve.

D. Meter Valves: Comply with AWWA C800 for high-pressure service-line valves. Include angle- or straight-through-pattern bronze body, ground-key plug or ball, and wide tee head, with inlet and outlet matching service piping material.

2.5. GATE VALVES

A. UL-Listed or FM-Approved Gate Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. American AVK Company; Valve & Fittings Division.
b. American Cast Iron Pipe Company; American Flow Control Division.
c. American Cast Iron Pipe Company; Waterous Company Subsidiary.
d. Clow Valve Company; a division of McWane, Inc.
e. Crane Co.; Crane Valve Group; Jenkins Valves.
f. Crane Co.; Crane Valve Group; Stockham Division.
g. East Jordan Iron Works, Inc.
h. Hammond Valve.
i. Kennedy Valve; a division of McWane, Inc.
j. M&H Valve Company; a division of McWane, Inc.
k. Milwaukee Valve Company.
l. Mueller Co.; Water Products Division.
m. NIBCO INC.
n. Shurjoint Piping Products.
o. Troy Valve; a division of Penn-Troy Manufacturing, Inc.
p. Tyco Fire & Building Products LP.
q. United Brass Works, Inc.
r. U.S. Pipe.
s. Watts Water Technologies, Inc.
t. Or Approved Equal

2. 175-psig (1200-kPa), UL-Listed or FM-Approved, Iron, Nonrising-Stem Gate Valves:

a. Description: Iron body and bonnet, bronze seating material, and inside screw.
b. Standards: UL 262 and "Approval Guide," published by FM Global, listing.
c. Pressure Rating: 175 psig (1200) minimum.
d. End Connections: Mechanical or push-on joint.
e. Indicator-Post Flange: Include on valves used with indicator posts.

3. 250-psig UL-Listed or FM-Approved, Iron, Nonrising-Stem Gate Valves:

a. Description: Iron body and bonnet, bronze seating material, and inside screw.
b. Standards: UL 262 and "Approval Guide," published by FM Global, listing.
c. Pressure Rating: 250 psig minimum.
d. End Connections: Mechanical or push-on joint.
e. Indicator-Post Flange: Include on valves used with indicator posts.

4. 175-psig, UL-Listed or FM-Approved, Iron, OS&Y, Gate Valves:

a. Description: Iron body and bonnet and bronze seating material.
b. Standards: UL 262 and "Approval Guide," published by FM Global, listing.
c. Pressure Rating: 175 psig minimum.
d. End Connections: Flanged or grooved.

5. 250-psig, UL-Listed or FM-Approved, Iron, OS&Y Gate Valves:

   a. Description: Iron body and bonnet and bronze seating material.
   b. Standards: UL 262 and "Approval Guide," published by FM Global, listing.
   c. Pressure Rating: 250 psig minimum.
   d. End Connections: Flanged or grooved.

6. UL-Listed or FM-Approved, OS&Y Bronze, Gate Valves:

   a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

      1) Crane Co.; Crane Valve Group; Crane Valves.
      2) Crane Co.; Crane Valve Group; Stockham Division.
      3) Milwaukee Valve Company.
      4) NIBCO INC.
      5) United Brass Works, Inc.
      6) Or Approved Equal

   b. Description: Bronze body and bonnet and bronze stem.
   c. Standards: UL 262 and "Approval Guide," published by FM Global, listing.
   d. Pressure Rating: 175 psig minimum.
   e. End Connections: Threaded.

2.6. GATE VALVE ACCESSORIES AND SPECIALTIES

A. Tapping-Sleeve Assemblies:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. American Cast Iron Pipe Company; Waterous Company Subsidiary.
   b. Clow Valve Company; a division of McWane, Inc.
   c. East Jordan Iron Works, Inc.
   d. Flowserve.
   e. Kennedy Valve; a division of McWane, Inc.
   f. M&H Valve Company; a division of McWane, Inc.
   g. Mueller Co.; Water Products Division.
   h. U.S. Pipe.
   i. Or Approved Equal

2. Description: Sleeve and valve compatible with drilling machine.
3. Standard: MSS SP-60.
4. Tapping Sleeve: Cast-iron, ductile-iron, or stainless-steel, two-piece bolted sleeve with flanged outlet for new branch connection. Sleeve shall match size and type of pipe material being tapped and have recessed flange for branch valve.
5. Valve: AWWA, cast-iron, nonrising-stem, metal-seated gate valve with one raised-face flange mating tapping-sleeve flange.

B. Valve Boxes: Comply with AWWA M44 for cast-iron valve boxes. Include top section, adjustable extension of length required for depth of burial of valve, plug with lettering "WATER," and bottom section with base that fits over valve and with a barrel approximately 5 inches in diameter.

1. Operating Wrenches: Steel; with tee-handle with one pointed end, stem of length to operate deepest buried valve, and socket matching valve operating nut.

2. Description: Vertical-type, cast-iron body with operating wrench, extension rod, and adjustable cast-iron barrel of length required for depth of burial of valve.
3. Standards: UL 789 and "Approval Guide," published by FM Global, listing.

2.7. BUTTERFLY VALVES

A. Provide AWWA, UL-listed, or FM-approved valves as required by New York City Building Code.

B. AWWA Butterfly Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. DeZurik/Copes-Vulcan; a unit of SPX Corporation.
   b. Milliken Valve Company.
   c. Mosser Valve; a division of Olson Technologies, Inc.
   d. Mueller Co.; Water Products Division.
   e. Pratt, Henry Company.
   f. Val-Matic Valve & Manufacturing Corp.
   g. Or Approved Equal

2. Description: Rubber seated.
3. Standard: AWWA C504.
4. Body Material: Cast or ductile iron.
5. Body Type: Wafer or flanged.
6. Pressure Rating: 150 psig.

C. UL Butterfly Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. Kennedy Valve; a division of McWane, Inc.
   b. Milwaukee Valve Company.
   c. Mueller Co.; Water Products Division.
   d. NIBCO INC.
   e. Pratt, Henry Company.
   f. Or Approved Equal

2. Description: Metal on resilient material seating.
3. Standards: UL 1091 and "Approval Guide," published by FM Global, listing.
4. Body Material: Cast or ductile iron.
5. Body Type: Wafer or flanged.

6. Pressure Rating: 175 psig.

2.8. CHECK VALVES

A. AWWA Check Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. American AVK Company; Valves & Fittings Division.
   b. American Cast Iron Pipe Company; American Flow Control Division.
   c. APCO Willamette Valve and Primer Corporation.
   d. Clow Valve Company; a division of McWane, Inc.
   e. Crane Co.; Crane Valve Group; Crane Valves.
   f. Crane Co.; Crane Valve Group; Stockham Division.
   g. Kennedy Valve; a division of McWane, Inc.
   h. M&H Valve Company; a division of McWane, Inc.
   i. Mueller Co.; Water Products Division.
   j. NIBCO INC.
   k. Watts Water Technologies, Inc.
   l. Or Approved Equal

2. Description: Swing-check type with resilient seat; with interior coating according to AWWA C550 and ends to match piping.
3. Standard: AWWA C508.
4. Pressure Rating: 175 psig.

B. UL-Listed or FM-Approved Check Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. American Cast Iron Pipe Company; Waterous Company Subsidiary.
   b. Clow Valve Company; a division of McWane, Inc.
   c. Crane Co.; Crane Valve Group; Stockham Division.
   d. Globe Fire Sprinkler Corporation.
   e. Kennedy Valve; a division of McWane, Inc.
   f. Kidde Fire Fighting.
   g. Matco-Norca.
   h. Mueller Co.; Water Products Division.
   i. NIBCO INC.
   j. Reliable Automatic Sprinkler Co., Inc.
   k. Tyco Fire & Building Products LP.
   l. United Brass Works, Inc.
   m. Victaulic Company.
   n. Viking Corporation.
   o. Watts Water Technologies, Inc.
   p. Or Approved Equal

2. Description: Swing-check type with pressure rating, rubber-face checks unless otherwise indicated, and ends matching piping.

3. Standards: UL 312 and "Approval Guide," published by FM Global, listing.
4. Pressure Rating: 175 psig.

C. Double-Check, Detector-Assembly Backflow Preventers:

1. Standards: ASSE 1048 and UL's "Fire Protection Equipment Directory" listing or "Approval Guide," published by FM Global, listing.
2. Operation: Continuous-pressure applications.
3. Pressure Loss: 8 psig maximum, through middle one-third of flow range.
4. Size: 6.
5. Design Flow Rate: 500 gpm.
6. Selected Unit Flow Range Limits: 750 gpm.
7. Pressure Loss at Design Flow Rate: 8 psig maximum.
8. Body Material: Ductile iron ASTM A536 grade 4.
9. End Connections: Flanged.
10. Configuration: Designed for horizontal flow.
11. Accessories:

a. Valves: UL 262, "Approval Guide," published by FM Global, listing, approved; OS&Y gate type with flanged ends on inlet and outlet.
b. Bypass: With displacement-type water meter, shutoff valves, and reduced-pressure backflow preventer.

D. Backflow Preventer Test Kits:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Conbraco Industries, Inc.; Apollo Valves.
b. FEBCO; SPX Valves & Controls.
c. Flomatic Corporation.
d. Watts Water Technologies, Inc.
e. Zurn Plumbing Products Group; Wilkins Water Control Products Division.
f. Or Approved Equal

2. Description: Factory calibrated, with gages, fittings, hoses, and carrying case with test-procedure instructions.

2.9. FIRE-DEPARTMENT CONNECTIONS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Elkhart Brass Mfg. Company, Inc.
2. Fire-End & Croker Corporation.
3. Guardian Fire Equipment, Inc.
4. Kidde Fire Fighting.
5. Potter Roemer.
6. Reliable Automatic Sprinkler Co., Inc.
7. Or Approved Equal

B. Description: Wall mount flush recessed chrome plated brass, thread inlets according to NFPA 1963 and matching 2014NYCBC. Include lugged caps, gaskets, and chains; lugged swivel connection and drop clapper for each hose-connection inlet.

C. Standard: UL 405.

D. Connections: Two NPS 3 inlets and one NPS 4 outlet.

E. Finish: Polished chrome plated.

F. Escutcheon Plate Marking: "Standpipe and auto sprinkler."

2.10. ALARM DEVICES

A. General: UL 753 and "Approval Guide," published by FM Global, listing, of types and sizes to mate and match piping and equipment.

B. Water-Flow Indicators: Vane-type water-flow detector, rated for 250-psig working pressure; designed for horizontal or vertical installation; with two single-pole, double-throw circuit switches to provide isolated alarm and auxiliary contacts, 7 A, 125-V ac and 0.25 A, 24-V dc; complete with factory-set, field-adjustable retard element to prevent false signals and tamperproof cover that sends signal when cover is removed.

C. Supervisory Switches: Single pole, double throw; designed to signal valve in other than fully open position.

D. Pressure Switches: Single pole, double throw; designed to signal increase in pressure.

2.11. SLEEVES

A. Cast-Iron Wall-Pipe Sleeves: Cast or fabricated of cast iron and equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop unless otherwise indicated.

B. Galvanized-Steel-Sheet Sleeves: 0.0239-inch minimum thickness; round tube closed with welded longitudinal joint.

C. Galvanized-Steel-Pipe Sleeves: ASTM A 53/A 53M, Type E, standard-weight, zinc-coated, plain ends.

2.12. SLEEVE SEALS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Advance Products & Systems, Inc.
2. Calpico, Inc.
3. Metraflex, Inc.
4. Pipeline Seal and Insulator, Inc.
5. Or Approved Equal

B. Description: Modular sealing element unit, designed for field assembly, to fill annular space between pipe and sleeve.

C. Sealing Elements: EPDM-rubber or NBR interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.

D. Pressure Plates: Carbon steel.

E. Connecting Bolts and Nuts: Carbon steel with corrosion-resistant coating of length required to secure pressure plates to sealing elements.

2.13. GROUT

A. Standard: ASTM C 1107, Grade B, posthardening and volume adjusting, dry, hydraulic-cement grout.

B. Characteristics: Nonshrink; recommended for interior and exterior applications.

C. Design Mix: 5000-psi, 28-day compressive strength.

D. Packaging: Premixed and factory packaged.

PART 3 - EXECUTION

3.1. EXECUTION REQUIREMENTS

A. Refer to DDC General Conditions for execution requirements.

3.2. EARTHWORK

A. Comply with excavating, trenching, and backfilling requirements in Section 310000 "Earthwork."

3.3. PIPING INSTALLATION

A. Water-Main Connection: Tap water main according to requirements of water utility company and of size and in location indicated.

B. Make connections larger than NPS 2 with tapping machine according to the following:

1. Install tapping sleeve and tapping valve according to MSS SP-60.
2. Install tapping sleeve on pipe to be tapped. Position flanged outlet for gate valve.
3. Use tapping machine compatible with valve and tapping sleeve; cut hole in main. Remove tapping machine and connect water-service piping.
4. Install gate valve onto tapping sleeve. Comply with MSS SP-60. Install valve with stem pointing up and with valve box.

C. Comply with NFPA 24 for fire-service-main piping materials and installation.

D. Install ductile-iron, water-service piping according to AWWA C600 and AWWA M41.

1. Install encasement for piping according to ASTM A 674 or AWWA C105.

E. Bury piping with depth of cover over top at least 48 inches according to the following:

1. Under Driveways: With at least 48 inches of cover over top.

F. Install piping by tunneling or jacking, or combination of both, under streets and other obstructions that cannot be disturbed.

G. Extend fire-suppression water-service piping and connect to water-supply source and building fire-suppression water-service piping systems at locations and pipe sizes indicated.

1. Terminate fire-suppression water-service piping at building floor slab until building-water-piping systems are installed. Terminate piping with caps, plugs, or flanges as required for piping material. Make connections to building's fire-suppression water-service piping systems when those systems are installed.

H. Install underground piping with restrained joints at horizontal and vertical changes in direction. Use restrained-joint piping, thrust blocks, anchors, tie-rods and clamps, and other supports.

I. Comply with requirements in Sections 211313 "Water Sprinkler System" for fire-suppression-water piping inside the building.

J. Comply with requirements in Section 221116 "Domestic Water Piping" for potable-water piping inside the building.

3.4. JOINT CONSTRUCTION

A. Install couplings, flanges, flanged fittings, unions, nipples, and transition and special fittings that have finish and pressure rating same as or higher than systems pressure rating for aboveground applications unless otherwise indicated.

B. Install unions adjacent to each valve in tubing NPS 2 and smaller.

C. Install flanges, flange adaptors, or couplings for grooved-end piping on valves, apparatus, and equipment having NPS 2-1/2 and larger end connections.

D. Ream ends of tubes and remove burrs.

E. Remove scale, slag, dirt, and debris from outside and inside of pipes, tubes, and fittings before assembly.

F. Ductile-Iron Piping, Gasketed Joints for Fire-Service-Main Piping: UL 194.

G. Ductile-Iron Piping, Grooved Joints: Cut-groove pipe. Assemble joints with grooved-end, ductile-iron-piping couplings, gaskets, lubricant, and bolts.

H. Flanged Joints: Select appropriate gasket material in size, type, and thickness suitable for water service. Join flanges with bolts according to ASME B31.9.

I. Dissimilar Materials Piping Joints: Use adapters compatible with both piping materials, with OD, and with system working pressure.

J. Do not use flanges or unions for underground piping.

3.5. ANCHORAGE INSTALLATION

A. Anchorage, General: Install water-distribution piping with restrained joints. Anchorages and restrained-joint types that may be used include the following:

1. Concrete thrust blocks.
2. Locking mechanical joints.
3. Set-screw mechanical retainer glands.
4. Bolted flanged joints.
5. Heat-fused joints.
6. Pipe clamps and tie rods.

B. Install anchorages for tees, plugs and caps, bends, crosses and valves, in fire-suppression water-service piping according to NFPA 24 and the following:

1. Gasketed-Joint, Ductile-Iron, Water-Service Piping: According to AWWA C600.

C. Apply full coat of asphalt or other acceptable corrosion-resistant material to surfaces of installed ferrous anchorage devices.

3.6. VALVE INSTALLATION

A. AWWA Gate Valves: Comply with AWWA C600 and AWWA M44. Install each underground valve with stem pointing up and with valve box.

B. AWWA Valves Other Than Gate Valves: Comply with AWWA C600 and AWWA M44.

C. UL-Listed or FM-Approved Gate Valves: Comply with NFPA 24. Install each underground valve and valves in vaults with stem pointing up and with vertical cast-iron indicator post.

D. UL-Listed or FM-Approved Valves Other Than Gate Valves: Comply with NFPA 24.

E. MSS Valves: Install as component of connected piping system.

F. Curb Valves: Install each underground curb valve with head pointed up and with service box.

G. Support valves and piping, not direct buried, on concrete piers. Comply with requirements for concrete piers in Section 033000 "Cast-in-Place Concrete."

3.7. DOUBLE DETECTOR CHECK VALVE INSTALLATION

A. Install in indoors or aboveground.

B. Install for proper direction of flow. Install bypass with water meter, gate valves on each side of meter, and check valve downstream from meter.

C. Support detector check valves and piping on concrete piers. Comply with requirements for concrete piers in Section 033000 "Cast-in-Place Concrete."

3.8. FIRE-DEPARTMENT CONNECTION INSTALLATION

A. Install ball drip valves at each check valve for fire-department connection to mains.

3.9. ALARM DEVICE INSTALLATION

A. General: Comply with NFPA 24 for devices and methods of valve supervision. Underground valves with valve box do not require supervision.

B. Supervisory Switches: Supervise valves in open position.

1. Valves: Grind away portion of exposed valve stem. Bolt switch, with plunger in stem depression, to OS&Y gate-valve yoke.
2. Indicator Posts: Drill and thread hole in upper-barrel section at target plate. Install switch, with toggle against target plate, on barrel of indicator post.

C. Locking and Sealing: Secure unsupervised valves as follows:

1. Valves: Install chain and padlock on open OS&Y gate valve.
2. Post Indicators: Install padlock on wrench on indicator post.

D. Pressure Switches: Drill and thread hole in exposed barrel of fire hydrant. Install switch.

E. Water-Flow Indicators: Install in water-service piping in vault. Select indicator with saddle and vane matching pipe size. Drill hole in pipe, insert vane, and bolt saddle to pipe.

F. Connect alarm devices to building's fire-alarm system. Wiring and fire-alarm devices are specified in Section 283111 " Digital, Addressable Fire Alarm System".

3.10. CONNECTIONS

A. Connect fire-suppression water-service piping to existing street water main.

B. Connect fire-suppression water-service piping to interior fire-suppression piping.

3.11. SLEEVE INSTALLATION

A. General Requirements: Install sleeves for pipes and tubes passing through penetrations in exterior walls.

1. Exception: Sleeves are not required for core-drilled holes.

B. Cut sleeves to length for mounting flush with both surfaces.

C. Install sleeves in new floor slabs and walls as they are constructed.

D. For exterior wall penetrations above grade, seal annular space between sleeves and piping using joint sealants appropriate for size, depth, and location of joint. Comply with requirements for joint sealants in Section 079200 "Interior Joint Sealants."

E. For exterior wall penetrations below grade, seal annular space between sleeves and piping using sleeve seals.

F. Seal space outside of sleeves in concrete walls with grout.

G. Install the following sleeve materials:

1. Galvanized- steel pipe or steel-sheet sleeves for pipes smaller than NPS 6.
2. Cast-iron wall-pipe or galvanized-steel pipe sleeves for pipes NPS 6 and larger.

3.12. SLEEVE SEAL INSTALLATION

A. Install sleeve seals in sleeves in exterior concrete floor slabs and walls at fire-suppression water-service piping entries into the building.

B. Select type and number of sealing elements required for pipe material and size. Position pipe in center of sleeve. Assemble sleeve seal components and install in annular space between pipe and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make a watertight seal.

3.13. FIELD QUALITY CONTROL

A. Use test procedure prescribed by New York City Building Code or, if method is not prescribed, use procedure described below.

B. Piping Tests: Conduct piping tests before joints are covered and after concrete thrust blocks have hardened sufficiently. Fill pipeline 24 hours before testing and apply test pressure to stabilize system. Use only potable water.

C. Hydrostatic Tests: Test at not less than one-and-one-half times the working pressure for two hours.

1. Increase pressure in 50-psig increments and inspect each joint between increments. Hold at test pressure for one hour; decrease to 0 psig. Slowly increase again to test pressure and hold for one

more hour. Maximum allowable leakage is 2 quarts per hour per 100 joints. Remake leaking joints with new materials and repeat test until leakage is within allowed limits.

D. Prepare test and inspection reports.

3.14. IDENTIFICATION

A. Install continuous underground detectable warning tape during backfilling of trench for underground fire-suppression water-service piping. Locate below finished grade, directly over piping. Underground warning tapes are specified in Section 310000 "Earthwork."

3.15. CLEANING

A. Clean and disinfect fire-suppression water-service piping as follows:

1. Purge new piping systems and parts of existing systems that have been altered, extended, or restoreed before use.
2. Use purging and disinfecting procedure prescribed by New York City Building Code or, if method is not prescribed, use procedure described in NFPA 24 for flushing of piping. Flush piping system with clean, potable water until dirty water does not appear at points of outlet.
3. Use purging and disinfecting procedure prescribed by New York City Building Code or, if method is not prescribed, use procedure described in AWWA C651 or do as follows:

    a. Fill system or part of system with water/chlorine solution containing at least 50 ppm of chlorine; isolate and allow to stand for 24 hours.
    b. Drain system or part of system of previous solution and refill with water/chlorine solution containing at least 200 ppm of chlorine; isolate and allow to stand for three hours.
    c. After standing time, flush system with clean, potable water until no chlorine remains in water coming from system.
    d. Submit water samples in sterile bottles as code requires. Repeat procedure if biological examination shows evidence of contamination.

B. Prepare reports of purging and disinfecting activities.

C. Underground fire-suppression water-service piping NPS 6 to NPS 12 shall be one of the following:

1. Grooved-end, ductile-iron pipe; grooved-end, ductile-iron pipe appurtenances; and grooved joints.
2. Mechanical-joint, ductile-iron pipe; mechanical-joint, ductile- or gray-iron, standard-pattern or ductile-iron, compact-pattern fittings; glands, gaskets, and bolts; and gasketed joints.
3. Push-on-joint, ductile-iron pipe; push-on-joint, ductile-iron compact-pattern fittings; and gasketed joints.

D. Aboveground fire-suppression water-service piping NPS 5 to NPS 12 shall be grooved-end, ductile-iron pipe; grooved-end, ductile-iron pipe appurtenances; and grooved joints.

E. Underslab fire-suppression water-service piping NPS 6 to NPS 12 shall be one of the following:

1. Grooved-end, ductile-iron pipe; grooved-end, ductile-iron pipe appurtenances; and grooved joints.
2. Mechanical-joint, ductile-iron pipe; mechanical-joint, ductile- or gray-iron, standard-pattern fittings; glands, gaskets, and bolts; and restrained, gasketed joints.
3. Push-on-joint, ductile-iron pipe; push-on-joint, ductile-iron compact-pattern fittings; and restrained, gasketed joints.

3.16. VALVE SCHEDULE

A. Drawings indicate valve types to be used. Where specific valve types are not indicated, the following requirements apply:

B. Valves shall be of pressure rating required for specific application.

C. Underground fire-suppression water-service shutoff valves NPS 3 and larger shall be one of the following:

1. 200-psig, AWWA, iron, nonrising-stem, metal-seated gate valves.
2. 250-psig, AWWA, iron, nonrising-stem, resilient-seated gate valves.
3. 175-psig,250-psig, UL-listed or FM-approved, iron, nonrising-stem gate valves.

D. Standard-pressure, aboveground fire-suppression water-service shutoff valves NPS 3 and larger shall be one of the following:

1. 200-psig, AWWA, iron, OS&Y, metal-seated gate valves.
2. 250-psig, AWWA, iron, OS&Y, resilient-seated gate valves.
3. 175-psig, 250-psig, UL-listed or FM-approved, iron, OS&Y gate valves.
4. AWWA UL-listed or FM-approved butterfly valves.

E. Fire-suppression water-service check valves NPS 3 and larger shall be one of the following:

1. AWWA UL-listed or FM-approved check valves.
2. UL-listed or FM-approved detector check valves.

END OF SECTION 211100

SECTION 211200
Fire-Suppression Standpipes

PART 1 - GENERAL

1.1. RELATED DOCUMENTS

A. The following documents apply to all required work for the Project: (1) the Contract Drawings, (2) the Specifications, (3) the General Conditions, (4) the Addendum and (5) the Contract (City of New York Standard Construction Contract).

1.2. SUMMARY

A. Section Includes:

1. Pipes, fittings, and specialties.
2. Fire-protection valves.
3. Hose connections.
4. Hose stations.
5. Monitors.
6. Fire-department connections.
7. Alarm devices.
8. Manual control stations.
9. Control panels.
10. Pressure gages.

B. Related Sections:

1. Section 211313 "Wet-Pipe Sprinkler Systems" for wet-pipe sprinkler piping.
2. Section 283111 "Digital, Addressable Fire-Alarm System" for alarm devices not specified in this Section.

1.3. DEFINITIONS

A. High-Pressure Standpipe Piping: Fire-suppression standpipe piping designed to operate at working pressure higher than standard 175 psig (1200 kPa), but not higher than 350 psig.

B. Standard-Pressure Standpipe Piping: Fire-suppression standpipe piping designed to operate at working pressure 175 psig maximum.

1.4. SYSTEM DESCRIPTIONS

A. Manual – Wet Standpipe System: Includes NPS 2-1/2 (DN 65) hose connections. Has open water-supply valve with pressure maintained and is capable of supplying water demand.

1.5. PERFORMANCE REQUIREMENTS

A. Standard-Pressure, Fire-Suppression Standpipe System Component: Listed for 175-psig minimum working pressure.

B. High-Pressure, Fire-Suppression Standpipe System Component: Listed for 350-psig working pressure.

C. Engineering Criteria: Engineer fire-suppression standpipes, including comprehensive engineering analysis by a professional engineer licensed in the State of New York, using performance requirements and design criteria indicated.

D. Fire-suppression standpipe design shall be approved by the Commissioner.

1. Maximum residual pressure at required flow at each hose-connection outlet is as follows unless otherwise indicated:

   a. NPS 2-1/2 (DN 65) Hose Connections: 100 psig (1200 kPa).

E. Seismic Performance: Fire-suppression standpipes shall withstand the effects of earthquake motions determined according to NFPA 13 and (ASCE/SEI 7).

1.6. SUBMITTALS

A. Refer to DDC General Conditions Section 01 33 00 "Submittal Procedures."

B. Product Data: For each type of product indicated. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.

C. Shop Drawings: For fire-suppression standpipes. Include plans, elevations, sections, details, and attachments to other work.

1. Wiring Diagrams: For power, signal, and control wiring.

D. Engineering Data Submittal: For standpipe systems indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer licensed in the state of New York responsible for their preparation.

E. Coordination Drawings: Fire-suppression standpipes, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:

1. Plumbing piping and equipment.
2. Piping.
3. HVAC piping, ductwork and equipment.
4. Electric conduits and equipment.
5. All general construction entities

F.Qualification Data: For qualified Installer.

G. Approved Standpipe Drawings: Working plans, prepared according to NYC Building Code and NFPA 14, that have been approved by NYC Department of Buildings, including hydraulic calculations if applicable.

H. Welding certificates.

I. Fire-hydrant flow test report.

J. Field Test Reports and Certificates: Indicate and interpret test results for compliance with performance requirements and as described in NYC Building Code and NFPA 14. Include "Contractor's Material and Test Certificate for Aboveground Piping" and "Contractor's Material and Test Certificate for Underground Piping."

K. Field quality-control reports.

L. Operation and Maintenance Data: For fire-suppression standpipes specialties to include in emergency, operation, and maintenance manuals.

1.7. QUALITY ASSURANCE

A. Refer to DDC General Conditions Section 01 40 00 "Quality Requirements."

B. Installer Qualifications:

1. Installer's responsibilities include fabricating and installing fire-suppression standpipes and providing professional engineering services. Base calculations on results of fire-hydrant flow test.

a. Engineering Services: Preparation of working plans, calculations, and field test reports by a qualified professional engineer licensed in the State of New York.

C. Welding Qualifications: Qualify procedures and operators according to ASME Boiler and Pressure Vessel Code.

D. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

E. NFPA Standards: Fire-suppression standpipe equipment, specialties, accessories, installation, and testing shall comply with NYC Building Code and NFPA 14, "Installation of Standpipe and Hose Systems."

PART 2 - PRODUCTS

2.1. PIPING MATERIALS

A. Comply with requirements in "Piping Schedule" Article for applications of pipe, tube, and fitting materials, and for joining methods for specific services, service locations, and pipe sizes.

2.2. STEEL PIPE AND FITTINGS

A. Standard Weight, Galvanized-and Black-Steel Pipe: ASTM A 53/A 53M, Grade B. Pipe ends may be factory or field formed to match joining method.

B. Schedule 10, Black-Steel Pipe: ASTM A 135 or ASTM A 795/A 795M, Schedule 10 in NPS 2.5 to NPS5; and NFPA 13-specified wall thickness in NPS 6 to NPS 10, plain end.

C. Standard-Weight, Galvanized-and Black-Steel Pipe Nipples: ASTM A 733, made of ASTM A 53/A 53M, seamless steel pipe with threaded ends.

D. Galvanized and Uncoated, Steel Couplings: ASTM A 865, threaded.

E. Galvanized and Uncoated, Gray-Iron Threaded Fittings: ASME B16.4, Class 125, standard pattern.

F. Malleable- or Ductile-Iron Unions: UL 860.

G. Cast-Iron Flanges: ASME B16.1, Class 125.

H. Steel Flanges and Flanged Fittings: ASME B16.5, Class 150.

I. Steel Welding Fittings: ASTM A 234/A 234M and ASME B16.9.

J. Grooved-Joint, Steel-Pipe Appurtenances:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Anvil International, Inc.
    b. Corcoran Piping System Co.
    c. National Fittings, Inc.
    d. Shurjoint Piping Products.
    e. Tyco Fire & Building Products LP.
    f. Victaulic Company.
    g. Or Approved Equal

2. Pressure Rating: 175 psig (1200 kPa).
3. Galvanized and Uncoated, Grooved-End Fittings for Steel Piping: ASTM A 47/A 47M, malleable-iron casting or ASTM A 536, ductile-iron casting; with dimensions matching steel pipe.
4. Grooved-End-Pipe Couplings for Steel Piping: AWWA C606 and UL 213, rigid pattern, unless otherwise indicated, for steel-pipe dimensions. Include ferrous housing sections, EPDM-rubber gasket, and bolts and nuts.

2.3. PIPING JOINING MATERIALS

A. Pipe-Flange Gasket Materials: AWWA C110, rubber, flat face, 1/8 inch thick or ASME B16.21, nonmetallic and asbestos free.

1. Class 125, Cast-Iron Flanges and Class 150, Bronze Flat-Face Flanges: Full-face gaskets.
2. Class 250, Cast-Iron Flanges and Class 300, Steel Raised-Face Flanges: Ring-type gaskets.

B. Metal, Pipe-Flange Bolts and Nuts: ASME B18.2.1, carbon steel unless otherwise indicated.

C. Welding Filler Metals: Comply with AWS D10.12M/D10.12 for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.

2.4. LISTED FIRE-PROTECTION VALVES

A. General Requirements:

1. Valves shall be UL listed or FM approved.
2. Minimum Pressure Rating for Standard-Pressure Piping: 175 psig 350.

B. Ball Valves:

1. Standard: UL 1091 except with ball instead of disc.
2. Valves NPS 1-1/2 and Smaller: Bronze body with threaded ends.
3. Valves NPS 2 and NPS 2-1/2 : Bronze body with threaded ends or ductile-iron body with grooved ends.
4. Valves NPS 3 : Ductile-iron body with grooved ends.

C. Iron Butterfly Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. Anvil International, Inc.
   b. Fivalco Inc.
   c. Global Safety Products, Inc.
   d. Kennedy Valve; a division of McWane, Inc.
   e. Milwaukee Valve Company.
   f. NIBCO INC.
   g. Pratt, Henry Company.
   h. Shurjoint Piping Products.
   i. Tyco Fire & Building Products LP.
   j. Victaulic Company.
   k. Or approved equal.

2. Standard: UL 1091.
3. Pressure Rating: 175 psig .
4. Body Material: Cast or ductile iron.
5. Style: Lug or wafer.
6. End Connections: Grooved.

D. Check Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following :

   a. AFAC Inc.
   b. American Cast Iron Pipe Company; Waterous Company Subsidiary.

c. Anvil International, Inc.
d. Clow Valve Company; a division of McWane, Inc.
e. Crane Co.; Crane Valve Group; Crane Valves.
f. Crane Co.; Crane Valve Group; Jenkins Valves.
g. Crane Co.; Crane Valve Group; Stockham Division.
h. Fire-End & Croker Corporation.
i. Fire Protection Products, Inc.
j. Fivalco Inc.
k. Globe Fire Sprinkler Corporation.
l. Groeniger & Company.
m. Kennedy Valve; a division of McWane, Inc.
n. Matco-Norca.
o. Metraflex, Inc.
p. Milwaukee Valve Company.
q. Mueller Co.; Water Products Division.
r. NIBCO INC.
s. Potter Roemer.
t. Reliable Automatic Sprinkler Co., Inc.
u. Shurjoint Piping Products.
v. Tyco Fire & Building Products LP.
w. United Brass Works, Inc.
x. Venus Fire Protection Ltd.
y. Victaulic Company.
z. Viking Corporation.
aa. Watts Water Technologies, Inc.
bb. Or approved equal.

2. Standard: UL 312.
3. Pressure Rating: 250 psig minimum.
4. Type: Swing check.
5. Body Material: Cast iron.
6. End Connections: Flanged or grooved.

E. Iron OS&Y Gate Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. American Cast Iron Pipe Company; Waterous Company Subsidiary.
b. American Valve, Inc.
c. Clow Valve Company; a division of McWane, Inc.
d. Crane Co.; Crane Valve Group; Crane Valves.
e. Crane Co.; Crane Valve Group; Jenkins Valves.
f. Crane Co.; Crane Valve Group; Stockham Division.
g. Hammond Valve.
h. Milwaukee Valve Company.
i. Mueller Co.; Water Products Division.
j. NIBCO INC.
k. Shurjoint Piping Products.

l. Tyco Fire & Building Products LP.
m. United Brass Works, Inc.
n. Watts Water Technologies, Inc.
o. Or approved equal.

2. Standard: UL 262.
3. Pressure Rating: 250 psig (1725 kPa) minimum.
4. Body Material: Cast or ductile iron.
5. End Connections: Flanged or grooved.

F. Indicating-Type Butterfly Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Anvil International, Inc.
b. Fivalco Inc.
c. Global Safety Products, Inc.
d. Kennedy Valve; a division of McWane, Inc.
e. Milwaukee Valve Company.
f. NIBCO INC.
g. Shurjoint Piping Products.
h. Tyco Fire & Building Products LP.
i. Victaulic Company.
j. Or approved equal.

2. Standard: UL 1091.
3. Pressure Rating: 175 psig minimum.
4. Valves NPS 2 and Smaller:

a. Valve Type: Ball or butterfly.
b. Body Material: Bronze.
c. End Connections: Threaded.

5. Valves NPS 2-1/2 and Larger:

a. Valve Type: Butterfly.
b. Body Material: Cast or ductile iron.
c. End Connections: Flanged, grooved, or wafer.

6. Valve Operation: Integral electrical, 115-V ac, prewired, single-circuit, supervisory switch electrical, 115-V ac, prewired, two-circuit, supervisory switch visual indicating device, as required for operating conditions.

G. NRS Gate Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. American Cast Iron Pipe Company; Waterous Company Subsidiary.

b. American Valve, Inc.
c. Clow Valve Company; a division of McWane, Inc.
d. Crane Co.; Crane Valve Group; Stockham Division.
e. Kennedy Valve; a division of McWane, Inc.
f. Mueller Co.; Water Products Division.
g. NIBCO INC.
h. Tyco Fire & Building Products LP.
i. Or approved equal.

2. Standard: UL 262.
3. Pressure Rating: 250 psig (1725 kPa) minimum.
4. Body Material: Cast iron with indicator post flange.
5. Stem: Nonrising.
6. End Connections: Flanged or grooved.

2.5. TRIM AND DRAIN VALVES

A. General Requirements:

1. Standard: UL's "Fire Protection Equipment Directory" lists or "Approval Guide," published by FM Global, listing.
2. Pressure Rating: 175 psig minimum.

B. Ball Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Affiliated Distributors.
b. Anvil International, Inc.
c. Barnett.
d. Conbraco Industries, Inc.; Apollo Valves.
e. Fire-End & Croker Corporation.
f. Fire Protection Products, Inc.
g. Flowserve.
h. FNW.
i. Jomar International, Ltd.
j. Kennedy Valve; a division of McWane, Inc.
k. Kitz Corporation.
l. Legend Valve.
m. Metso Automation USA Inc.
n. Milwaukee Valve Company.
o. NIBCO INC.
p. Potter Roemer.
q. Red-White Valve Corporation.
r. Southern Manufacturing Group.
s. Stewart, M. A. and Sons Ltd.
t. Tyco Fire & Building Products LP.
u. Victaulic Company.

v. Watts Water Technologies, Inc.
w. Or approved equal.

2.6. SPECIALTY VALVES

A. General Requirements:

1. Standard: UL's "Fire Protection Equipment Directory" listing or "Approval Guide," published by FM Global, listing.
2. Pressure Rating:

   a. Standard-Pressure Piping Specialty Valves: 175 psig minimum.
   b. High-Pressure Piping Specialty Valves: 350 psig.

3. Body Material: Cast or ductile iron.
4. Size: Same as connected piping.
5. End Connections: Flanged or grooved.

B. Automatic Ball Drip Drain Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. AFAC Inc.
   b. Reliable Automatic Sprinkler Co., Inc.
   c. Tyco Fire & Building Products LP.
   d. Or approved equal.

2. Standard: UL 1726.
3. Pressure Rating: 175 psig minimum.
4. Type: Automatic draining, ball check.
5. Size: NPS 3/4 .
6. End Connections: Threaded.

2.7. HOSE CONNECTIONS

A. Adjustable-Valve Hose Connections:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. AFAC Inc.
   b. Elkhart Brass Mfg. Company, Inc.
   c. Fire-End & Croker Corporation.
   d. Fire Protection Products, Inc.
   e. GMR International Equipment Corporation.
   f. Guardian Fire Equipment, Inc.
   g. Potter Roemer.
   h. Tyco Fire & Building Products LP.
   i. Wilson & Cousins Inc.

j. Zurn Plumbing Products Group; Wilkins Water Control Products Division.
k. Or approved equal.

2. Standard: UL 668 hose valve, with integral UL 1468 reducing or restricting pressure-control device, for connecting fire hose.
3. Pressure Rating: 350 psig minimum.
4. Material: Brass or bronze.
5. Size: NPS 1-1/2 or NPS 2-1/2, as indicated.
6. Inlet: Female pipe threads.
7. Outlet: Male hose threads with lugged cap, gasket, and chain. Include hose valve threads according to NFPA 1963 and matching 2014NYCBC.
8. Pattern: Angle or gate.
9. Pressure-Control Device Type: Pressure reducing.
10. Design Outlet Pressure Setting: psig.
11. Finish: Rough brass or bronze.

B. Nonadjustable-Valve Hose Connections:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. AFAC Inc.
b. Elkhart Brass Mfg. Company, Inc.
c. Fire-End & Croker Corporation.
d. Fire Protection Products, Inc.
e. GMR International Equipment Corporation.
f. Guardian Fire Equipment, Inc.
g. Kennedy Valve; a division of McWane, Inc.
h. Mueller Co.; Water Products Division.
i. NIBCO INC.
j. Potter Roemer.
k. Tyco Fire & Building Products LP.
l. Wilson & Cousins Inc.
m. Or approved equal.

2. Standard: UL 668 hose valve for connecting fire hose.
3. Pressure Rating: 300 psig minimum.
4. Material: Brass or bronze.
5. Size: NPS 1-1/2 or NPS 2-1/2, as indicated.
6. Inlet: Female pipe threads.
7. Outlet: Male hose threads with lugged cap, gasket, and chain. Include hose valve threads according to NFPA 1963 and matching 2014NYCBC.
8. Pattern: Angle or gate.
9. Finish: Rough brass or bronze.

C. Flush-Type, Fire-Department Connection:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. AFAC Inc.
b. Elkhart Brass Mfg. Company, Inc.
c. GMR International Equipment Corporation.
d. Guardian Fire Equipment, Inc.
e. Potter Roemer.
f. Or approved equal.

2. Standard: FM approved.
3. Type: Flush, for wall mounting, two-way inlet
4. Pressure Rating: 600 psig minimum.
5. Body Material: Corrosion-resistant metal.
6. Inlets: Brass with threads according to NFPA 1963 and matching 2014NYCBC sizes and threads. Include extension pipe nipples, brass lugged swivel connections, and check devices or clappers.
7. Caps: Brass, lugged type, with gasket and chain.
8. Escutcheon Plate: Rectangular, brass, wall type.
9. Outlet: With pipe threads.
10. Body Style: Horizontal.
11. Number of Inlets: Two.
12. Outlet Location: Back Bottom Left side, Right side Top as required.
13. Escutcheon Plate Marking: Similar to "AUTO SPKR & STANDPIPE."
14. Finish: Polished chrome plated.
15. Outlet Size: NPS 4 (DN 100) NPS 5 (DN 125) NPS 6 (DN 150).

2.8. ALARM DEVICES

A. Alarm-device types shall match piping and equipment connections.

B. Electrically Operated Alarm Bell:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Fire-Lite Alarms, Inc.; a Honeywell company.
b. Notifier; a Honeywell company.
c. Potter Electric Signal Company.
d. Or approved equal.

2. Standard: UL 464.
3. Type: Vibrating, metal alarm bell.
4. Size: 8-inch minimum 10-inch (250-mm) diameter.
5. Finish: Red-enamel factory finish, suitable for outdoor use.

C. Water-Flow Indicators:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. ADT Security Services, Inc.
b. McDonnell & Miller; ITT Industries.
c. Potter Electric Signal Company.

d. System Sensor; a Honeywell company.
e. Viking Corporation.
f. Watts Industries (Canada) Inc.
g. Or approved equal.

2. Standard: UL 346.
3. Water-Flow Detector: Electrically supervised.
4. Components: Two single-pole, double-throw circuit switches for isolated alarm and auxiliary contacts, 7 A, 125-V ac and 0.25 A, 24-V dc; complete with factory-set, field-adjustable retard element to prevent false signals and tamperproof cover that sends signal if removed.
5. Type: Paddle operated.
6. Pressure Rating: 250 psig.
7. Design Installation: Horizontal or vertical.

D. Pressure Switches:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. AFAC Inc.
b. Barksdale, Inc.
c. Detroit Switch, Inc.
d. Potter Electric Signal Company.
e. System Sensor; a Honeywell company.
f. Tyco Fire & Building Products LP.
g. United Electric Controls Co.
h. Viking Corporation.
i. Or approved equal.

2. Standard: UL 346.
3. Type: Electrically supervised water-flow switch with retard feature.
4. Components: Single-pole, double-throw switch with normally closed contacts.
5. Design Operation: Rising pressure signals water flow.

E. Valve Supervisory Switches:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Fire-Lite Alarms, Inc.; a Honeywell company.
b. Kennedy Valve; a division of McWane, Inc.
c. Potter Electric Signal Company.
d. System Sensor; a Honeywell company.
e. Or approved equal.

2. Standard: UL 346.
3. Type: Electrically supervised.
4. Components: Single-pole, double-throw switch with normally closed contacts.
5. Design: Signals that controlled valve is in other than fully open position.

2.9. PRESSURE GAGES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. AMETEK; U.S. Gauge Division.
2. Ashcroft Inc.
3. Brecco Corporation.
4. WIKA Instrument Corporation.
5. Or approved equal.

B. Standard: UL 393.

C. Dial Size: 3-1/2- to 4-1/2-inch diameter.

D. Pressure Gage Range: 0 to 300 psig.

E. Water System Piping Gage: Include "WATER" or "AIR/WATER" label on dial face.

2.10. ESCUTCHEONS

A. General: Manufactured ceiling, floor, and wall escutcheons and floor plates.

B. One-Piece, Cast-Brass Escutcheons: Polished chrome-plated finish with set-screws.

C. One-Piece, Deep-Pattern Escutcheons: Deep-drawn, box-shaped brass with chrome-plated finish.

D. One-Piece, Stamped-Steel Escutcheons: Chrome-plated finish with set-screw.

E. Split-Casting, Cast-Brass Escutcheons: Polished chrome-plated finish with concealed hinge and set-screw.

F.Split-Plate, Stamped-Steel Escutcheons: Chrome-plated finish with concealed hinge and set-screw.

G. One-Piece Floor Plates: Cast-iron flange with holes for fasteners.

H. Split-Casting Floor Plates: Cast brass with concealed hinge.

2.11. SLEEVES

A. Galvanized-Steel-Sheet Sleeves: 0.0239-inch (0.6-mm) minimum thickness; round tube closed with welded longitudinal joint.

B. Galvanized-Steel-Pipe Sleeves: ASTM A 53/A 53M, Type E, standard weight, zinc coated, plain ends.

C. Stack Sleeve Fittings: Manufactured, cast-iron sleeve with integral clamping flange. Include clamping ring and bolts and nuts for membrane flashing.

1. Underdeck Clamp: Clamping ring with set-screws.

2.12. SLEEVE SEALS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Advance Products & Systems, Inc.
2. Calpico, Inc.
3. Metraflex, Inc.
4. Pipeline Seal and Insulator, Inc.
5. Or approved equal.

B. Description: Modular sealing element unit, designed for field assembly, to fill annular space between pipe and sleeve.

1. Sealing Elements: EPDM-rubber interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.
2. Pressure Plates: Carbon steel.
3. Connecting Bolts and Nuts: Carbon steel with corrosion-resistant coating of length required to secure pressure plates to sealing elements.

2.13. GROUT

A. Standard: ASTM C 1107, Grade B, posthardening and volume adjusting, dry, hydraulic-cement grout.

B. Characteristics: Nonshrink, and recommended for interior and exterior applications.

C. Design Mix: 5000-psi , 28-day compressive strength.

D. Packaging: Premixed and factory packaged.

PART 3 - EXECUTION

3.1. EXECUTION REQUIREMENTS

A. Refer to DDC General Conditions for execution requirements.

3.2. PREPARATION

A. Perform fire-hydrant flow test according to NYC DEP NFPA 14 and NFPA 291. Use results for system design calculations required in "Quality Assurance" Article.

B. Report test results promptly and in writing.

3.3. EXAMINATION

A. Examine roughing-in for hose connections and stations to verify actual locations of piping connections before installation.

B. Examine walls and partitions for suitable thickness, fire- and smoke-rated construction, framing for hose-station cabinets, and other conditions where hose connections and stations are to be installed.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.4. SERVICE-ENTRANCE PIPING

A. Connect fire-suppression standpipe piping to water-service piping at service entrance into building. Comply with requirements for exterior piping in Section 221113 "Facility Water Distribution Piping."

B. Install shutoff valve, backflow preventer, pressure gage, drain, and other accessories at connection to fire-suppression water-service piping. Comply with requirements for backflow preventers in Section 221113 "Facility Water Distribution Piping."

C. Install shutoff valve, check valve, pressure gage, and drain at connection to water service.

3.5. PIPING INSTALLATION

A. Locations and Arrangements: Drawing plans, schematics, and diagrams indicate general location and arrangement of piping. Install piping as indicated, as far as practical.

1. Deviations from approved working plans for piping require written approval from the Commissioner. File written approval with Commissioner before deviating from approved working plans.

B. Piping Standard: Comply with requirements in NYC Building Code NFPA 14 for installation of fire-suppression standpipe piping.

C. Install seismic restraints on piping. Comply with requirements in NFPA 13 for seismic-restraint device materials and installation.

D. Install listed fittings to make changes in direction, branch takeoffs from mains, and reductions in pipe sizes.

E. Install drain valves on standpipes. Extend drain piping to outside of building.

F.Install automatic ball drip drain valves to drain piping between fire-department connections and check valves. Drain to floor drain or outside building.

G. Install alarm devices in piping systems.

H. Install hangers and supports for standpipe system piping according to NYC Building Code and NFPA 14. Comply with requirements in NFPA 13 for hanger materials.

I. Install pressure gages on riser or feed main and at top of each standpipe. Include pressure gages with connection not less than NPS 1/4 and with soft-metal seated globe valve, arranged for draining pipe between gage and valve. Install gages to permit removal, and install where they will not be subject to freezing.

J. Fill wet-type standpipe system piping with water.

K. Install electric heating cables and pipe insulation on wet-type, fire-suppression standpipe piping in areas subject to freezing.

3.6. JOINT CONSTRUCTION

A. Install couplings, flanges, flanged fittings, unions, nipples, and transition and special fittings that have finish and pressure ratings same as or higher than system's pressure rating for aboveground applications unless otherwise indicated.

B. Install unions adjacent to each valve in pipes NPS 2 and smaller.

C. Install flanges, flange adapters, or couplings for grooved-end piping on valves, apparatus, and equipment having NPS 2-1/2 and larger end connections.

D. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.

E. Remove scale, slag, dirt, and debris from inside and outside of pipes, tubes, and fittings before assembly.

F.Flanged Joints: Select appropriate gasket material in size, type, and thickness suitable for water service. Join flanges with gasket and bolts according to ASME B31.9.

G. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:

1. Apply appropriate tape or thread compound to external pipe threads.
2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged.

H. Steel-Piping, Cut-Grooved Joints: Cut square-edge groove in end of pipe according to AWWA C606. Assemble coupling with housing, gasket, lubricant, and bolts. Join steel pipe and grooved-end fittings according to AWWA C606 for steel-pipe joints.

I. Steel-Piping, Roll-Grooved Joints: Roll rounded-edge groove in end of pipe according to AWWA C606. Assemble coupling with housing, gasket, lubricant, and bolts. Join steel pipe and grooved-end fittings according to AWWA C606 for steel-pipe grooved joints.

J. Welded Joints: Construct joints according to AWS D10.12M/D10.12, using qualified processes and welding operators according to "Quality Assurance" Article.

K. Dissimilar-Material Piping Joints: Make joints using adapters compatible with materials of both piping systems.

3.7. VALVE AND SPECIALTIES INSTALLATION

A. Install listed fire-protection valves, trim and drain valves, specialty valves and trim, controls, and specialties according to NYC Building Code NFPA 14 and NYC Department of Buildings.

B. Install listed fire-protection shutoff valves supervised-open, located to control sources of water supply except from fire-department connections. Install permanent identification signs indicating portion of system controlled by each valve.

3.8. HOSE-CONNECTION INSTALLATION

A. Install hose connections adjacent to standpipes.

B. Install freestanding hose connections for access and minimum passage restriction.

C. Install NPS 1-1/2 hose-connection valves with flow-restricting device.

D. Install NPS 2-1/2 hose connections with quick-disconnect NPS 2-1/2 by NPS 1-1/2 (DN 65 by DN 40) reducer adapter and flow-restricting device.

3.9. FIRE-DEPARTMENT CONNECTION INSTALLATION

A. Install wall-type, fire-department connections.

B. Install automatic ball drip drain valve at each check valve for fire-department connection.

3.10. ESCUTCHEON INSTALLATION

A. Install escutcheons for penetrations of walls, ceilings, and floors.

B. Escutcheons for New Piping:

1. Piping with Fitting or Sleeve Protruding from Wall: One piece, deep pattern.
2. Bare Piping at Wall and Floor Penetrations in Finished Spaces: One piece, cast brass with polished chrome-plated finish.
3. Bare Piping at Ceiling Penetrations in Finished Spaces: One piece, cast brass with polished chrome-plated finish.
4. Bare Piping in Unfinished Service Spaces: One piece, stamped steel with set-screw.
5. Bare Piping in Equipment Rooms: One piece, stamped steel with set-screw.
6. Bare Piping at Floor Penetrations in Equipment Rooms: One-piece floor plate.

3.11. SLEEVE INSTALLATION

A. General Requirements: Install sleeves for pipes and tubes passing through penetrations in floors, partitions, roofs, and walls.

B. Sleeves are not required for core-drilled holes.

C. Permanent sleeves are not required for holes formed by removable PE sleeves.

D. Cut sleeves to length for mounting flush with both surfaces unless otherwise indicated.

E. Install sleeves in new partitions, slabs, and walls as they are built.

F. For interior wall penetrations, seal annular space between sleeve and pipe or pipe insulation using joint sealants appropriate for size, depth, and location of joint. Comply with requirements for joint sealants in Section 079200 "Interior Joint Sealants."

G. For exterior wall penetrations above grade, seal annular space between sleeve and pipe using joint seal ants appropriate for size, depth, and location of joint. Comply with requirements for joint sealants in Sec tion 079201"Exterior Joint Sealants."

H. For exterior wall penetrations below grade, seal annular space between sleeve and pipe using sleeve seals.

I. Seal space outside of sleeves in concrete slabs and walls with grout.

J. Install sleeves that are large enough to provide 1 inch annular clear space between sleeve and pipe or pipe insulation unless otherwise indicated.

K. Install sleeve materials according to the following applications:

1. Sleeves for Piping Passing through Concrete Floor Slabs: Galvanized-steel pipe.
2. Sleeves for Piping Passing through Concrete Floor Slabs of Mechanical Equipment Areas or Other Wet Areas: Galvanized-steel pipe.

    a. Extend sleeves 2 inches above finished floor level.
    b. For pipes penetrating floors with membrane waterproofing, extend cast-iron sleeve fittings below floor slab as required to secure clamping ring if ring is specified. Secure flashing between clamping flanges. Install section of cast-iron soil pipe to extend sleeve to 2 inches above finished floor level.

3. Sleeves for Piping Passing through Gypsum-Board Partitions:

    a. Galvanized-steel-pipe sleeves for pipes smaller than NPS 6.
    b. Galvanized-steel-sheet sleeves for pipes NPS 6 and larger.
    c. Exception: Sleeves are not required for water-supply tubes and waste pipes for individual plumbing fixtures if escutcheons will cover openings.

4. Sleeves for Piping Passing through Concrete Roof Slabs: Galvanized-steel pipe.
5. Sleeves for Piping Passing through Exterior Concrete Walls:

    a. Galvanized-steel-pipe sleeves for pipes smaller than NPS 6.
    b. Cast-iron wall pipe sleeves for pipes NPS 6 (DN 150) and larger.
    c. Install sleeves that are large enough to provide 1-inch annular clear space between sleeve and pipe or pipe insulation when sleeve seals are used.

6. Sleeves for Piping Passing through Interior Concrete Walls:

    a. Galvanized-steel-pipe sleeves for pipes smaller than NPS 6.
    b. Galvanized-steel-sheet sleeves for pipes NPS 6 and larger.

L. Fire-Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with firestop materials.

3.12. SLEEVE SEAL INSTALLATION

A. Install sleeve seals in sleeves in exterior concrete walls at water-service piping entries into building.

B. Select type and number of sealing elements required for pipe material and size. Position pipe in center of sleeve. Assemble sleeve seal components and install in annular space between pipe and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

3.13. IDENTIFICATION

A. Install labeling and pipe markers on equipment and piping according to requirements in NYC Building Code and NFPA 14. Each hose connection provided with a conspicuous sign that reads "Manual Stand pipe for Fire Department Use Only."

B. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

3.14. FIELD QUALITY CONTROL

A. Tests and Inspections:

1. Leak Test: After installation, charge systems and test for leaks. Restore leaks and retest until no leaks exist.
2. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
3. Flush, test, and inspect standpipe systems according to NYC Building Code NFPA 14, "System Acceptance" Chapter.
4. Energize circuits to electrical equipment and devices.
5. Start and run air compressors.
6. Coordinate with fire-alarm tests. Operate as required.
7. Coordinate with fire-pump tests. Operate as required.

B. Fire-suppression standpipe system will be considered defective if it does not pass tests and inspections.

C. Prepare test and inspection reports.

3.15. INSTRUCTION

A. Engage a factory-authorized service representative to instruct the City of New York's operating person nel to adjust, operate, and maintain specialty valves.

3.16. PIPING SCHEDULE

A. Piping between Fire-Department Connections and Check Valves: Galvanized, standard-weight steel pipe with threaded ends; cast-iron threaded fittings; and threaded or grooved ends; grooved-end fittings; grooved-end-pipe couplings; and grooved joints.

B. Standard-pressure, wet-type, fire-suppression standpipe piping, NPS 2.5 and smaller, shall be one of the following:

1. Standard-weight, black-steel pipe with threaded ends; uncoated, gray-iron threaded fittings; and threaded joints.
2. Standard-weight, galvanized-steel pipe with threaded ends; galvanized, gray-iron threaded fittings; and threaded joints.

C. Standard-pressure, wet-type, fire-suppression standpipe piping, NPS 3 and larger shall be one of the fol lowing:

1. Standard-weight, black-steel pipe with threaded ends; uncoated, gray-iron threaded fittings; and threaded joints.
2. Standard-weight, galvanized-steel pipe with threaded ends; galvanized, gray-iron threaded fittings; and threaded joints.
3. Standard-weight, black-steel pipe with cut- or roll-grooved ends; uncoated, grooved-end fittings for steel piping; grooved-end-pipe couplings for steel piping; and grooved joints.
4. Standard-weight, galvanized-steel pipe with cut-grooved ends; galvanized, grooved-end fittings for steel piping; grooved-end-pipe couplings for steel piping; and grooved joints.
5. Schedule 10,black-steel pipe with roll-grooved ends; uncoated, grooved-end fittings for steel piping; grooved-end-pipe couplings for steel piping; and grooved joints.

END OF SECTION 211200

SECTION 211313
Wet-Pipe Sprinkler Systems

PART 1 - GENERAL

1.1. RELATED DOCUMENTS

A. The following documents apply to all required work for the Project: (1) the Contract Drawings, (2) the Specifications, (3) the General Conditions, (4) the Addendum and (5) the Contract (City of New York Standard Construction Contract).

1.2. SUMMARY

A. Section Includes:

1. Pipes, fittings, and specialties.
2. Fire-protection valves.
3. Fire-department connections.
4. Sprinklers.
5. Alarm devices.
6. Control panels.
7. Pressure gages.

B. Related Sections:

1. Section 211200 "Fire-Suppression Standpipes" for standpipe piping.
2. Section 213113 "Electric-Drive, Centrifugal Fire Pumps" for fire pumps, pressure-maintenance pumps, and fire-pump controllers.

1.3. DEFINITIONS

A. High-Pressure Sprinkler Piping: Wet-pipe sprinkler system piping designed to operate at working pressure higher than standard 175 psig, but not higher than 350 psig.

B. Standard-Pressure Sprinkler Piping: Wet-pipe sprinkler system piping designed to operate at working pressure of 175 psig (1200 kPa) maximum.

1.4. SYSTEM DESCRIPTIONS

A. Wet-Pipe Sprinkler System: Automatic sprinklers are attached to piping containing water and that is connected to water supply through a fire pump. Water discharges immediately from sprinklers when they are opened. Sprinklers open when heat melts fusible link or destroys frangible device. Hose connections are included if indicated.

1.5. PERFORMANCE REQUIREMENTS

A. Standard-Pressure Piping System Component: Listed for 175-psig, minimum working pressure.

B. Engineering Requirements: Engineer sprinkler system(s), including comprehensive engineering analysis by a professional engineer licensed in the State of New York, using performance requirements and design criteria indicated.

C. Sprinkler system design shall be approved as required by the New York City Building Code.

1. Margin of Safety for Available Water Flow and Pressure: 10 percent, including losses through water-service piping, valves, and backflow preventers.
2. Sprinkler Occupancy Hazard Classifications:
   a. Building Service Areas: Ordinary Hazard, Group 1.
   b. General Storage Areas: Ordinary Hazard, Group 1.
   c. Mechanical Equipment Rooms: Ordinary Hazard, Group 1.
   d. Office and Public Areas: Light Hazard.
3. Minimum Density for Automatic-Sprinkler Piping Design:
   a. Light-Hazard Occupancy: 0.10 gpm over 1500-sq. ft. area.
   b. Ordinary-Hazard, Group 1 Occupancy: 0.15 gpm over 1500-sq. ft. area.
   c. Ordinary-Hazard, Group 2 Occupancy: 0.20 gpm over 1500-sq. ft. area.
4. Maximum Protection Area per Sprinkler:
   a. Office Spaces: 225 sq. ft.
   b. Storage Areas: 130 sq. ft.
   c. Mechanical Equipment Rooms: 130 sq. ft.
   d. Electrical Equipment Rooms: 130 sq. ft.
   e. Other Areas: According to NFPA 13 recommendations unless otherwise indicated.
5. Total Combined Hose-Stream Demand Requirement: According to NYC Building Code and NFPA 13 unless otherwise indicated:
   a. Light-Hazard Occupancies: 100 gpm for 30 minutes.
   b. Ordinary-Hazard Occupancies: 250 gpm for 60 to 90 minutes.

D. Seismic Performance: Sprinkler piping shall withstand the effects of earthquake motions determined according to NFPA 13.

1.6. SUBMITTALS

A. Refer to DDC General Conditions Section 01 33 00 "Submittal Procedures."

B. Product Data: For each type of product indicated. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.

C. Shop Drawings: For wet-pipe sprinkler systems. Include plans, elevations, sections, details, and attachments to other work.

1. Wiring Diagrams: For power, signal, and control wiring.

D. Coordination Drawings: Sprinkler systems, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:

1. Domestic water piping.
2. Sanitary Piping.
3. HVAC hydronic piping and other conduits.
4. Ductwork.
5. Items penetrating finished ceiling include the following:

   a. Lighting fixtures.
   b. Air outlets and inlets.
   c. Speakers.
   d. Miscellaneous ceiling mounted devices.

E. Approved Sprinkler Piping Drawings: Working plans, prepared according to NFPA 13, that have been approved, including hydraulic calculations if applicable.

F. Welding certificates.

G. Fire-hydrant flow test report.

H. Field quality-control reports.

I. Operation and Maintenance Data: For sprinkler specialties to include in emergency, operation, and maintenance manuals.

J. Engineering Data Submittal: For wet standpipe systems indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer licensed in the state of New York responsible for their preparation.

1.7. QUALITY ASSURANCE

A. Refer to DDC General Conditions Section 01 40 00 "Quality Requirements."

B. Materials and work shall conform to the latest edition of reference specifications specified herein and requirements of the New York City Building Code.

C. Installer Qualifications:

1. Installer's responsibilities include fabricating and installing sprinkler systems and providing professional engineering services. Base calculations on results of fire-hydrant flow test.

   a. Engineering Services: Preparation of working plans, calculations, and field test reports by a professional engineer licensed in the State of New York.

D. Welding Qualifications: Qualify procedures and operators according to ASME Boiler and Pressure Vessel Code.

E. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

F. NFPA Standards: Sprinkler system equipment, specialties, accessories, installation, and testing shall comply with the following:

1. NYC Building Code.
2. NFPA 13, "Installation of Sprinkler Systems."

1.8. COORDINATION

A. Coordinate layout and installation of sprinklers with other construction that penetrates ceilings, including light fixtures, HVAC equipment, and partition assemblies.

PART 2 - PRODUCTS

2.1. PIPING MATERIALS

A. Comply with requirements in "Piping Schedule" Article for applications of pipe, tube, and fitting materials, and for joining methods for specific services, service locations, and pipe sizes.

2.2. STEEL PIPE AND FITTINGS

A. Standard Weight, Galvanized and Black-Steel Pipe: ASTM A 53/A 53M. Pipe ends may be factory or field formed to match joining method.

B. Schedule 10, Black-Steel Pipe: ASTM A 135 or ASTM A 795/A 795M, Schedule 10 in NPS 2.5 and larger.

C. Galvanized and Black-Steel Pipe Nipples: ASTM A 733, made of ASTM A 53/A 53M, standard-weight, seamless steel pipe with threaded ends.

D. Galvanized and Uncoated, Steel Couplings: ASTM A 865, threaded.

E. Galvanized and Uncoated, Gray-Iron Threaded Fittings: ASME B16.4, Class 125, standard pattern.

F. Malleable- or Ductile-Iron Unions: UL 860.

G. Cast-Iron Flanges: ASME 16.1, Class 125.

H. Flanges and fittings in first paragraph below are available in NPS 1/2 to NPS 24 (DN 15 to DN 600).

I. Steel Flanges and Flanged Fittings: ASME B16.5, Class 150.

J. Steel Welding Fittings: ASTM A 234/A 234M and ASME B16.9.

K. Grooved-Joint, Steel-Pipe Appurtenances:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. Anvil International, Inc.
   b. Corcoran Piping System Co.
   c. National Fittings, Inc.
   d. Shurjoint Piping Products.
   e. Tyco Fire & Building Products LP.
   f. Victaulic Company.
   g. Or Approved Equal

2. Pressure Rating: 175 psig.
3. Galvanized and Uncoated, Grooved-End Fittings for Steel Piping: ASTM A 47/A 47M, malleable-iron casting or ASTM A 536, ductile-iron casting; with dimensions matching steel pipe.
4. Grooved-End-Pipe Couplings for Steel Piping: AWWA C606 and UL 213, rigid pattern, unless otherwise indicated, for steel-pipe dimensions. Include ferrous housing sections, EPDM-rubber gasket, and bolts and nuts.

2.3. PIPING JOINING MATERIALS

A. Pipe-Flange Gasket Materials: AWWA C110, rubber, flat face, 1/8 inch thick and or ASME B16.21, nonmetallic and asbestos free.

   1. Class 125, Cast-Iron Flanges and Class 150, Bronze Flat-Face Flanges: Full-face gaskets.
   2. Class 250, Cast-Iron Flanges and Class 300, Steel Raised-Face Flanges: Ring-type gaskets.

B. Metal, Pipe-Flange Bolts and Nuts: ASME B18.2.1, carbon steel unless otherwise indicated.

C. Welding Filler Metals: Comply with AWS D10.12M/D10.12 for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.

2.4. LISTED FIRE-PROTECTION VALVES

A. General Requirements:

   1. Valves shall be UL listed or FM approved.
   2. Minimum Pressure Rating for Standard-Pressure Piping: 175 psig.
   3. Minimum Pressure Rating for High-Pressure Piping: 350 psig.

B. Ball Valves:

   1. Standard: UL 1091 except with ball instead of disc.
   2. Valves NPS 1-1/2 and Smaller: Bronze body with threaded ends.
   3. Valves NPS 2 and NPS 2-1/2: Bronze body with threaded ends or ductile-iron body with grooved ends.
   4. Valves NPS 3: Ductile-iron body with grooved ends.

C. Bronze Butterfly Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. Fivalco Inc.
   b. Global Safety Products, Inc.
   c. Milwaukee Valve Company.
   d. Or Approved Equal

2. Standard: UL 1091.
3. Pressure Rating: 175 psig.
4. Body Material: Bronze.
5. End Connections: Threaded.

D. Iron Butterfly Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. Anvil International, Inc.
   b. Fivalco Inc.
   c. Global Safety Products, Inc.
   d. Kennedy Valve; a division of McWane, Inc.
   e. Milwaukee Valve Company.
   f. NIBCO INC.
   g. Pratt, Henry Company.
   h. Shurjoint Piping Products.
   i. Tyco Fire & Building Products LP.
   j. Victaulic Company.
   k. Or Approved Equal

2. Standard: UL 1091.
3. Pressure Rating: 175 psig .
4. Body Material: Cast or ductile iron.
5. Style: Lug or wafer.
6. End Connections: Grooved.

E. Check Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. AFAC Inc.
   b. American Cast Iron Pipe Company; Waterous Company Subsidiary.
   c. Anvil International, Inc.
   d. Clow Valve Company; a division of McWane, Inc.
   e. Crane Co.; Crane Valve Group; Crane Valves.
   f. Crane Co.; Crane Valve Group; Jenkins Valves.
   g. Crane Co.; Crane Valve Group; Stockham Division.
   h. Fire-End & Croker Corporation.
   i. Fire Protection Products, Inc.

j. Fivalco Inc.
k. Globe Fire Sprinkler Corporation.
l. Groeniger & Company.
m. Kennedy Valve; a division of McWane, Inc.
n. Matco-Norca.
o. Metraflex, Inc.
p. Milwaukee Valve Company.
q. Mueller Co.; Water Products Division.
r. NIBCO INC.
s. Potter Roemer.
t. Reliable Automatic Sprinkler Co., Inc.
u. Shurjoint Piping Products.
v. Tyco Fire & Building Products LP.
w. United Brass Works, Inc.
x. Venus Fire Protection Ltd.
y. Victaulic Company.
z. Viking Corporation.
aa. Watts Water Technologies, Inc.
bb. Or Approved Equal

2. Standard: UL 312.
3. Pressure Rating: 250 psig minimum.
4. Type: Swing check.
5. Body Material: Cast iron.
6. End Connections: Flanged or grooved.

F. Bronze OS&Y Gate Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Crane Co.; Crane Valve Group; Crane Valves.
b. Crane Co.; Crane Valve Group; Stockham Division.
c. Milwaukee Valve Company.
d. NIBCO INC.
e. United Brass Works, Inc.
f. Or Approved Equal

2. Standard: UL 262.
3. Pressure Rating: 175 psig.
4. Body Material: Bronze.
5. End Connections: Threaded.

G. Iron OS&Y Gate Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. American Cast Iron Pipe Company; Waterous Company Subsidiary.
b. American Valve, Inc.
c. Clow Valve Company; a division of McWane, Inc.
d. Crane Co.; Crane Valve Group; Crane Valves.
e. Crane Co.; Crane Valve Group; Jenkins Valves.
f. Crane Co.; Crane Valve Group; Stockham Division.
g. Hammond Valve.
h. Milwaukee Valve Company.
i. Mueller Co.; Water Products Division.
j. NIBCO INC.
k. Shurjoint Piping Products.
l. Tyco Fire & Building Products LP.
m. United Brass Works, Inc.
n. Watts Water Technologies, Inc.
o. Or Approved Equal

2. Standard: UL 262.
3. Pressure Rating: 250 psig minimum.
4. Body Material: Cast or ductile iron.
5. End Connections: Flanged or grooved.

H. Indicating-Type Butterfly Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Anvil International, Inc.
b. Fivalco Inc.
c. Global Safety Products, Inc.
d. Kennedy Valve; a division of McWane, Inc.
e. Milwaukee Valve Company.
f. NIBCO INC.
g. Shurjoint Piping Products.
h. Tyco Fire & Building Products LP.
i. Victaulic Company.
j. Or Approved Equal

2. Standard: UL 1091.
3. Pressure Rating: 175 psig minimum.
4. Valves NPS 2 and Smaller:

a. Valve Type: Ball or butterfly.
b. Body Material: Bronze.
c. End Connections: Threaded.

5. Valves NPS 2-1/2 and Larger:

a. Valve Type: Butterfly.
b. Body Material: Cast or ductile iron.
c. End Connections: Flanged, grooved, or wafer.

6. Valve Operation: Integral electrical, 115-V ac, prewired, single-circuit, supervisory switch electrical, 115-V ac, prewired, two-circuit, supervisory switch, visual indicating device as required by project requirements.

I. NRS Gate Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. American Cast Iron Pipe Company; Waterous Company Subsidiary.
b. American Valve, Inc.
c. Clow Valve Company; a division of McWane, Inc.
d. Crane Co.; Crane Valve Group; Stockham Division.
e. Kennedy Valve; a division of McWane, Inc.
f. Mueller Co.; Water Products Division.
g. NIBCO INC.
h. Tyco Fire & Building Products LP.
i. Or Approved Equal

2. Standard: UL 262.
3. Pressure Rating: 250 psig minimum.
4. Body Material: Cast iron with indicator post flange.
5. Stem: Nonrising.
6. End Connections: Flanged or grooved.

2.5. TRIM AND DRAIN VALVES

A. General Requirements:

1. Standard: UL's "Fire Protection Equipment Directory"listing or "Approval Guide," published by FM Global, listing.
2. Pressure Rating: 175 psig minimum.

B. Angle Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Fire Protection Products, Inc.
b. United Brass Works, Inc.
c. Milwaukee Valve Company
d. Or Approved Equal

C. Ball Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. Affiliated Distributors.
   b. Anvil International, Inc.
   c. Barnett.
   d. Conbraco Industries, Inc.; Apollo Valves.
   e. Fire-End & Croker Corporation.
   f. Fire Protection Products, Inc.
   g. Flowserve.
   h. FNW.
   i. Jomar International, Ltd.
   j. Kennedy Valve; a division of McWane, Inc.
   k. Kitz Corporation.
   l. Legend Valve.
   m. Metso Automation USA Inc.
   n. Milwaukee Valve Company.
   o. NIBCO INC.
   p. Potter Roemer.
   q. Red-White Valve Corporation.
   r. Southern Manufacturing Group.
   s. Stewart, M. A. and Sons Ltd.
   t. Tyco Fire & Building Products LP.
   u. Victaulic Company.
   v. Watts Water Technologies, Inc.
   w. Or Approved Equal

D. Globe Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. Fire Protection Products, Inc.
   b. NIBCO INC.
   c. United Brass Works, Inc.
   d. Or Approved Equal

E. Plug Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. Southern Manufacturing Group.
   b. Flowserve
   c. Kennedy Valve; a division of McWane, Inc.
   d. Or Approved Equal

2.6. SPECIALTY VALVES

A. General Requirements:

1. Standard: UL's "Fire Protection Equipment Directory" listing or "Approval Guide," published by FM Global, listing.
2. Pressure Rating:
   a. Standard-Pressure Piping Specialty Valves: 175 psig minimum.
   b. High-Pressure Piping Specialty Valves: 350 psig minimum.
3. Body Material: Cast or ductile iron.
4. Size: Same as connected piping.
5. End Connections: Flanged or grooved.

B. Automatic (Ball Drip) Drain Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. AFAC Inc.
   b. Reliable Automatic Sprinkler Co., Inc.
   c. Tyco Fire & Building Products LP.
   d. Or Approved Equal
2. Standard: UL 1726.
3. Pressure Rating: 175 psig minimum.
4. Type: Automatic draining, ball check.
5. Size: NPS 3/4.
6. End Connections: Threaded.

2.7. FIRE-DEPARTMENT CONNECTIONS

A. Flush-Type, Fire-Department Connection:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. AFAC Inc.
   b. Elkhart Brass Mfg. Company, Inc.
   c. GMR International Equipment Corporation.
   d. Guardian Fire Equipment, Inc.
   e. Potter Roemer.
   f. Or Approved Equal
2. Standard: UL 405.
3. Type: Flush, for wall mounting.

4. Pressure Rating: 175 psig minimum.
5. Body Material: Corrosion-resistant metal.
6. Inlets: Brass with threads according to NFPA 1963 and matching sizes and threads. Include extension pipe nipples, brass lugged swivel connections, and check devices or clappers.
7. Caps: Brass, lugged type, with gasket and chain.
8. Escutcheon Plate: Rectangular, brass, wall type.
9. Outlet: With pipe threads.
10. Body Style: Horizontal.
11. Number of Inlets: Two.
12. Outlet Location: Back, Bottom, Left side, Right side or Top as required.
13. Escutcheon Plate Marking: Similar to "AUTO SPKR."
14. Finish: Polished chrome plated.
15. Outlet Size: As indicated on the drawings.

2.8. SPRINKLER SPECIALTY PIPE FITTINGS

A. Branch Outlet Fittings:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. Anvil International, Inc.
   b. National Fittings, Inc.
   c. Shurjoint Piping Products.
   d. Tyco Fire & Building Products LP.
   e. Victaulic Company.
   f. Or Approved Equal

2. Standard: UL 213.
3. Pressure Rating: 175 psig minimum.
4. Body Material: Ductile-iron housing with EPDM seals and bolts and nuts.
5. Type: Mechanical-T and -cross fittings.
6. Configurations: Snap-on and strapless, ductile-iron housing with branch outlets.
7. Size: Of dimension to fit onto sprinkler main and with outlet connections as required to match connected branch piping.
8. Branch Outlets: Grooved or threaded.

B. Flow Detection and Test Assemblies:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. AGF Manufacturing Inc.
   b. Reliable Automatic Sprinkler Co., Inc.
   c. Tyco Fire & Building Products LP.
   d. Victaulic Company.
   e. Or Approved Equal

2. Standard: UL's "Fire Protection Equipment Directory" listing or "Approval Guide," published by FM Global, listing.
3. Pressure Rating: 175 psig minimum.
4. Body Material: Cast- or ductile-iron housing with orifice, sight glass, and integral test valve.
5. Size: Same as connected piping.
6. Inlet and Outlet: Threaded.

C. Branch Line Testers:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. Elkhart Brass Mfg. Company, Inc.
   b. Fire-End & Croker Corporation.
   c. Potter Roemer.
   d. Or Approved Equal

2. Standard: UL 199.
3. Pressure Rating: 175 psig.
4. Body Material: Brass.
5. Size: Same as connected piping.
6. Inlet: Threaded.
7. Drain Outlet: Threaded and capped.
8. Branch Outlet: Threaded, for sprinkler.

D. Sprinkler Inspector's Test Fittings:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. AGF Manufacturing Inc.
   b. Triple R Specialty.
   c. Tyco Fire & Building Products LP.
   d. Victaulic Company.
   e. Viking Corporation.
   f. Or Approved Equal

2. Standard: UL's "Fire Protection Equipment Directory" listing or "Approval Guide," published by FM Global, listing.
3. Pressure Rating: 175 psig minimum.
4. Body Material: Cast- or ductile-iron housing with sight glass.
5. Size: Same as connected piping.
6. Inlet and Outlet: Threaded.

2.9. SPRINKLERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. AFAC Inc.

2. Globe Fire Sprinkler Corporation.
3. Reliable Automatic Sprinkler Co., Inc.
4. Tyco Fire & Building Products LP.
5. Venus Fire Protection Ltd.
6. Victaulic Company.
7. Viking Corporation.
8. Or Approved Equal

B. General Requirements:

1. Standard: UL's "Fire Protection Equipment Directory" listing or "Approval Guide," published by FM Global, listing.
2. Pressure Rating for Automatic Sprinklers: 175 psig minimum.

C. Automatic Sprinklers with Heat-Responsive Element:

1. Nonresidential Applications: UL 199.
2. Characteristics: Nominal 1/2-inch orifice with Discharge Coefficient K of 5.6, and for "Ordinary" temperature classification rating unless otherwise indicated or required by application.

D. Sprinkler Finishes:

1. Chrome plated.
2. Bronze.
3. Painted.

E. Special Coatings:

1. Wax.
2. Lead.
3. Corrosion-resistant paint.

F. Sprinkler Escutcheons: Materials, types, and finishes for the following sprinkler mounting applications. Escutcheons for concealed, flush, and recessed-type sprinklers are specified with sprinklers.

1. Ceiling Mounting: Chrome-plated steel, one piece, flat and Chrome-plated steel, two piece, with 1-inch vertical adjustment.
2. Sidewall Mounting: Chrome-plated steel, one piece, flat.

G. Sprinkler Guards:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. Reliable Automatic Sprinkler Co., Inc.
   b. Tyco Fire & Building Products LP.
   c. Victaulic Company.
   d. Viking Corporation.
   e. Or Approved Equal

2. Standard: UL 199.
3. Type: Wire cage with fastening device for attaching to sprinkler.

2.10. ALARM DEVICES

A. Alarm-device types shall match piping and equipment connections.

B. Electrically Operated Alarm Bell:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. Fire-Lite Alarms, Inc.; a Honeywell company.
   b. Notifier; a Honeywell company.
   c. Potter Electric Signal Company.
   d. Or Approved Equal

2. Standard: UL 464.
3. Type: Vibrating, metal alarm bell.
4. Size: 8-inch minimum-diameter.
5. Finish: Red-enamel factory finish, suitable for outdoor use.

C. Water-Flow Indicators:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. ADT Security Services, Inc.
   b. McDonnell & Miller; ITT Industries.
   c. Potter Electric Signal Company.
   d. System Sensor; a Honeywell company.
   e. Viking Corporation.
   f. Watts Industries (Canada) Inc.
   g. Or Approved Equal

2. Standard: UL 346.
3. Water-Flow Detector: Electrically supervised.
4. Components: Two single-pole, double-throw circuit switches for isolated alarm and auxiliary contacts, 7 A, 125-V ac and 0.25 A, 24-V dc; complete with factory-set, field-adjustable retard element to prevent false signals and tamperproof cover that sends signal if removed.
5. Type: Paddle operated.
6. Pressure Rating: 250 psig.
7. Design Installation: Horizontal or vertical.

D. Pressure Switches:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. AFAC Inc.
   b. Barksdale, Inc.

c. Detroit Switch, Inc.
d. Potter Electric Signal Company.
e. System Sensor; a Honeywell company.
f. Tyco Fire & Building Products LP.
g. United Electric Controls Co.
h. Viking Corporation.
i. Or Approved Equal

2. Standard: UL 346.
3. Type: Electrically supervised water-flow switch with retard feature.
4. Components: Single-pole, double-throw switch with normally closed contacts.
5. Design Operation: Rising pressure signals water flow.

E. Valve Supervisory Switches:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Fire-Lite Alarms, Inc.; a Honeywell company.
b. Kennedy Valve; a division of McWane, Inc.
c. Potter Electric Signal Company.
d. System Sensor; a Honeywell company.
e. Or Approved Equal

2. Standard: UL 346.
3. Type: Electrically supervised.
4. Components: Single-pole, double-throw switch with normally closed contacts.
5. Design: Signals that controlled valve is in other than fully open position.

2.11. PRESSURE GAGES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. AMETEK; U.S. Gauge Division.
2. Ashcroft, Inc.
3. Brecco Corporation.
4. WIKA Instrument Corporation.
5. Or Approved Equal

B. Standard: UL 393.

C. Dial Size: 3-1/2- to 4-1/2-inch diameter.

D. Pressure Gage Range: 0 to 250 psig minimum, 0-350 psig for high pressure piping.

E. Water System Piping Gage: Include "WATER" or "AIR/WATER" label on dial face.

F. Air System Piping Gage: Include retard feature and "AIR" or "AIR/WATER" label on dial face.

2.12. ESCUTCHEONS

A. General: Manufactured ceiling, floor, and wall escutcheons and floor plates.

B. One-Piece, Cast-Brass Escutcheons: Polished chrome-plated finish with set-screws.

C. One-Piece, Deep-Pattern Escutcheons: Deep-drawn, box-shaped brass with chrome-plated finish.

D. One-Piece, Stamped-Steel Escutcheons: Chrome-plated finish with set-screw.

E. Split-Casting, Cast-Brass Escutcheons: Polished chrome-plated finish with concealed hinge and set-screw.

F. Split-Plate, Stamped-Steel Escutcheons: Chrome-plated finish with concealed hinge and set-screw.

G. One-Piece Floor Plates: Cast-iron flange (with holes for fasteners).

H. Split-Casting Floor Plates: Cast brass with concealed hinge.

2.13. SLEEVES

A. Cast-Iron Wall Pipe Sleeves: Cast or fabricated of cast iron and equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop unless otherwise indicated.

B. Galvanized-Steel-Sheet Sleeves: 0.0239-inch minimum thickness; round tube closed with welded longitudinal joint.

C. Galvanized-Steel-Pipe Sleeves: ASTM A 53/A 53M, Type E, standard weight, zinc coated, plain ends.

D. Stack Sleeve Fittings: Manufactured, cast-iron sleeve with integral clamping flange. Include clamping ring and bolts and nuts for membrane flashing.

1. Underdeck Clamp: Clamping ring with set-screws.

2.14. SLEEVE SEALS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Advance Products & Systems, Inc.
2. Calpico, Inc.
3. Metraflex, Inc.
4. Pipeline Seal and Insulator, Inc.
5. Or Approved Equal

B. Description: Modular sealing element unit, designed for field assembly, to fill annular space between pipe and sleeve.

1. Sealing Elements: EPDM-rubber interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.
2. Pressure Plates: Carbon steel.
3. Connecting Bolts and Nuts: Carbon steel with corrosion-resistant coating of length required to secure pressure plates to sealing elements.

2.15. GROUT

A. Standard: ASTM C 1107, Grade B, posthardening and volume adjusting, dry, hydraulic-cement grout.

B. Characteristics: Nonshrink, and recommended for interior and exterior applications.

C. Design Mix: 5000-psi, 28-day compressive strength.

D. Packaging: Premixed and factory packaged.

PART 3 - EXECUTION

3.1. EXECUTION REQUIREMENTS

A. Refer to DDC General Conditions for execution requirements.

3.2. PREPARATION

A. Perform fire-hydrant flow test according to NFPA 13 and NFPA 291. Use results for system design calculations required in "Quality Assurance" Article.

B. Report test results promptly and in writing.

3.3. PIPING INSTALLATION

A. Locations and Arrangements: Drawing plans, schematics, and diagrams indicate general location and arrangement of piping. Install piping as indicated, as far as practical.

1. Deviations from approved working plans for piping require written approval from the Commissioner. File written approval with Commissioner before deviating from approved working plans.

B. Piping Standard: Comply with requirements for installation of sprinkler piping in NFPA 13.

C. Install seismic restraints on piping. Comply with requirements for seismic-restraint device materials and installation in NFPA 13.

D. Use listed fittings to make changes in direction, branch takeoffs from mains, and reductions in pipe sizes.

E. Install unions adjacent to each valve in pipes NPS 2 and smaller.

F. Install flanges, flange adapters, or couplings for grooved-end piping on valves, apparatus, and equipment having NPS 2-1/2 and larger end connections.

G. Install "Inspector's Test Connections" in sprinkler system piping, complete with shutoff valve, and sized and located according to NFPA 13.

H. Install sprinkler piping with drains for complete system drainage.

I. Install sprinkler control valves, test assemblies, and drain risers adjacent to standpipes when sprinkler piping is connected to standpipes.

J. Install automatic (ball drip) drain valve at each check valve for fire-department connection, to drain piping between fire-department connection and check valve. Install drain piping to and spill over floor drain or to outside building.

K. Install alarm devices in piping systems.

L. Install hangers and supports for sprinkler system piping according to NYC Building Code and NFPA 13. Comply with requirements for hanger materials in NYC Building Code and NFPA 13.

M. Install pressure gages on riser or feed main and at each sprinkler test connection. Include pressure gages with connection not less than NPS 1/4 and with soft metal seated globe valve, arranged for draining pipe between gage and valve. Install gages to permit removal, and install where they will not be subject to freezing.

N. Fill sprinkler system piping with water.

3.4. JOINT CONSTRUCTION

A. Install couplings, flanges, flanged fittings, unions, nipples, and transition and special fittings that have finish and pressure ratings same as or higher than system's pressure rating for aboveground applications unless otherwise indicated.

B. Install unions adjacent to each valve in pipes NPS 2 and smaller.

C. Install flanges, flange adapters, or couplings for grooved-end piping on valves, apparatus, and equipment having NPS 2-1/2 and larger end connections.

D. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.

E. Remove scale, slag, dirt, and debris from inside and outside of pipes, tubes, and fittings before assembly.

F. Flanged Joints: Select appropriate gasket material in size, type, and thickness suitable for water service. Join flanges with gasket and bolts according to ASME B31.9.

G. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:

1. Apply appropriate tape or thread compound to external pipe threads.
2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged.

H. Welded Joints: Construct joints according to AWS D10.12M/D10.12, using qualified processes and welding operators according to "Quality Assurance" Article.

1. Shop weld pipe joints where welded piping is indicated. Do not use welded joints for galvanized-steel pipe.

I. Steel-Piping, Cut-Grooved Joints: Cut square-edge groove in end of pipe according to AWWA C606. Assemble coupling with housing, gasket, lubricant, and bolts. Join steel pipe and grooved-end fittings according to AWWA C606 for steel-pipe joints.

J. Steel-Piping, Roll-Grooved Joints: Roll rounded-edge groove in end of pipe according to AWWA C606. Assemble coupling with housing, gasket, lubricant, and bolts. Join steel pipe and grooved-end fittings according to AWWA C606 for steel-pipe grooved joints.

K. Dissimilar-Material Piping Joints: Make joints using adapters compatible with materials of both piping systems.

3.5. VALVE AND SPECIALTIES INSTALLATION

A. Install listed fire-protection valves, trim and drain valves, specialty valves and trim, controls, and specialties according to NFPA 13 and the New York City Building Code.

B. Install listed fire-protection shutoff valves supervised open, located to control sources of water supply except from fire-department connections. Install permanent identification signs indicating portion of system controlled by each valve.

C. Install check valve in each water-supply connection. Install backflow preventers instead of check valves in potable-water-supply sources.

D. Specialty Valves:

1. General Requirements: Install in vertical position for proper direction of flow, in main supply to system.

3.6. SPRINKLER INSTALLATION

A. Install sprinklers in suspended ceilings in center of narrow dimension of acoustical ceiling panels.

B. Install dry-type sprinklers with water supply from heated space. Do not install pendent or sidewall, wet-type sprinklers in areas subject to freezing.

3.7. FIRE-DEPARTMENT CONNECTION INSTALLATION

A. Install wall-type, fire-department connections.

B. Install automatic (ball drip) drain valve at each check valve for fire-department connection.

3.8. ESCUTCHEON INSTALLATION

A. Install escutcheons for penetrations of walls, ceilings, and floors.

B. Escutcheons for New Piping:

1. Piping with Fitting or Sleeve Protruding from Wall: One piece, deep pattern.
2. Bare Piping at Wall and Floor Penetrations in Finished Spaces: One piece, cast brass with polished chrome-plated finish stamped steel with set-screw.
3. Bare Piping at Ceiling Penetrations in Finished Spaces: One piece, cast brass with polished chrome-plated finish. One piece, stamped steel with set-screw.
4. Bare Piping in Unfinished Service Spaces: One piece, stamped steel with set-screw.
5. Bare Piping in Equipment Rooms: One piece, stamped steel with set-screw.
6. Bare Piping at Floor Penetrations in Equipment Rooms: One-piece floor plate.

3.9. SLEEVE INSTALLATION

A. General Requirements: Install sleeves for pipes and tubes passing through penetrations in floors, partitions, roofs, and walls.

B. Sleeves are not required for core-drilled holes.

C. Permanent sleeves are not required for holes formed by removable PE sleeves.

D. Cut sleeves to length for mounting flush with both surfaces unless otherwise indicated.

E. Install sleeves in new partitions, slabs, and walls as they are built.

F. For interior wall penetrations, seal annular space between sleeve and pipe or pipe insulation using joint sealants appropriate for size, depth, and location of joint. Comply with requirements for joint sealants in Section 079200 "Interior Joint Sealants."

G. For exterior wall penetrations above grade, seal annular space between sleeve and pipe using joint sealants appropriate for size, depth, and location of joint. Comply with requirements for joint sealants in Section 079201 "Exterior Joint Sealants."

H. For exterior wall penetrations below grade, seal annular space between sleeve and pipe using sleeve seals.

I. Seal space outside of sleeves in concrete slabs and walls with grout.

J. Install sleeves that are large enough to provide 1 inch annular clear space between sleeve and pipe or pipe insulation unless otherwise indicated.

K. Install sleeve materials according to the following applications:

1. Sleeves for Piping Passing through Concrete Floor Slabs: Galvanized-steel pipe.
2. Sleeves for Piping Passing through Concrete Floor Slabs of Mechanical Equipment Areas or Other Wet Areas: Galvanized-steel pipe.

    a. Extend sleeves 2 inches above finished floor level.
    b. For pipes penetrating floors with membrane waterproofing, extend cast-iron sleeve fittings below floor slab as required to secure clamping ring if ring is specified. Secure flashing between clamping flanges. Install section of cast-iron soil pipe to extend sleeve to 2 inches above finished floor level.

3. Sleeves for Piping Passing through Gypsum-Board Partitions:

    a. Galvanized-steel-pipe sleeves for pipes smaller than NPS 6.
    b. Galvanized-steel-sheet sleeves for pipes NPS 6 and larger.

4. Sleeves for Piping Passing through Exterior Concrete Walls:

    a. Galvanized-steel-pipe sleeves for pipes smaller than NPS 6.
    b. Cast-iron wall-pipe sleeves for pipes NPS 6 and larger.
    c. Install sleeves that are large enough to provide 1-inch annular clear space between sleeve and pipe or pipe insulation when sleeve seals are used.

5. Sleeves for Piping Passing through Interior Concrete Walls:

    a. Galvanized-steel-pipe sleeves for pipes smaller than NPS 6 (DN 150).
    b. Galvanized-steel-sheet sleeves for pipes NPS 6 and larger.

L. Fire-Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with firestop materials.

3.10. SLEEVE SEAL INSTALLATION

A. Install sleeve seals in sleeves in exterior concrete walls at water-service piping entries into building.

B. Select type and number of sealing elements required for pipe material and size. Position pipe in center of sleeve. Assemble sleeve seal components and install in annular space between pipe and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

3.11. IDENTIFICATION

A. Install labeling and pipe markers on equipment and piping according to requirements in NFPA 13.

B. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

3.12. FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Tests and Inspections:

1. Leak Test: After installation, charge systems and test for leaks. Restore leaks and retest until no leaks exist.
2. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
3. Flush, test, and inspect sprinkler systems according to NYC Building Code and NFPA 13, "Systems Acceptance" Chapter.
4. Energize circuits to electrical equipment and devices.
5. Coordinate with fire-alarm tests. Operate as required.
6. Coordinate with fire-pump tests. Operate as required.
7. Verify that equipment hose threads are same as NYC fire-department equipment.

C. Sprinkler piping system will be considered defective if it does not pass tests and inspections.

D. Prepare test and inspection reports.

3.13. CLEANING

A. Clean dirt and debris from sprinklers.

B. Remove and replace sprinklers with paint other than factory finish.

3.14. INSTRUCTION

A. Engage a factory-authorized service representative to instruct the City of New York's operating personnel to adjust, operate, and maintain specialty valves and pressure-maintenance pumps.

3.15. PIPING SCHEDULE

A. Piping between Fire-Department Connections and Check Valves: Galvanized, standard-weight steel pipe with threaded ends; cast-iron threaded fittings; and threaded or grooved ends; grooved-end fittings; grooved-end-pipe couplings; and grooved joints.

B. Sprinkler specialty fittings may be used, downstream of control valves, instead of specified fittings.

C. Standard-pressure, wet-pipe sprinkler system, NPS 2 and smaller, shall be one of the following:

1. Standard-weight, black-steel pipe with threaded ends; uncoated, gray-iron threaded fittings; and threaded joints.
2. Standard-weight, galvanized-steel pipe with threaded ends; galvanized, gray-iron threaded fittings; and threaded joints.

D. Standard-pressure, wet-pipe sprinkler system, NPS 2-1/2 and larger, shall be one of the following:

1. Standard-weight, black-steel pipe with threaded ends; uncoated, gray-iron threaded fittings; and threaded joints.

2. Standard-weight, galvanized-steel pipe with threaded ends; galvanized, gray-iron threaded fittings; and threaded joints.
3. Standard-weight, black-steel pipe with cut or roll-grooved ends; uncoated, grooved-end fittings for steel piping; grooved-end-pipe couplings for steel piping; and grooved joints.
4. Standard-weight, galvanized-steel pipe with cut-grooved ends; galvanized, grooved-end fittings for steel piping; grooved-end-pipe couplings for steel piping; and grooved joints.
5. Standard-weight, black-steel pipe with plain ends; steel welding fittings; and welded joints.
6. Schedule 10, black-steel pipe with roll-grooved ends; uncoated, grooved-end fittings for steel piping; grooved-end-pipe couplings for steel piping; and grooved joints.
7. Schedule 10, black-steel pipe with plain ends; welding fittings; and welded joints.

3.16. SPRINKLER SCHEDULE

A. Use sprinkler types in subparagraphs below for the following applications:

1. Rooms without Ceilings: Upright or sidewall sprinklers.
2. Rooms with Suspended Ceilings: Pendent, recessed, flush, and concealed sprinklers as indicated.
3. Wall Mounting: Sidewall sprinklers.
4. Spaces Subject to Freezing: Upright, pendent, dry sprinklers; and sidewall, dry sprinklers as indicated
5. Special Applications: Extended-coverage and quick-response sprinklers where indicated.

B. Provide sprinkler types in subparagraphs below with finishes indicated.

1. Concealed Sprinklers: Rough brass, with factory-painted white cover plate.
2. Flush Sprinklers: Bright chrome, with painted white escutcheon.
3. Recessed Sprinklers: Bright chrome, with bright chrome escutcheon.
4. Upright Pendent and Sidewall Sprinklers: Chrome plated in finished spaces exposed to view; rough bronze in unfinished spaces not exposed to view; wax coated where exposed to acids, chemicals, or other corrosive fumes.

END OF SECTION 211313

SECTION 213113
Electric-Drive, Centrifugal Sprinkler Booster Pumps

PART 1 - GENERAL

1.1. RELATED DOCUMENTS

A. The following documents apply to all required work for the Project: (1) the Contract Drawings, (2) the Specifications, (3) the General Conditions, (4) the Addendum and (5) the Contract (City of New York Standard Construction Contract).

1.2. SUMMARY

A. Section Includes:

1. In-line fire pumps.
2. Fire-pump accessories and specialties.
3. Flow meter systems.

1.3. PERFORMANCE REQUIREMENTS

A. Seismic Performance: Fire pumps shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.

1. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified.

B. Pump Equipment, Accessory, and Specialty Pressure Rating: 175 psig minimum unless higher pressure rating is indicated.

1.4. SUBMITTALS

A. Refer to DDC General Conditions Section 01 33 00 "Submittal Procedures."

B. Product Data: For each type of product indicated. Include rated capacities, operating characteristics, performance curves, electrical characteristics, and furnished specialties and accessories.

C. Shop Drawings: For fire pumps, motor drivers, and fire-pump accessories and specialties. Include plans, elevations, sections, details, and attachments to other work.

1. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
2. Wiring Diagrams: For power, signal, and control wiring.

D. Seismic Qualification Certificates: For fire pumps, accessories, and components, from manufacturer.

1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

E. Product Certificates: For each fire pump, from manufacturer.

F. Source quality-control reports.

G. Field quality-control reports.

H. Operation and Maintenance Data: For fire pumps to include in operation and maintenance manuals.

1.5. QUALITY ASSURANCE

A. Refer to DDC General Conditions Section 01 40 00 "Quality Requirements."

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NYC Building Code and NFPA 70, by a qualified testing agency, and marked for intended location and application.

C. Code Compliance: Comply with NYC Building Code and NFPA 20, "Installation of Stationary Pumps for Fire Protection."

1.6. COORDINATION

A. Coordinate sizes and locations of concrete bases with actual equipment provided.

PART 2 - PRODUCTS

2.1. GENERAL REQUIREMENTS FOR CENTRIFUGAL FIRE PUMPS

A. Description: Factory-assembled and -tested fire-pump and driver unit.

B. Base: Fabricated and attached to fire-pump and driver unit with reinforcement to resist movement of pump during seismic events when base is anchored to building substrate.

C. Finish: Red paint applied to factory-assembled and -tested unit before shipping.

2.2. VERTICAL, SINGLE-STAGE, SPLIT-CASE FIRE PUMPS

A. Manufacturers: Subject to compliance with requirements, provide product indicated on drawings or comparable product by one of the following:

1. A-C Fire Pump Systems; a business of ITT Industries.
2. Patterson Pump Company; a subsidiary of the Gorman-Rupp Company.

3. PACO Pumps; Grundfos Pumps Corporation, U.S.A.
4. Peerless Pump, Inc.
5. Or Approved Equal

B. Pump:

1. Standard: UL 448, for split-case pumps for fire service.
2. Casing: Axially split case, cast iron with ASME B16.1 pipe-flange connections.
3. Impeller: Cast bronze, statically and dynamically balanced, and keyed to shaft.
4. Wear Rings: Replaceable bronze.
5. Shaft and Sleeve: Steel shaft with bronze sleeve.

    a. Shaft Bearings: Grease-lubricated ball bearings in cast-iron housing.
    b. Seals: Stuffing box with minimum of four rings of graphite-impregnated braided yarn and bronze packing gland.

6. Mounting: Pump and driver shafts are horizontal, with pump and driver on same base.

C. Coupling: Flexible and capable of absorbing torsional vibration and shaft misalignment. Include metal coupling guard.

D. Driver:

1. Standard: UL 1004A.
2. Type: Electric motor; NEMA MG 1, polyphase Design B.

2.3. FIRE-PUMP ACCESSORIES AND SPECIALTIES

A. Automatic Air-Release Valves: Comply with NYC Building Code and NFPA 20 for installation in fire-pump casing.

B. Circulation Relief Valves: UL 1478, brass, spring loaded; for installation in pump discharge piping.

C. Relief Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. BERMAD Control Valves.
    b. CLA-VAL Automatic Control Valves.
    c. Kunkle Valve; a part of Tyco International Ltd.
    d. OCV Control Valves.
    e. Watts Regulator Company; a division of Watts Water Technologies, Inc.
    f. Zurn Plumbing Products Group; Wilkins Water Control Products.
    g. Or Approved Equal

2. Description: UL 1478, bronze or cast iron, spring loaded; for installation in fire-suppression water-supply piping.

D. Inlet Fitting: Eccentric tapered reducer at pump suction inlet.

E. Outlet Fitting: Concentric tapered reducer at pump discharge outlet.

F. Discharge Cone: Closed or open type.

G. Hose Valve Manifold Assembly (Provided on the Roof):

1. Standard: Comply with requirements in NYC Building Code and NFPA 20.
2. Header Pipe: ASTM A 53/A 53M, Schedule 40, galvanized steel with ends threaded according to ASME B1.20.1.
3. Header Pipe Fittings: ASME B16.4, galvanized cast-iron threaded fittings.
4. Automatic Drain Valve: UL 1726.
5. Manifold:

   a. Test Connections: Comply with UL 405 except provide outlets without clappers instead of inlets.
   b. Body: Flush type, brass or ductile iron, with number of outlets required by NFPA 20.
   c. Nipples: ASTM A 53/A 53M, Schedule 40, galvanized-steel pipe with ends threaded according to ASME B1.20.1.
   d. Adapters and Caps with Chain: Brass or bronze, with outlet threaded according to NFPA 1963 and matching NYC fire-department threads.
   e. Escutcheon Plate: Brass or bronze; rectangular.
   f. Hose Valves: UL 668, bronze, with outlet threaded according to NFPA 1963 and matching NYC fire-department threads.
   g. Exposed Parts Finish: Rough brass.
   h. Escutcheon Plate Marking: Equivalent to "FIRE PUMP TEST."

2.4. GROUT

A. Standard: ASTM C 1107, Grade B, post-hardening and volume-adjusting, dry, hydraulic-cement grout.

B. Characteristics: Nonshrink and recommended for interior and exterior applications.

C. Design Mix: 5000-psi, 28-day compressive strength.

D. Packaging: Premixed and factory packaged.

2.5. SOURCE QUALITY CONTROL

A. Testing: Test and inspect fire pumps according to UL 448 requirements for "Operation Test" and "Manufacturing and Production Tests."

1. Verification of Performance: Rate fire pumps according to UL 448.

B. Fire pumps will be considered defective if they do not pass tests and inspections.

C. Prepare test and inspection reports.

PART 3 - EXECUTION

3.1. EXECUTION REQUIREMENTS

A. Refer to DDC General Conditions for execution requirements.

3.2. EXAMINATION

A. Examine equipment bases and anchorage provisions, with Installer present, for compliance with requirements and for conditions affecting performance of fire pumps.

B. Examine roughing-in for fire-suppression piping systems to verify actual locations of piping connections before fire-pump installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.3. INSTALLATION

A. Fire-Pump Installation Standard: Comply with NYC Building Code and NFPA 20 for installation of fire pumps, relief valves, and related components.

B. Equipment Mounting: Install fire pumps on concrete bases. Comply with requirements for concrete bases specified in 033000 Section Cast-in-Place Concrete.

1. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch centers around the full perimeter of concrete base.
2. For supported equipment, install epoxy-coated anchor bolts that extend through concrete base and anchor into structural concrete floor.
3. Place and secure anchorage devices. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
4. Install anchor bolts to elevations required for proper attachment to supported equipment.

C. Install fire-pump suction and discharge piping equal to or larger than sizes required by NYC Building Code and NFPA 20.

D. Support piping and pumps separately so weight of piping does not rest on pumps.

E. Install valves that are same size as connecting piping. Comply with requirements for fire-protection valves specified in Section 211200 "Fire-Suppression Standpipes" and Section 211313 "Wet-Pipe Sprinkler Systems."

F. Install pressure gages on fire-pump suction and discharge flange pressure-gage tappings. Comply with requirements for pressure gages specified in Section 211200 "Fire-Suppression Standpipes." and Section 211313 "Wet-Pipe Sprinkler Systems."

G. Install piping hangers and supports, anchors, valves, gages, and equipment supports according to NYC Building Code and NFPA 20.

H. Install flowmeters and sensors. Install flowmeter-system components and make connections according to NYC Building Code and NFPA 20 and manufacturer's written instructions.

I. Electrical Wiring: Install electrical devices furnished by equipment manufacturers but not factory mounted. Furnish copies of manufacturers' wiring diagram submittals to electrical Installer.

J. Wiring Method: Conceal conductors and cables in accessible ceilings, walls, and floors where possible.

3.4. ALIGNMENT

A. After alignment is correct, tighten anchor bolts evenly. Fill baseplate completely with grout, with metal blocks and shims or wedges in place. Tighten anchor bolts after grout has hardened. Check alignment and make required corrections.

B. Align piping connections.

C. Align pump and driver shafts for angular and parallel alignment according to HI 1.4 and to tolerances specified by manufacturer.

3.5. CONNECTIONS

A. Comply with requirements for piping and valves specified in Section 211200 "Fire-Suppression Standpipes." And Section 211313 "Wet-Pipe Sprinkler Systems." Drawings indicate general arrangement of piping, fittings, and specialties.

B. Install piping adjacent to pumps and equipment to allow service and maintenance.

C. Connect relief-valve discharge to drainage piping or point of discharge.

D. Connect fire pumps to their controllers.

3.6. IDENTIFICATION

A. Identify system components. Comply with requirements for fire-pump marking according to NYC Building Code and NFPA 20.

3.7. FIELD QUALITY CONTROL

A. Test each fire pump with its controller as a unit. Comply with requirements for electric-motor-driver fire-pump controllers specified in Section 213900 "Controllers for Fire-Pump Drivers."

B. Perform tests and inspections.

1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.

C. Tests and Inspections:

1. After installing components, assemblies, and equipment including controller, test for compliance with requirements.
2. Test according to NYC Building Code and NFPA 20 for acceptance and performance testing.
3. Leak Test: After installation, charge system and test for leaks. Restore leaks and retest until no leaks exist.
4. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
5. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

D. Components, assemblies, and equipment will be considered defective if they do not pass tests and inspections.

E. Prepare test and inspection reports.

F. Furnish fire hoses in number, size, and length required to reach storm drain or other acceptable location to dispose of fire-pump test water. Hoses are for tests only.

3.8. STARTUP SERVICE

A. Engage a factory-authorized service representative to perform startup service.

1. Complete installation and startup checks according to manufacturer's written instructions.

3.9. INSTRUCTION

A. Engage a factory-authorized service representative to instruct the City of New York's operating personnel to adjust, operate, and maintain fire pumps.

END OF SECTION 213113

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SECTION 213900
Controllers for Sprinkler Booster Pump Drivers

PART 1 - GENERAL

1.1. RELATED DOCUMENTS

A. The following documents apply to all required work for the Project: (1) the Contract Drawings, (2) the Specifications, (3) the General Conditions, (4) the Addendum and (5) the Contract (City of New York Standard Construction Contract).

1.2. SUMMARY

A. Section Includes:

1. Full-service, full-voltage controllers rated 600 V and less.

1.3. DEFINITIONS

A. ATS: Automatic transfer switches (es).

B. ECM: Electronic control module.

C. MCCB: Molded-case circuit breaker.

D. N.O.: Normally open.

1.4. PERFORMANCE REQUIREMENTS

A. Seismic Performance: Fire-pump controllers and alarm panels shall withstand the effects of earthquake motions determined according to ASCE/SEI 7 and the New York City Building Code.

1.5. SUBMITTALS

A. Refer to DDC General Conditions Section 01 33 00 "Submittal Procedures."

B. Product Data: For each type of product indicated. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.

C. Shop Drawings: For each type of product indicated. Include dimensioned plans, elevations, sections, details, and attachments to other work, including required clearances and service spaces around controller enclosures.

1. Show tabulations of the following:

a. Each installed unit's type and details.
b. Enclosure types and details for types other than NEMA 250, Type 2.

c. Factory-installed devices.
d. Nameplate legends.
e. Short-circuit current (withstand) rating of integrated unit.
f. Features, characteristics, ratings, and factory settings of individual overcurrent protective devices.

2. Detail equipment assemblies and indicate dimensions, weights, loads, method of field assembly, components, and location and size of each field connection.
3. Schematic and Connection Diagrams: For power, signal, alarm, and control wiring and for pressure-sensing tubing.

D. Product Certificates: For each type of product indicated, from manufacturer.

E. Manufacturer's factory test reports of fully assembled and tested equipment.

F. Field quality-control reports.

G. Operation and Maintenance Data: For each type of product indicated to include in emergency, operation, and maintenance manuals. In addition to items specified in DDC General Conditions Section "Operation and Maintenance Data," include the following:

1. Manufacturer's written instructions for setting field-adjustable timers, controls, and status and alarm points.
2. Manufacturer's written instructions for testing, adjusting, and reprogramming microprocessor-based logic controls.

1.6. QUALITY ASSURANCE

A. Refer to DDC General Conditions Section 01 40 00 "Quality Requirements."

B. Source Limitations: Obtain fire-pump controllers and all associated equipment from single source or producer.

C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

D. Comply with standards of NYC Building Code pertaining to materials and installation.

E. Comply with NYC Building Code and NFPA 20 and NFPA 70.

F. IEEE Compliance: Fabricate and test enclosed controllers according to IEEE 344 to withstand seismic forces defined in Section 260548 "Vibration and Seismic Controls for Electrical Systems."

1.7. DELIVERY, STORAGE, AND HANDLING

A. Store controllers indoors in clean, dry space with uniform temperature to prevent condensation. Protect enclosed controllers from exposure to dirt, fumes, water, corrosive substances, and physical damage.

1.8. PROJECT CONDITIONS

A. Environmental Limitations:

1. Ambient Temperature Rating: Not less than 40 deg F and not exceeding 122 deg F unless otherwise indicated.
2. Altitude Rating: Not exceeding 6600 feet unless otherwise indicated.

1.9. COORDINATION

A. Coordinate layout and installation of controllers with other construction including conduit, piping, fire-pump equipment, and adjacent surfaces. Maintain required clearances for workspace and equipment access doors and panels. Ensure that controllers are within sight of fire-pump drivers.

B. Coordinate sizes and locations of concrete bases with actual equipment provided.

PART 2 - PRODUCTS

2.1. FULL VOLTAGE FIRE PUMP CONTROLLERS

A. Basis of Design: Subject to compliance with requirements, provide:

1. Aquarius Fluid Products, Inc.
2. ASCO Power Technologies, LP; Firetrol Products.
3. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
4. Hubbell Incorporated; Hubbell Industrial Controls.
5. Joslyn Clark Corporation.
6. Master Control Systems, Inc.
7. Metron, Inc.
8. Tornatech.
9. Or Approved Equal

B. General Requirements for Full-Service Controllers:

1. Comply with NYC Building Code NFPA 20 and UL 218.
2. Listed by an NRTL for electric-motor driver for fire-pump service.
3. Combined automatic and nonautomatic operation.
4. Factory assembled, wired, and tested; continuous-duty rated.
5. Service Equipment Label: NRTL labeled for use as service equipment.

C. Method of Starting:

1. Pressure-switch actuated.

a. Water-pressure-actuated switch and pressure transducer with independent high- and low-calibrated adjustments responsive to water pressure in fire-suppression piping.
b. System pressure recorder, electric ac driven, with spring backup.
c. Programmable minimum-run-time relay to prevent short cycling.

d. Programmable timer for weekly tests.

2. Combined manual and automatic across the line type rated for HP specified.
3. Emergency Start: Mechanically operated start handle that closes and retains the motor RUN contactor independent of all electric or pressure actuators.

D. Method of Stopping: Non-automatic shutdown after automatic starting.

E. Capacity: Rated for fire-pump-driver horsepower and short-circuit-current (withstand) rating equal to or greater than short-circuit current available at controller location.

F. Method of Isolation and Overcurrent Protection: Interlocked isolating switch and nonthermal MCCB; with a common, externally mounted operating handle, and providing locked-rotor protection.

G. Door-Mounted Operator Interface and Controls:

1. Monitor, display, and control the devices, alarms, functions, and operations listed in NFPA 20 as required for drivers and controller types used.
2. Method of Control and Indication:

a. Controller, with multiline digital readout.
b. Membrane keypad.
c. LED alarm and status indicating lights.

3. Local and Remote Alarm and Status Indications:

a. Controller power on.
b. Motor running condition.
c. Loss-of-line power.
d. Line-power phase reversal.
e. Line-power single-phase condition.

4. Audible alarm, with silence push button.
5. Nonautomatic START and STOP push buttons or switches.

2.2. ENCLOSURES

A. Fire-Pump Controllers, ATS, Remote Alarm Panels, and Low-Suction-Shutdown Panels: NEMA 250, to comply with environmental conditions at installed locations and NFPA 20.

B. Enclosure Color: Manufacturer's standard "fire-pump-controller red.

C. Nameplates: Comply with NYC Building Code and NFPA 20; complete with capacity, characteristics, approvals, listings, and other pertinent data.

D. Optional Features:

1. Floor stands, 12 inches high, for floor-mounted controllers.

2.3. SOURCE QUALITY CONTROL

A. Testing: Test and inspect fire-pump controllers according to requirements in NYC Building Code and NFPA 20 and UL 218.

1. Verification of Performance: Rate controllers according to operation of functions and features specified.

B. Fire-pump controllers will be considered defective if they do not pass tests and inspections.

C. Prepare test and inspection reports.

PART 3 - EXECUTION

3.1. EXECUTION REQUIREMENTS

A. Refer to DDC General Conditions for execution requirements.

3.2. EXAMINATION

A. Examine areas and surfaces to receive equipment, with Installer present, for compliance with requirements and other conditions affecting performance.

B. Examine equipment before installation. Reject equipment that is wet or damaged by moisture or mold.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.3. CONTROLLER INSTALLATION

A. Install controllers within sight of their respective drivers.

B. Connect controllers to their dedicated pressure-sensing lines.

C. Floor-Mounting Controllers: Install controllers on 4-inch nominal-thickness concrete bases, using floor stands high enough so that the bottom of enclosure cabinet is not less than 12 inches (305 mm) above finished floor. Comply with requirements for concrete bases specified in Section 033000 "Cast-in-Place Concrete."

1. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch (450-mm) centers around the full perimeter of concrete base.
2. For supported equipment, install epoxy-coated anchor bolts that extend through concrete base, and anchor into structural concrete floor.
3. Place and secure anchorage devices. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
4. Install anchor bolts to elevations required for proper attachment to supported equipment.

D. Seismic Bracing: Comply with requirements specified in Section 260548 "Vibration and Seismic Controls for Electrical Systems."

E. Temporary Lifting Provisions: Remove temporary lifting eyes, channels, and brackets and temporary blocking of moving parts from enclosures and components.

F. Comply with NEMA ICS 15.

3.4. POWER WIRING INSTALLATION

A. Install power wiring between controllers and their services or sources, and between controllers and their drivers. Comply with requirements in NYC Building Code and NFPA 20, NFPA 70, and Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

3.5. CONTROL AND ALARM WIRING INSTALLATION

A. Install wiring between controllers and remote devices and facility's central monitoring system. Comply with requirements in NYC Building Code and NFPA 20, and NFPA 70.

B. Install wiring between controllers and the building's fire-alarm system. Comply with requirements specified in Section 283111 "Digital, Addressable Fire-Alarm System."

C. Bundle, train, and support wiring in enclosures.

D. Connect remote manual and automatic activation devices where applicable.

3.6. IDENTIFICATION

A. Comply with requirements in NYC Building Code and NFPA 20 for marking fire-pump controllers.

B. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification in NYC Building Code and NFPA 20 and as specified in Section 260553 "Identification for Electrical Systems."

3.7. FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

B. Perform tests and inspections.

1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.

C. Acceptance Testing Preparation:

1. Inspect and Test Each Component:

a. Inspect wiring, components, connections, and equipment installations. Test and adjust components and equipment.

b. Test insulation resistance for each element, component, connecting supply, feeder, and control circuits.
c. Test continuity of each circuit.

2. Verify and Test Each Electric-Driver Controller:
   a. Verify that voltages at controller locations are within plus 10 or minus 1 percent of motor nameplate rated voltages, with motors off. If outside this range for any motor, notify Commissioner before starting the motor(s).
   b. Test each motor for proper phase rotation.

3. Operational Test: After electrical circuitry has been energized, start units to confirm proper unit operation.
4. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

D. Field Acceptance Tests:

1. Do not begin field acceptance testing until suction piping has been flushed and hydrostatically tested and the certificate for flushing and testing has been submitted to Commissioner and NYC Department of Buildings.
2. Prior to starting, notify NYC Department of Buildings of the time and place of the acceptance testing.
3. Engage manufacturer's factory-authorized service representative to be present during the testing.
4. Perform field acceptance tests as outlined in NFPA 20.

E. Controllers will be considered defective if they do not pass tests and inspections.

F. Prepare test and inspection reports.

3.8. STARTUP SERVICE

A. Engage a factory-authorized service representative to perform startup service.

1. Complete installation and startup checks according to manufacturer's written instructions.

3.9. ADJUSTING

A. Adjust controllers and battery charger systems to function smoothly and as recommended by manufacturer.

B. Set field-adjustable switches, auxiliary relays, time-delay relays, and timers.

C. Program microprocessors for required operational sequences, status indications, alarms, event recording, and display features. Clear events memory after final acceptance testing and prior to Substantial Completion.

D. Set field-adjustable pressure switches.

3.10. PROTECTION

A. Temporary Heating: Apply temporary heat to maintain temperature according to manufacturer's written instructions until enclosed controllers are ready to be energized and placed into service.

B. Replace controllers whose interiors have been exposed to water or other liquids prior to Substantial Completion.

3.11. INSTRUCTION

A. Engage a factory-authorized service representative to instruct the City of New York's operating personnel to adjust, operate, and maintain controllers, and to use and reprogram microprocessor-based controls within this equipment.

END OF SECTION 213900

SECTION 220500
Common Work Results For Plumbing

PART 1 - GENERAL

1.1. RELATED DOCUMENTS

A. The following documents apply to all required work for the Project: (1) the Contract Drawings, (2) the Specifications, (3) the General Conditions, (4) the Addendum and (5) the Contract (City of New York Standard Construction Contract).

B. LEED General Requirements:

1. Refer to DDC General Conditions.

a. Section 01 81 13.04 "Submittal Design Requirements for LEED v4 Buildings."

1.2. SUMMARY

A. This Section includes the following:

1. Piping materials and installation instructions common to most piping systems.
2. Transition fittings.
3. Dielectric fittings.
4. Mechanical sleeve seals.
5. Sleeves.
6. Escutcheons.
7. Grout.
8. Plumbing demolition.
9. Equipment installation requirements common to equipment sections.
10. Painting and finishing.
11. Concrete bases.
12. Supports and anchorages.

B. Related Sections:

1. Section 024119 "Selective Demolition and Alteration Work" for general demolition requirements and procedures.

1.3. DEFINITIONS

A. Finished Spaces: Spaces other than mechanical and electrical equipment rooms, furred spaces, pipe chases, unheated spaces immediately below roof, spaces above ceilings, unexcavated spaces, crawlspaces, and tunnels.

B. Exposed, Interior Installations: Exposed to view indoors. Examples include finished occupied spaces and mechanical equipment rooms.

C. Exposed, Exterior Installations: Exposed to view outdoors or subject to outdoor ambient temperatures and weather conditions. Examples include rooftop locations.

D. Concealed, Interior Installations: Concealed from view and protected from physical contact by building occupants. Examples include above ceilings and in chases.

E. Concealed, Exterior Installations: Concealed from view and protected from weather conditions and physical contact by building occupants but subject to outdoor ambient temperatures. Examples include installations within unheated shelters.

1.4. SUBMITTALS

A. Refer to DDC General Conditions Section 01 33 00 "Submittal Procedures."

B. Product Data: For the following:

1. Transition fittings.
2. Dielectric fittings.
3. Mechanical sleeve seals.
4. Escutcheons.

C. Welding certificates.

1.5. QUALITY ASSURANCE

A. Refer to DDC General Conditions Section 01 40 00 "Quality Requirements."

B. Steel Support Welding: Qualify processes and operators according to AWS D1.1, "Structural Welding Code--Steel."

C. Steel Pipe Welding: Qualify processes and operators according to ASME Boiler and Pressure Vessel Code: Section IX, "Welding and Brazing Qualifications."

1. Comply with provisions in ASME B31 Series, "Code for Pressure Piping."
2. Certify that each welder has passed AWS qualification tests for welding processes involved and that certification is current.

D. Electrical Characteristics for Plumbing Equipment: Equipment of higher electrical characteristics may be furnished provided such proposed equipment is approved in writing and connecting electrical services, circuit breakers, and conduit sizes are appropriately modified. If minimum energy ratings or efficiencies are specified, equipment shall comply with requirements.

1.6. DELIVERY, STORAGE, AND HANDLING

A. Deliver pipes and tubes with factory-applied end caps. Maintain end caps through shipping, storage, and handling to prevent pipe end damage and to prevent entrance of dirt, debris, and moisture.

B. Store plastic pipes protected from direct sunlight. Support to prevent sagging and bending.

1.7. COORDINATION

A. Arrange for pipe spaces, chases, slots, and openings in building structure during progress of construction, to allow for plumbing installations.

B. Coordinate installation of required supporting devices and set sleeves in poured-in-place concrete and other structural components as they are constructed.

C. Coordinate requirements for access panels and doors for plumbing items requiring access that are concealed behind finished surfaces. Access panels and doors are specified in Section 083113 "Access Doors."

PART 2 - PRODUCTS

2.1. PIPE, TUBE, AND FITTINGS

A. Refer to individual Sections for pipe, tube, and fitting materials and joining methods.

B. Pipe Threads: ASME B1.20.1 for factory-threaded pipe and pipe fittings.

2.2. JOINING MATERIALS

A. Refer to individual Sections for special joining materials not listed below.

B. Pipe-Flange Gasket Materials: Suitable for chemical and thermal conditions of piping system contents.

1. ASME B16.21, nonmetallic, flat, asbestos-free, 1/8-inch (3.2-mm) maximum thickness unless thickness or specific material is indicated.

    a. Full-Face Type: For flat-face, Class 125, cast-iron and cast-bronze flanges.
    b. Narrow-Face Type: For raised-face, Class 250, cast-iron and steel flanges.

2. AWWA C110, rubber, flat face, 1/8 inch (3.2 mm) thick, unless otherwise indicated; and full-face or ring type, unless otherwise indicated.

C. Flange Bolts and Nuts: ASME B18.2.1, carbon steel, unless otherwise indicated.

D. Plastic, Pipe-Flange Gasket, Bolts, and Nuts: Type and material recommended by piping system manufacturer, unless otherwise indicated.

1. Solder Filler Metals: ASTM B 32, lead-free alloys. Include water-flushable flux according to ASTM B 813.

E. Brazing Filler Metals: AWS A5.8, BCuP Series, copper-phosphorus alloys for general-duty brazing, unless otherwise indicated; and AWS A5.8, BAg1, silver alloy for refrigerant piping, unless otherwise indicated.

F. Welding Filler Metals: Comply with AWS D10.12 for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.

G. Solvent Cements for Joining Plastic Piping:

1. ABS Piping: ASTM D 2235.
2. CPVC Piping: ASTM F 493.
3. PVC Piping: ASTM D 2564. Include primer according to ASTM F 656.
4. PVC to ABS Piping Transition: ASTM D 3138.

H. Fiberglass Pipe Adhesive: As furnished or recommended by pipe manufacturer.

2.3. TRANSITION FITTINGS

A. AWWA Transition Couplings: Same size as, and with pressure rating at least equal to and with ends compatible with, piping to be joined.

1. Manufacturers:

a. Cascade Waterworks Mfg. Co.
b. Dresser Industries, Inc.; DMD Div.
c. Ford Meter Box Company, Incorporated (The); Pipe Products Div.
d. JCM Industries.
e. Smith-Blair, Inc.
f. Viking Johnson.
g. Or Approved Equal

2. Underground Piping NPS 1-1/2 (DN 40) and Smaller: Manufactured fitting or coupling.
3. Underground Piping NPS 2 (DN 50) and Larger: AWWA C219, metal sleeve-type coupling.

B. Plastic-to-Metal Transition Fittings: CPVC and PVC one-piece fitting with manufacturer's Schedule 80 equivalent dimensions; one end with threaded brass insert, and one solvent-cement-joint end.

C. Plastic-to-Metal Transition Adaptors: One-piece fitting with manufacturer's SDR 11 equivalent dimensions; one end with threaded brass insert, and one solvent-cement-joint end.

D. Plastic-to-Metal Transition Unions: MSS SP-107, CPVC and PVC four-part union. Include brass end, solvent-cement-joint end, rubber O-ring, and union nut.

E. Flexible Transition Couplings for Underground Nonpressure Drainage Piping: ASTM C 1173 with elastomeric sleeve ends same size as piping to be joined, and corrosion-resistant metal band on each end.

1. Manufacturers:

a. Cascade Waterworks Mfg. Co.
b. Fernco, Inc.
c. Mission Rubber Company.
d. Plastic Oddities, Inc.

e. Or Approved Equal

2.4. DIELECTRIC FITTINGS

A. Description: Combination fitting of copper alloy and ferrous materials with threaded, solder-joint, plain, or weld-neck end connections that match piping system materials.

B. Insulating Material: Suitable for system fluid, pressure, and temperature.

C. Dielectric Unions: Factory-fabricated, union assembly, for 250-psig (1725-kPa) minimum working pressure at 180 deg F (82 deg C).

1. Manufacturers:

a. Capitol Manufacturing Co.
b. Central Plastics Company.
c. Eclipse, Inc.
d. Epco Sales, Inc.
e. Hart Industries, International, Inc.
f. Watts Industries, Inc.; Water Products Div.
g. Zurn Industries, Inc.; Wilkins Div.
h. Or Approved Equal

D. Dielectric Flanges: Factory-fabricated, companion-flange assembly, for 150- or 300-psig (1035- or 2070-kPa) minimum working pressure as required to suit system pressures.

1. Manufacturers:

a. Capitol Manufacturing Co.
b. Central Plastics Company.
c. Epco Sales, Inc.
d. Watts Industries, Inc.; Water Products Div.
e. Or Approved Equal

E. Dielectric-Flange Kits: Companion-flange assembly for field assembly. Include flanges, full-face- or ring-type neoprene or phenolic gasket, phenolic or polyethylene bolt sleeves, phenolic washers, and steel backing washers.

1. Manufacturers:

a. Advance Products & Systems, Inc.
b. Calpico, Inc.
c. Central Plastics Company.
d. Pipeline Seal and Insulator, Inc.
e. Or Approved Equal

2. Separate companion flanges and steel bolts and nuts shall have 150- or 300-psig (1035- or 2070-kPa) minimum working pressure where required to suit system pressures.

F. Dielectric Couplings: Galvanized-steel coupling with inert and noncorrosive, thermoplastic lining; threaded ends; and 300-psig (2070-kPa) minimum working pressure at 225 deg F (107 deg C).

G. Dielectric Nipples: Electroplated steel nipple with inert and noncorrosive, thermoplastic lining; plain, threaded, or grooved ends; and 300-psig (2070-kPa) minimum working pressure at 225 deg F (107 deg C).

1. Manufacturers:

   a. Perfection Corp.
   b. Precision Plumbing Products, Inc.
   c. Sioux Chief Manufacturing Co., Inc.
   d. Victaulic Co. of America.
   e. Or Approved Equal

2.5. MECHANICAL SLEEVE SEALS

A. Description: Modular sealing element unit, designed for field assembly, to fill annular space between pipe and sleeve.

1. Manufacturers:

   a. Advance Products & Systems, Inc.
   b. Calpico, Inc.
   c. Metraflex Co.
   d. Pipeline Seal and Insulator, Inc.
   e. Or Approved Equal

2. Sealing Elements: Include type and number required for pipe material and size of pipe.
3. Pressure Plates: Include two for each sealing element.
4. Connecting Bolts and Nuts: Length required to secure pressure plates to sealing elements. Include one for each sealing element.

2.6. SLEEVES

A. Galvanized-Steel Sheet: 0.0239-inch (0.6-mm) minimum thickness; round tube closed with welded longitudinal joint.

B. Steel Pipe: ASTM A 53, Type E, Grade B, Schedule 40, galvanized, plain ends.

C. Cast Iron: Cast or fabricated "wall pipe" equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop, unless otherwise indicated.

D. Stack Sleeve Fittings: Manufactured, cast-iron sleeve with integral clamping flange. Include clamping ring and bolts and nuts for membrane flashing.

1. Underdeck Clamp: Clamping ring with set screws.

E. Molded PVC: Permanent, with nailing flange for attaching to wooden forms.

F. PVC Pipe: ASTM D 1785, Schedule 40.

G. Molded PE: Reusable, PE, tapered-cup shaped, and smooth-outer surface with nailing flange for attaching to wooden forms.

2.7. ESCUTCHEONS

A. Description: Manufactured wall and ceiling escutcheons and floor plates, with an ID to closely fit around pipe, tube, and insulation of insulated piping and an OD that completely covers opening.

B. One-Piece, Deep-Pattern Type: Deep-drawn, box-shaped brass with polished chrome-plated finish.

C. One-Piece, Cast-Brass Type: With set screw.

1. Finish: Polished chrome-plated and rough brass.

D. Split-Casting, Cast-Brass Type: With concealed hinge and set screw.

1. Finish: Polished chrome-plated and rough brass.
2. One-Piece, Stamped-Steel Type: With set screw or spring clips and chrome-plated finish.

E. Split-Plate, Stamped-Steel Type: With set screw or spring clips, and chrome-plated finish.

F. One-Piece, Floor-Plate Type: Cast-iron floor plate.

G. Split-Casting, Floor-Plate Type: Cast brass with concealed hinge and set screw.

2.8. GROUT

A. Description: ASTM C 1107, Grade B, nonshrink and nonmetallic, dry hydraulic-cement grout.

1. Characteristics: Post-hardening, volume-adjusting, non-staining, noncorrosive, nongaseous, and recommended for interior and exterior applications.
2. Design Mix: 5000-psi (34.5-MPa), 28-day compressive strength.
3. Packaging: Premixed and factory packaged.

PART 3 - EXECUTION

3.1. EXECUTION REQUIREMENTS

A. Refer to DDC General Conditions for execution requirements.

3.2. PLUMBING DEMOLITION

A. Disconnect, demolish, and remove plumbing systems, equipment, and components indicated to be removed.

1. Piping to Be Removed: Remove portion of piping indicated to be removed and cap or plug remaining piping with same or compatible piping material.
2. Piping to Be Abandoned in Place: Drain piping and cap or plug piping with same or compatible piping material.
3. Equipment to Be Removed: Disconnect and cap services and remove equipment.
4. Equipment to Be Removed and Reinstalled: Disconnect and cap services and remove, clean, and store equipment; when appropriate, reinstall, reconnect, and make equipment operational.
5. Equipment to Be Removed and Salvaged: Disconnect and cap services and remove equipment and deliver to the Commissioner.

B. If pipe, insulation, or equipment to remain is damaged in appearance or is unserviceable, remove damaged or unserviceable portions and replace with new products of equal capacity and quality.

3.3. PIPING SYSTEMS - COMMON REQUIREMENTS

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on Coordination Drawings.

B. Install piping in concealed locations, unless otherwise indicated and except in equipment rooms and service areas.

C. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

D. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.

E. Install piping to permit valve servicing.

F. Install piping at indicated slopes.

G. Install piping free of sags and bends.

H. Install fittings for changes in direction and branch connections.

I. Install piping to allow application of insulation.

J. Select system components with pressure rating equal to or greater than system operating pressure.

K. Install escutcheons for penetrations of walls, ceilings, and floors according to the following:

1. New Piping:

   a. Piping with Fitting or Sleeve Protruding from Wall: One-piece, deep-pattern type.
   b. Chrome-Plated Piping: One-piece, cast-brass type with polished chrome-plated finish.
   c. Insulated Piping: One-piece, stamped-steel type with spring clips.

d. Bare Piping at Wall and Floor Penetrations in Finished Spaces: One-piece, cast-brass type with polished chrome-plated finish.
e. Bare Piping at Ceiling Penetrations in Finished Spaces: cast-brass type with polished chrome-plated finish.
f. Bare Piping in Unfinished Service Spaces: One-piece, cast-brass type with polished chrome-plated and rough-brass finish.
g. Bare Piping in Equipment Rooms: One-piece, cast-brass type.
h. Bare Piping at Floor Penetrations in Equipment Rooms: One-piece, floor-plate type.

3.4. PIPING JOINT CONSTRUCTION

A. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.

B. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.

C. Soldered Joints: Apply ASTM B 813, water-flushable flux, unless otherwise indicated, to tube end. Construct joints according to ASTM B 828 or CDA's "Copper Tube Handbook," using lead-free solder alloy complying with ASTM B 32.

D. Brazed Joints: Construct joints according to AWS's "Brazing Handbook," "Pipe and Tube" Chapter, using copper-phosphorus brazing filler metal complying with AWS A5.8.

E. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:

1. Apply appropriate tape or thread compound to external pipe threads unless dry seal threading is specified.
2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.

F. Welded Joints: Construct joints according to AWS D10.12, using qualified processes and welding operators according to Part 1 "Quality Assurance" Article.

G. Flanged Joints: Select appropriate gasket material, size, type, and thickness for service application. Install gasket concentrically positioned. Use suitable lubricants on bolt threads.

H. Plastic Piping Solvent-Cement Joints: Clean and dry joining surfaces. Join pipe and fittings according to the following:

1. Comply with ASTM F 402 for safe-handling practice of cleaners, primers, and solvent cements.
2. ABS Piping: Join according to ASTM D 2235 and ASTM D 2661 Appendixes.
3. CPVC Piping: Join according to ASTM D 2846/D 2846M Appendix.
4. PVC Pressure Piping: Join schedule number ASTM D 1785, PVC pipe and PVC socket fittings according to ASTM D 2672. Join other-than-schedule-number PVC pipe and socket fittings according to ASTM D 2855.
5. PVC Nonpressure Piping: Join according to ASTM D 2855.

6. PVC to ABS Nonpressure Transition Fittings: Join according to ASTM D 3138 Appendix.
7. Plastic Pressure Piping Gasketed Joints: Join according to ASTM D 3139.
8. Plastic Nonpressure Piping Gasketed Joints: Join according to ASTM D 3212

I. PE Piping Heat-Fusion Joints: Clean and dry joining surfaces by wiping with clean cloth or paper towels. Join according to ASTM D 2657.

1. Plain-End Pipe and Fittings: Use butt fusion.
2. Plain-End Pipe and Socket Fittings: Use socket fusion.

J. Fiberglass Bonded Joints: Prepare pipe ends and fittings, apply adhesive, and join according to pipe manufacturer's written instructions.

3.5. PIPING CONNECTIONS

A. Make connections according to the following, unless otherwise indicated:

1. Install unions, in piping NPS 2 (DN 50) and smaller, adjacent to each valve and at final connection to each piece of equipment.
2. Install flanges, in piping NPS 2-1/2 (DN 65) and larger, adjacent to flanged valves and at final connection to each piece of equipment.
3. Dry Piping Systems: Install dielectric unions and flanges to connect piping materials of dissimilar metals.
4. Wet Piping Systems: Install dielectric coupling and nipple fittings to connect piping materials of dissimilar metals.

3.6. EQUIPMENT INSTALLATION - COMMON REQUIREMENTS

A. Install equipment to allow maximum possible headroom unless specific mounting heights are not indicated.

B. Install equipment level and plumb, parallel and perpendicular to other building systems and components in exposed interior spaces, unless otherwise indicated.

C. Install plumbing equipment to facilitate service, maintenance, and restore or replacement of components. Connect equipment for ease of disconnecting, with minimum interference to other installations. Extend grease fittings to accessible locations.

D. Install equipment to allow right of way for piping installed at required slope.

3.7. PAINTING

A. Painting of plumbing systems, equipment, and components is specified in Sections 099000 "Painting and Finishing."

B. Damage and Touchup: Restore marred and damaged factory-painted finishes with materials and procedures to match original factory finish.

END OF SECTION 220500

SECTION 220516
Expansion Fittings and Loops for Plumbing Piping

PART 1 - GENERAL

1.1. RELATED DOCUMENTS

A. The following documents apply to all required work for the Project: (1) the Contract Drawings, (2) the Specifications, (3) the General Conditions, (4) the Addendum and (5) the Contract (City of New York Standard Construction Contract).

B. LEED General Requirements:

1. Refer to DDC General Conditions.

a. Section 01 81 13.04 "Sustainable Design Requirements for LEED v4 Buildings."

1.2. SUMMARY

A. Section Includes:

1. Flexible-hose packless expansion joints.
2. Metal-bellows packless expansion joints.
3. Rubber packless expansion joints.
4. Grooved-joint expansion joints.
5. Pipe loops and swing connections.
6. Alignment guides and anchors.

1.3. PERFORMANCE REQUIREMENTS

A. Compatibility: Products shall be suitable for piping service fluids, materials, working pressures, and temperatures.

B. Capability: Products to absorb 200 percent of maximum axial movement between anchors.

1.4. SUBMITTALS

A. Refer to DDC General Conditions Section 01 33 00 "Submittal Procedures."

B. Product Data: For each type of product indicated.

C. Product Certificates: For each type of expansion joint, from manufacturer.

D. Maintenance Data: For expansion joints to include in maintenance manuals.

PART 2 - PRODUCTS

2.1. PACKLESS EXPANSION JOINTS

A. Flexible-Hose Packless Expansion Joints:

1. Manufacturers: Subject to compliance with requirements, provide products by one the following:

   a. Flex-Hose Co., Inc.
   b. Flexicraft Industries.
   c. Flex Pression Ltd.
   d. Metraflex, Inc.
   e. Unisource Manufacturing, Inc.
   f. Or Approved Equal

2. Description: Manufactured assembly with inlet and outlet elbow fittings and two flexible-metal-hose legs joined by long-radius, 180-degree return bend or center section of flexible hose.
3. Flexible Hose: Corrugated-metal inner hoses and braided outer sheaths.
4. Expansion Joints for Copper Tubing NPS 2 (DN 50) and Smaller: Copper-alloy fittings with solder-joint end connections.
5. Expansion Joints for Copper Tubing NPS 2-1/2 to NPS 4: Copper-alloy fittings with threaded end connections.

B. Metal-Bellows Packless Expansion Joints:

1. Manufacturers: Subject to compliance with requirements, provide products by one the following:

   a. Adsco Manufacturing LLC.
   b. American BOA, Inc.
   c. Badger Industries, Inc.
   d. Expansion Joint Systems, Inc.
   e. Flex-Hose Co., Inc.
   f. Flexicraft Industries.
   g. Flex Pression Ltd.
   h. Flex-Weld, Inc.
   i. Flo Fab inc.
   j. Hyspan Precision Products, Inc.
   k. Metraflex, Inc.
   l. Proco Products, Inc.
   m. Senior Flexonics Pathway.
   n. Tozen Corporation.
   o. Unaflex.
   p. Unisource Manufacturing, Inc.
   q. Universal Metal Hose; a subsidiary of Hyspan Precision Products, Inc.
   r. U.S. Bellows, Inc.
   s. WahlcoMetroflex.
   t. Or Approved Equal

2. Standards: ASTM F 1120 and EJMA's "Standards of the Expansion Joint Manufacturers Association, Inc."
3. Type: Circular, corrugated bellows with external tie rods.
4. Minimum Pressure Rating: 175 psig unless otherwise indicated.
5. Configuration: Single joint with base and double joint with base class(es) unless otherwise indicated.
6. Expansion Joints for Copper Tubing: Single- or multi-ply phosphor-bronze bellows, copper pipe ends, and brass shrouds.

C. Rubber Packless Expansion Joints:

1. Manufacturers: Subject to compliance with requirements:

   a. Amber/Booth Company, Inc.; a div. of Vibration Isolation Products of Texas, Inc.
   b. Flex-Hose Co., Inc.
   c. Flexicraft Industries.
   d. Flex-Weld, Inc.
   e. Garlock Sealing Technologies.
   f. General Rubber Corporation.
   g. Mason Industries, Inc.; Mercer Rubber Co.
   h. Metraflex, Inc.
   i. Proco Products, Inc.
   j. Red Valve Company, Inc.
   k. Tozen Corporation.
   l. Unaflex.
   m. Unisource Manufacturing, Inc.
   n. Or Approved Equal

2. Standards: ASTM F 1123 and FSA's "Technical Handbook: Non-Metallic Expansion Joints and Flexible Pipe Connectors."
3. Material: Fabric-reinforced rubber complying with FSA-NMEJ-703.
4. Minimum Pressure Rating for NPS 1-1/2 to NPS 4: 150 psig at 220 deg F.
5. Minimum Pressure Rating for NPS 5 and NPS 6: 140 psig at 200 deg F.
6. Minimum Pressure Rating for NPS 8 to NPS 12: 140 psig at 180 deg F.
7. Material for Water: EPDM.
8. End Connections: Full-faced, integral steel flanges with steel retaining rings.

2.2. ALIGNMENT GUIDES AND ANCHORS

A. Alignment Guides:

1. Manufacturers: Subject to compliance with requirements, provide products by one the following:

   a. Adsco Manufacturing LLC.
   b. Advanced Thermal Systems, Inc.
   c. Flex-Hose Co., Inc.
   d. Flexicraft Industries.
   e. Flex-Weld, Inc.
   f. Hyspan Precision Products, Inc.

g. Metraflex, Inc.
h. Senior Flexonics Pathway.
i. Unisource Manufacturing, Inc.
j. U.S. Bellows, Inc.
k. Or Approved Equal

2. Description: Steel, factory-fabricated alignment guide, with bolted two-section outer cylinder and base for attaching to structure; with two-section guiding spider for bolting to pipe.

B. Anchor Materials:

1. Steel Shapes and Plates: ASTM A 36/A 36M.
2. Bolts and Nuts: ASME B18.10 or ASTM A 183, steel hex head.
3. Washers: ASTM F 844, steel, plain, flat washers.
4. Mechanical Fasteners: Insert-wedge-type stud with expansion plug anchor for use in hardened portland cement concrete, with tension and shear capacities appropriate for application.

a. Stud: Threaded, zinc-coated carbon steel.
b. Expansion Plug: Zinc-coated steel.
c. Washer and Nut: Zinc-coated steel.

5. Chemical Fasteners: Insert-type-stud, bonding-system anchor for use with hardened portland cement concrete, with tension and shear capacities appropriate for application.

a. Bonding Material: ASTM C 881/C 881M, Type IV, Grade 3, two-component epoxy resin suitable for surface temperature of hardened concrete where fastener is to be installed.
b. Stud: ASTM A 307, zinc-coated carbon steel with continuous thread on stud unless otherwise indicated.
c. Washer and Nut: Zinc-coated steel.

PART 3 - EXECUTION

3.1. EXECUTION REQUIREMENTS

A. Refer to DDC General Conditions for execution requirements.

3.2. EXPANSION-JOINT INSTALLATION

A. Install expansion joints of sizes matching sizes of piping in which they are installed.

B. Install metal-bellows expansion joints according to EJMA's "Standards of the Expansion Joint Manufacturers Association, Inc."

C. Install rubber packless expansion joints according to FSA-NMEJ-702.

D. Install grooved-joint expansion joints to grooved-end steel piping

3.3. PIPE LOOP AND SWING CONNECTION INSTALLATION

A. Install pipe loops cold-sprung in tension or compression as required to partly absorb tension or compression produced during anticipated change in temperature.

B. Connect risers and branch connections to mains with at least five pipe fittings including tee in main.

C. Connect risers and branch connections to terminal units with at least four pipe fittings including tee in riser.

D. Connect mains and branch connections to terminal units with at least four pipe fittings including tee in main.

3.4. ALIGNMENT-GUIDE AND ANCHOR INSTALLATION

A. Install alignment guides to guide expansion and to avoid end-loading and torsional stress.

B. Install one guide(s) on each side of pipe expansion fittings and loops. Install guides nearest to expansion joint not more than four pipe diameters from expansion joint.

C. Attach guides to pipe and secure guides to building structure.

D. Install anchors at locations to prevent stresses from exceeding those permitted by ASME B31.9 and to prevent transfer of loading and stresses to connected equipment.

E. Anchor Attachments:

1. Anchor Attachment to Galvanized-Steel Pipe: Attach with pipe hangers. Use MSS SP-69, Type 42, riser clamp welded to anchor.
2. Anchor Attachment to Copper Tubing: Attach with pipe hangers. Use MSS SP-69, Type 24, U-bolts bolted to anchor.

F. Use grout to form flat bearing surfaces for guides and anchors attached to concrete.

END OF SECTION 220516

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SECTION 220519
Meters and Gages For Plumbing Piping

PART 1 - GENERAL

1.1. RELATED DOCUMENTS

A. The following documents apply to all required work for the Project: (1) the Contract Drawings, (2) the Specifications, (3) the General Conditions, (4) the Addendum and (5) the Contract (City of New York Standard Construction Contract).

B. LEED General Requirements:

1. Refer to DDC General Conditions.
   a. Section 01 81 13.04 "Sustainable Design Requirements for LEED v4 Buildings."

1.2. SUMMARY

A. Section Includes:

1. Bimetallic-actuated thermometers.
2. Liquid-in-glass thermometers.
3. Thermowells.
4. Dial-type pressure gages.
5. Gage attachments.
6. Test plugs.

1.3. SUBMITTALS

A. Refer to DDC General Conditions Section 01 33 00 "Submittal Procedures."

B. Product Data: For each type of product indicated.

C. Product Certificates: For each type of meter and gage, from manufacturer.

D. Operation and Maintenance Data: For meters and gages to include in operation and maintenance manuals.

1.4. QUALITY ASSURANCE

A. Refer to DDC General Conditions Section 01 40 00 "Quality Requirements."

PART 2 - PRODUCTS

2.1. BIMETALLIC-ACTUATED THERMOMETERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Ernst Flow Industries.
2. Marsh Bellofram.
3. Trerice, H. O. Co.
4. Watts Regulator Co.; a div. of Watts Water Technologies, Inc.
5. Weiss Instruments, Inc.
6. WIKA Instrument Corporation - USA.
7. Or Approved Equal

B. Standard: ASME B40.200.

C. Case: Hermetically sealed type(s); stainless steel with 3-inch nominal diameter.

D. Dial: Nonreflective aluminum with permanently etched scale markings and scales in deg F.

E. Connector Type(s): Union joint, adjustable angle, with unified-inch screw threads.

F. Connector Size: 1/2 inch, with ASME B1.1 screw threads.

G. Stem: 0.25 in diameter; stainless steel.

H. Window: Double strength glass.

I. Ring: Stainless steel.

J. Element: Bimetal coil.

K. Pointer: Dark-colored metal.

L. Accuracy: Plus or minus 1 percent of scale range.

2.2. LIQUID-IN-GLASS THERMOMETERS

A. Metal-Case, Industrial-Style, Liquid-in-Glass Thermometers:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Ernst Flow Industries.
    b. Trerice, H. O. Co.
    c. Weiss Instruments, Inc.
    d. Or Approved Equal

2. Standard: ASME B40.200.
3. Case: Cast aluminum; 9-inch nominal size unless otherwise indicated.
4. Case Form: Adjustable angle unless otherwise indicated.
5. Tube: Glass with magnifying lens and blue or red organic liquid.
6. Tube Background: Non-reflective aluminum with permanently etched scale markings graduated in deg F.
7. Window: Glass or acrylic.

8. Stem: Aluminum, brass or stainless steel and of length to suit installation.

   a. Design for Air-Duct Installation: With ventilated shroud.
   b. Design for Thermowell Installation: Bare stem.

9. Connector: 1-1/4 inches, with ASME B1.1 screw threads.
10. Accuracy: Plus or minus 1 percent of scale range or one scale division, to a maximum of 1.5 percent of scale range.

2.3. THERMOWELLS

A. Thermowells:

1. Standard: ASME B40.200.
2. Description: Pressure-tight, socket-type fitting made for insertion into piping tee fitting.
3. Material: Brass or stainless steel.
4. Type: Stepped shank unless straight or tapered shank is indicated.
5. External Threads: ½ inch, ¾ inch, or 1 inch, ASME B1.20.1 pipe threads.
6. Internal Threads: 1/2, 3/4, and 1 inch, with ASME B1.1 screw threads.
7. Bore: Diameter required to match thermometer bulb or stem.
8. Insertion Length: Length required to match thermometer bulb or stem.
9. Lagging Extension: Include on thermowells for insulated piping and tubing.
10. Bushings: For converting size of thermowell's internal screw thread to size of thermometer connection.

2.4. PRESSURE GAGES

A. Direct-Mounted, Metal-Case, Dial-Type Pressure Gages:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. AMETEK, Inc.; U.S. Gauge.
   b. Marsh Bellofram.
   c. Trerice, H. O. Co.
   d. Watts Regulator Co.; a div. of Watts Water Technologies, Inc.
   e. Weiss Instruments, Inc.
   f. WIKA Instrument Corporation - USA.
   g. Or Approved Equal

2. Standard: ASME B40.100.
3. Case: Liquid-filled type(s); stainless steel; 4-1/2-inch nominal diameter.
4. Pressure-Element Assembly: Bourdon tube unless otherwise indicated.
5. Pressure Connection: 316L stainless steel, with 1/4 inch, ASME B1.20.1 pipe threads and bottom-outlet type unless back-outlet type is indicated.
6. Movement: Mechanical, with link to pressure element and connection to pointer.
7. Dial: Nonreflective aluminum with permanently etched scale markings graduated in psi.
8. Pointer: Dark-colored metal.

9. Window: Glass.
10. Ring: Stainless steel.
11. Accuracy: Grade A, plus or minus 1 percent of middle half of scale range.

2.5. GAGE ATTACHMENTS

A. Snubbers: ASME B40.100, brass; with 1/4 inch ASME B1.20.1 pipe threads and surge-dampening device. Include extension for use on insulated piping.

B. Siphons: Loop-shaped section of brass pipe with 1/4 inch pipe threads.

C. Valves: Brass or stainless-steel needle, with 1/4 inch, ASME B1.20.1 pipe threads.

2.6. TEST PLUGS

A. Product: Subject to compliance with requirements, provide product by one of the following:

1. Petersin Equipment Co. Inc.
2. Trerice, H. O. Co.
3. Watts Regulator Co.; a div. of Watts Water Technologies, Inc.
4. Weiss Instruments, Inc.
5. Or Approved Equal

B. Description: Test-station fitting made for insertion into piping tee fitting.

C. Body: Brass or stainless steel with core inserts and gasketed and threaded cap. Include extended stem on units to be installed in insulated piping.

D. Thread Size: 1/2 inch, ASME B1.20.1 pipe thread.

E. Minimum Pressure and Temperature Rating: 500 psig at 240 deg F.

F. Core Inserts: Neoprene self-sealing rubber.

PART 3 - EXECUTION

3.1. EXECUTION REQUIREMENTS

A. Refer to DDC General Conditions for execution requirements.

3.2. INSTALLATION

A. Install thermowells with socket extending one-third of pipe diameter and in vertical position in piping tees.

B. Install thermowells of sizes required to match thermometer connectors. Include bushings if required to match sizes.

C. Install thermowells with extension on insulated piping.

D. Install direct-mounted thermometers in thermowells and adjust vertical and tilted positions.

E. Install direct-mounted pressure gages in piping tees with pressure gage located on pipe at the most readable position.

F. Install valve and snubber in piping for each pressure gage for fluids.

G. Install test plugs in piping tees.

H. Install thermometers in the following locations:

1. Inlet and outlet of each water heater.
2. Inlets and outlets of each domestic water heat exchanger.
3. Inlet and outlet of each domestic hot-water storage tank.

I. Install pressure gages in the following locations:

1. Building water service entrance into building.
2. Inlet and outlet of each pressure-reducing valve.
3. Suction and discharge of each domestic water pump.

3.3. CONNECTIONS

A. Install meters and gages adjacent to machines and equipment to allow service and maintenance of meters, gages, machines, and equipment.

3.4. ADJUSTING

A. Adjust faces of meters and gages to proper angle for best visibility.

3.5. THERMOMETER SCHEDULE

A. Thermometers at inlet and outlet of each domestic water heater shall be one of the following:

1. Sealed, bimetallic-actuated type.
2. Industrial-style, liquid-in-glass type.

B. Thermometers at inlets and outlets of each domestic water heat exchanger shall be one of the following:

1. Sealed, bimetallic-actuated type.
2. Industrial-style, liquid-in-glass type.

C. Thermometers at inlet and outlet of each domestic hot-water storage tank shall be one of the following:

1. Sealed, bimetallic-actuated type.

2. Industrial-style, liquid-in-glass type.

D. Thermometer stems shall be of length to match thermowell insertion length.

3.6. THERMOMETER SCALE-RANGE SCHEDULE

A. Scale Range for Domestic Cold-Water Piping: 0 to 100 deg F.

B. Scale Range for Domestic Hot-Water Piping: 20 to 240 deg F.

3.7. PRESSURE-GAGE SCHEDULE

A. Pressure gages at discharge of each water service into building shall be the following:

1. Liquid-filled direct-mounted, metal case.

B. Pressure gages at inlet and outlet of each water pressure-reducing valve shall be of the following:

1. Liquid-filled direct-mounted, metal case.

C. Pressure gages at suction and discharge of each domestic water pump shall be the following:

1. Liquid-filled direct-mounted, metal case.

3.8. PRESSURE-GAGE SCALE-RANGE SCHEDULE

A. Scale Range for Water Service Piping: 0 to 160 psi.

B. B. Scale Range for Domestic Water Piping: 0 to 160 psi.

END OF SECTION 220519

SECTION 220523
General Duty Valves for Plumbing Piping

PART 1 - GENERAL

1.1. RELATED DOCUMENTS

A. The following documents apply to all required work for the Project: (1) the Contract Drawings, (2) the Specifications, (3) the General Conditions, (4) the Addendum and (5) the Contract (City of New York Standard Construction Contract).

B. LEED General Requirements.

1. Refer to DDC General Conditions.

a. Section 01 81 13.04 "Sustainable Design Requirements for LEED v4 Buildings."

1.2. SUMMARY

A. Section Includes

1. Gate valves
2. Globe and angle valves
3. Swing check valves
4. Lift check valves
5. Silent check valves (pump discharge)
6. Ball valves
7. Butterfly valves
8. Plug lubricated valves
9. Pressure reducing valves
10. Solenoid valves
11. Water service valves

1.3. SUBMITTALS

A. Refer to DDC General Conditions Section 01 33 00 "Submittal Procedures."

1.4. QUALITY ASSURANCE

A. Refer to DDC General Conditions Section 01 40 00 "Quality Requirements."

B. Provide valves of same manufacturer throughout.

C. Provide valves with manufacturer's name and pressure rating clearly marked on the outside of the body.

D. Manufacturers

1. Gate, globe, angle valves, swing, lift and ball check valves

    a. Jenkins
    b. Stockham
    c. Hammond
    d. Kennedy
    e. Crane
    f. Flygt
    g. Or Approved Equal

2. Silent check valves

    a. Smolensky
    b. Williams - Hager
    c. Mueller
    d. Or Approved Equal

3. Ball valves

    a. Apollo
    b. Watts
    c. Worcester
    d. Jamesbury
    e. Fairbanks
    f. Rockwell McCanna
    g. Or Approved Equal

4. Butterfly Valves

    a. Rockwell - McCanna Co.
    b. Jamesbury Co.
    c. Duriron
    d. Or Approved Equal

5. Plug lubricated valves

    a. Rockwell Norstrom
    b. DeZurik
    c. Dresser
    d. Or Approved Equal

6. Pressure reducing valves (PRV)

a. Central station

1. Cla-Val
2. Roll Seal
3. Gungenhauser
4. Or Approved Equal

b. Local PRV

1. Ford
2. A.W. Cash
3. Watts
4. Or Approved Equal

PART 2 - PRODUCTS

2.1. GATE VALVES

A. Valve bodies three inches (3") and smaller shall be all bronze with bronze trim.

B. Valve bodies four inches (4") and larger shall be iron body with bronze trim.

C. Bronze valve shall have aluminum alloy hand wheels. Iron body valves shall have malleable, cast iron or high tensile strength alloy steel hand wheels.

D. Use rising stem gate valves where space permits.

E. Valves six inches (6") and larger shall be equipped with valve bypass.

F. Ball valves may be substituted for gate valves in sizes three inches (3") and smaller.

G. Valve Application:

1. Domestic Water System

Sizes	Pressure Class SWP/CWP	Model No.	Valve End
2 1/2" & smaller	/300	0282	Socket
3" & larger	125/200	0405	Flange
2" & larger	250/500	0312	Flange

2. Storm Water Sump Pump Discharge

Sizes SWP/CWP	Pressure Class	Model No.	Valve End
2" & 2 1/2"	150/300	0252	Screw
3" & larger	125/200	0405	Flange

2.2. GLOBE & ANGLE VALVES

A. Valve bodies three inches (3") and smaller shall be all bronze with bronze trim.

B. Valve bodies four inches (4") and larger shall be iron body with bronze mounted trim.

C. Provide re-grindable seats and composite discs for all globe valves and throttling nuts for globe valves used for pipe line balancing.

D. Ball valves may be substituted for globe valves in sized three inches (3") and smaller.

E. Valve Application

1. Domestic Water System

Sizes SWP/CWP	Pressure Class Rating	Model No.	Valve End
2" & smaller	/300	4502-2	Socket
2 1/2" & 3"	150/300	U-01	Screw
4" & larger	125/200	0102	Flange

2.3. SWING CHECK VALVES

A. Valve bodies three inches (3") and smaller shall be all bronze.

B. Valve bodies four inches (4") and larger shall be iron body bronze mounted.

C. Swing check valves shall be provided with composite discs for sewage ejector and sump pump discharge.

D. Double door check valves for compressed air shall be threaded full flange type, carbon steel body, stainless steel door and pins (type C), monel spring, and Buna-N seats.

2.4. SILENT CHECK VALVE

A. Silent check valves for domestic water, non-potable water system pump discharges shall be flanged globe type with stainless steel (S/S) spring and Buna-N insert.

B. Silent check valves for fire standpipe pump discharges shall be flanged water type with stainless steel spring and Buna-N insert.

C. Valve seat and disc shall be renewable and reseated without special tools.

D. All parts of valves in contact with deionized, demineralized, and/or process water shall be stainless steel.

E. Valve Application

1. Domestic Water Pump Discharge

Sizes	Pressure Class & WOG Rating	Model No.	Body	Disc	Seat Ring
2 1/2" & smaller	125/175	329	Semi-Steel	Bronze	Bronze
2 1/2" & smaller	150/285	329	Cast steel	S/S	S/S
2 1/2" & smaller	250/400	329	Cast steel	S/S	S/S
3" & larger	125/175	636	Semi-Steel	Bronze	Bronze
3" & larger	150/285	636	Cast-Steel	S/S	S/S
3" & larger	250/400	636	Semi-Steel	Bronze	Bronze
3" & larger	300/740	636	Cast-Steel	S/S	S/S

2. Non-Potable Water Pump Discharge

Size	Pressure Class & WOG Rating	Model No.	Body	Disc	Seat Ring
2 1/2" & Smaller	125/175	329	Semi-Steel	Bronze	Bronze
3" & larger	125/175	636	Semi-Steel	Bronze	Bronze

2.5. BALL VALVES

A. Ball valves may be substituted for gate and globe valves in sizes three inches (3") and smaller.

B. Ball valves installed in piping for balancing shall be provided with memory balancing stops.

C. Ball valves shall have full port ball and body construction.

D. Bronze ball valves shall be constructed of a one piece bronze casting and machined end piece retainer, rated at 600 P.S.I. CWP, with blow-out proof stem design complete with teflon seat and seals and chrome plated full port bronze ball.

E. All ball valves shall be (100%) factory tested.

F. Provide union end valves at equipment in lieu of one union.

G: Provide ball valves with mounting pad where valve actuators are required.

H. Provide "T" handle to actuate valves two inches (2") and smaller in lieu of lever handle when space limitations exist.

I. Valve Application

1. Domestic Water Systems

Size	Model No.	Valve End
1/2"	70-203	Socket
3/4"	77-204	Socket
1"	77-205	Socket
1 1/4"	77-206	Socket
1 1/2"	77-207	Socket
2"	77-208	Socket
2 1/2"	77-209	Screw w/adapter
3"	70-200	Screw w/adapter

2.6. PLUG VALVES

A. Manufacturers:

1. Subject to compliance with requirements, provide products by one of the following:

a) Nibco
b) Crane Co.
c) Stockham
d) Or Approved Equal

B. Up to and including 2 inches: Bronze body, bronze tapered plug, non-lubricated, Teflon packing, threaded ends.

C. Over 2 inches: Bronze body, bronze tapered plug, non-lubricated, Teflon packing, threaded ends.

2.7. RELIEF VALVES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Watts Regulator Co.
2. Kunkle Valve Co.
3. Taco, Inc.
4. Bell & Gossett Co.
5. Or Approved Equal

B. Bronze body, Teflon seat, steel stem and springs automatic direct pressure actuated, capacities ASME certified and labeled.

2.8. STRAINERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Sarco
2. Mueller Brass Co.
3. Hoffman Specialty ITT.
4. Or Approved Equal

B. Size 2 inch and under: Screwed brass or iron body for 175 psig working pressure, Y pattern with a/32 inch stainless steel perforated screen.

C. Size 2 inch to 4 inch: Flanged iron body for 175 psig working pressure, Y pattern with 3/64 inch stainless steel perforated screen.

D. Size 5 inch and larger: Flanged iron body for 175 psig working pressure, basket pattern with 1/8 inch stainless steel perforated screen.

2.9. CHAINWHEELS

A. Manufacturers: Subject to compliance with requirements, provide products by one the following:

1. Babbitt Steam Specialty co.
2. Roto Hammer Industries.
3. Trumbull Industries.
4. Or approved equal.

B. Description: Valve actuation assembly with sprocket rim, brackets, and chain.

1. Brackets: Type, number, size, and fasteners required to mount actuator on valve.

2. Attachment: for connection to fall butterfly and plug valve stema.
3. Sprocket Rim with Chain Guides: Ductile or cast iron of type and size required for valve.
4. Chain: Hot-dip, galvanized steel of size required to fit sprocket rim.

PART 3 - EXECUTION

3.1. EXECUTION REQUIREMENTS

A. Refer to DDC General Conditions for execution requirements.

3.2. EXAMINATION

A. Examine valve interior for cleanliness, freedom from foreign matter, and corrosion. Remove special packing materials, such as blocks, used to prevent disc movement during shipping and handling.

B. Operate valves in positions from fully open to fully closed. Examine guides and seats made accessible by such operations.

C. Examine threads on valve and mating pipe for form and cleanliness.

D. Examine mating flange faces for conditions that might cause leakage. Check bolting for proper size, length, and material. Verify that gasket is of proper size, that its material composition is suitable for service, and that it is free from defects and damage.

E. Do not attempt to restore defective valves; replace with new valves.

F. Ream pipe and tube ends. Remove burrs.

G. Remove scale and dirt on inside and outside before assembly.

H. Prepare piping connections to equipment with flanges or unions.

3.3. VALVE INSTALLATION

A. Install valves with unions or flanges at each piece of equipment arranged to allow service, maintenance, and equipment removal without system shutdown.

B. Locate valves for easy access and provide separate support where necessary.

C. Install valves in horizontal piping with stem at or above center of pipe.

D. Install valves in position to allow full stem movement.

E. Install chain wheels on operators for valves 4 inch and larger and more than 96 inches above floor. Extend chains to 60 inches above finished floor.

F. Install check valves for proper direction of flow and as follows:

1. Revise check valve installation requirements to suit Project; delete those not required.
2. Swing Check Valves: In horizontal position with hinge pin level.
3. Center-Guided Check Valves: In horizontal or vertical position, between flanges.
4. Lift Check Valves: With stem upright and plumb.

G. Install in accordance with manufacturer's instructions.

H. Provide non-conducting dielectric connections wherever jointing dissimilar metals.

I. Provide clearance for installation of insulation and access to valves and fittings.

J. Provide access where valves and fittings are not exposed. Coordinate size and location of access doors with Section 083113 "Access Doors."

K. Install valves with stems upright or horizontal, not inverted.

L. Provide one plug valve wrench for every ten plug valves sized 2 inches and smaller, minimum of one. Provide each plug valve sized 2" inches and larger with a wrench with set screw.

M. Pipe vents from gas pressure reducing valves to outdoors and terminate in weatherproof hood.

3.4. APPLICATION

A. Install unions downstream of valves and at equipment or apparatus connections.

B. Install brass male adapters each side of valves in copper piped system. Sweat solder adapters to pipe.

C. Install gate ball or ball valves for shut-off and to isolate equipment, part of systems, or vertical risers.

D. Install globe ball valves for throttling, bypass, or manual flow control services.

E. Provide swing check valves on discharge of circulation pumps.

F. Provide plug valves in natural gas systems for shut-off service.

3.5. ADJUSTING

A. Adjust or replace valve packing after piping systems have been tested and put into services but before final adjusting and balancing. Replace valves if persistent leaking occurs.

END OF SECTION 220523

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SECTION 220529
Hangers and Supports for Plumbing Piping and Equipment

PART 1 - GENERAL

1.1. RELATED DOCUMENTS

A. The following documents apply to all required work for the Project: (1) the Contract Drawings, (2) the Specifications, (3) the General Conditions, (4) the Addendum and (5) the Contract (City of New York Standard Construction Contract).

B. LEED General Requirements:

1. Refer to DDC General Conditions.

a. Section 01 81 13.04 "Sustainable Design Requirements for LEED v4 Buildings."

1.2. SUMMARY

A. This Section includes the following hangers and supports for plumbing system piping and equipment:

1. Steel pipe hangers and supports.
2. Trapeze pipe hangers.
3. Metal framing systems.
4. Thermal-hanger shield inserts.
5. Fastener systems.
6. Pipe stands.
7. Pipe positioning systems.
8. Equipment supports.

B. Related Sections include the following:

1. Section 220516 "Expansion Fittings and Loops for Plumbing Piping" for pipe guides and anchors.

1.3. DEFINITIONS

A. MSS: Manufacturers Standardization Society for The Valve and Fittings Industry Inc.

B. Terminology: As defined in MSS SP-90, "Guidelines on Terminology for Pipe Hangers and Supports."

1.4. PERFORMANCE REQUIREMENTS

A. Provide supports for multiple pipes, including pipe stands, capable of supporting combined weight of supported systems, system contents, and test water.

B. Provide equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.

C. Provide seismic-restraint hangers and supports for piping and equipment.

1.5. SUBMITTALS

A. Refer to DDC General Conditions Section 01 33 00 "Submittal Procedures."

B. Product Data: For the following:

1. Steel pipe hangers and supports.
2. Thermal-hanger shield inserts.
3. Pipe positioning systems.

C. Shop Drawings: Show fabrication and installation details and include calculations for the following:

1. Trapeze pipe hangers. Include Product Data for components.
2. Metal framing systems. Include Product Data for components.
3. Pipe stands. Include Product Data for components.
4. Equipment supports.

D. Welding certificates.

1.6. QUALITY ASSURANCE

A. Refer to DDC General Conditions Section 01 40 00 "Quality Requirements."

B. Welding: Qualify procedures and personnel according to the following:

1. AWS D1.1, "Structural Welding Code--Steel."
2. AWS D1.2, "Structural Welding Code--Aluminum."
3. AWS D1.4, "Structural Welding Code--Reinforcing Steel."
4. ASME Boiler and Pressure Vessel Code: Section IX.

PART 2 - PRODUCTS

2.1. STEEL PIPE HANGERS AND SUPPORTS

A. Description: MSS SP-58, Types 1 through 58, factory-fabricated components. Refer to Part 3 "Hanger and Support Applications" Article for where to use specific hanger and support types.

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. AAA Technology & Specialties Co., Inc.
2. Bergen-Power Pipe Supports.
3. B-Line Systems, Inc.; a division of Cooper Industries.
4. Carpenter & Paterson, Inc.
5. Empire Industries, Inc.
6. ERICO/Michigan Hanger Co.

7. Globe Pipe Hanger Products, Inc.
8. Grinnell Corp.
9. GS Metals Corp.
10. National Pipe Hanger Corporation.
11. PHD Manufacturing, Inc.
12. PHS Industries, Inc.
13. Piping Technology & Products, Inc.
14. Tolco Inc.
15. Or Approved Equal

C. Galvanized, Metallic Coatings: Pregalvanized or hot dipped.

D. Nonmetallic Coatings: Plastic coating, jacket, or liner.

E. Padded Hangers: Hanger with fiberglass or other pipe insulation pad or cushion for support of bearing surface of piping.

2.2. TRAPEZE PIPE HANGERS

A. Description: MSS SP-69, Type 59, shop- or field-fabricated pipe-support assembly made from structural-steel shapes with MSS SP-58 hanger rods, nuts, saddles, and U-bolts.

2.3. METAL FRAMING SYSTEMS

A. Description: MFMA-3, shop- or field-fabricated pipe-support assembly made of steel channels and other components.

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. B-Line Systems, Inc.; a division of Cooper Industries.
2. ERICO/Michigan Hanger Co.; ERISTRUT Div.
3. GS Metals Corp.
4. Power-Strut Div.; Tyco International, Ltd.
5. Thomas & Betts Corporation.
6. Tolco Inc.
7. Unistrut Corp.; Tyco International, Ltd.
8. Or Approved Equal

C. Coatings: Manufacturer's standard finish unless bare metal surfaces are indicated.

D. Nonmetallic Coatings: Plastic coating, jacket, or liner.

2.4. FASTENER SYSTEMS

A. Powder-Actuated Fasteners: Threaded-steel stud, for use in hardened portland cement concrete with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. Hilti, Inc.
   b. ITW Ramset/Red Head.
   c. Masterset Fastening Systems, Inc.
   d. MKT Fastening, LLC.
   e. Powers Fasteners.
   f. Or Approved Equal

B. Mechanical-Expansion Anchors: Insert-wedge-type zinc-coated steel, for use in hardened portland cement concrete with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. B-Line Systems, Inc.; a division of Cooper Industries.
   b. Empire Industries, Inc.
   c. Hilti, Inc.
   d. ITW Ramset/Red Head.
   e. MKT Fastening, LLC.
   f. Powers Fasteners.
   g. Or Approved Equal

2.5. PIPE STAND FABRICATION

A. Pipe Stands, General: Shop or field-fabricated assemblies made of manufactured corrosion-resistant components to support roof-mounted piping.

B. Compact Pipe Stand: One-piece plastic unit with integral-rod-roller, pipe clamps, or V-shaped cradle to support pipe, for roof installation without membrane penetration.

C. Low-Type, Single-Pipe Stand: One-piece stainless-steel base unit with plastic roller, for roof installation without membrane penetration.

D. High-Type, Single-Pipe Stand: Assembly of base, vertical and horizontal members, and pipe support, for roof installation without membrane penetration.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. ERICO/Michigan Hanger Co.
   b. MIRO Industries.
   c. Portable Pipe Hangers.
   d. Or Approved Equal

2. Base: Stainless steel.
3. Vertical Members: Two or more cadmium-plated-steel or stainless-steel, continuous-thread rods.
4. Horizontal Member: Cadmium-plated-steel or stainless-steel rod with plastic or stainless-steel, roller-type pipe support.

E. High-Type, Multiple-Pipe Stand: Assembly of bases, vertical and horizontal members, and pipe supports, for roof installation without membrane penetration.

1. Bases: One or more plastic.
2. Vertical Members: Two or more protective-coated-steel channels.
3. Horizontal Member: Protective-coated-steel channel.
4. Pipe Supports: Galvanized-steel, clevis-type pipe hangers.

F. Curb-Mounting-Type Pipe Stands: Shop- or field-fabricated pipe support made from structural-steel shape, continuous-thread rods, and rollers for mounting on permanent stationary roof curb.

2.6. PIPE POSITIONING SYSTEMS

A. Description: IAPMO PS 42, system of metal brackets, clips, and straps for positioning piping in pipe spaces for plumbing fixtures for commercial applications.

B. Manufacturers: Subject to compliance with requirements, provide products by the one of the following:

1. C & S Mfg. Corp.
2. HOLDRITE Corp.; Hubbard Enterprises.
3. Samco Stamping, Inc.
4. Or Approved Equal

2.7. EQUIPMENT SUPPORTS

A. Description: Welded, shop- or field-fabricated equipment support made from structural-steel shapes.

2.8. MISCELLANEOUS MATERIALS

A. Structural Steel: ASTM A 36/A 36M, steel plates, shapes, and bars; black and galvanized.

B. Grout: ASTM C 1107, factory-mixed and -packaged, dry, hydraulic-cement, nonshrink and nonmetallic grout; suitable for interior and exterior applications.

1. Properties: Nonstaining, noncorrosive, and nongaseous.
2. Design Mix: 5000-psi (34.5-MPa), 28-day compressive strength.

PART 3 - EXECUTION

3.1. EXECUTION REQUIREMENTS

A. Refer to DDC General Conditions for execution requirements.

3.2. HANGER AND SUPPORT APPLICATIONS

A. Specific hanger and support requirements are specified in Sections specifying piping systems and equipment.

B. Comply with MSS SP-69 for pipe hanger selections and applications that are not specified in piping system Sections.

C. Use hangers and supports with galvanized, metallic coatings for piping and equipment that will not have field-applied finish.

D. Use nonmetallic coatings on attachments for electrolytic protection where attachments are in direct contact with copper tubing.

E. Use padded hangers for piping that is subject to scratching.

F. Horizontal-Piping Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Adjustable, Steel Clevis Hangers (MSS Type 1): For suspension of noninsulated or insulated stationary pipes, NPS 1/2 to NPS 30 .
2. Steel Pipe Clamps (MSS Type 4): For suspension of cold and hot pipes, NPS 1/2 to NPS 24, if little or no insulation is required.
3. Pipe Hangers (MSS Type 5): For suspension of pipes, NPS 1/2 to NPS 4, to allow off-center closure for hanger installation before pipe erection.
4. Adjustable, Swivel Split- or Solid-Ring Hangers (MSS Type 6): For suspension of noninsulated stationary pipes, NPS 3/4 to NPS 8.
5. Adjustable, Steel Band Hangers (MSS Type 7): For suspension of noninsulated stationary pipes, NPS 1/2 to NPS 8.
6. Adjustable Band Hangers (MSS Type 9): For suspension of noninsulated stationary pipes, NPS 1/2 to NPS 8.
7. Adjustable, Swivel-Ring Band Hangers (MSS Type 10): For suspension of noninsulated stationary pipes, NPS 1/2 to NPS 2.
8. Split Pipe-Ring with or without Turnbuckle-Adjustment Hangers (MSS Type 11): For suspension of noninsulated stationary pipes, NPS 3/8 to NPS 8.
9. Extension Hinged or 2-Bolt Split Pipe Clamps (MSS Type 12): For suspension of noninsulated stationary pipes, NPS 3/8 to NPS 3.
10. U-Bolts (MSS Type 24): For support of heavy pipes, NPS 1/2 to NPS 30.
11. Clips (MSS Type 26): For support of insulated pipes not subject to expansion or contraction.
12. Pipe Saddle Supports (MSS Type 36): For support of pipes, NPS 4 to NPS 36, with steel pipe base stanchion support and cast-iron floor flange.
13. Pipe Stanchion Saddles (MSS Type 37): For support of pipes, NPS 4 to NPS 36, with steel pipe base stanchion support and cast-iron floor flange and with U-bolt to retain pipe.
14. Adjustable, Pipe Saddle Supports (MSS Type 38): For stanchion-type support for pipes, NPS 2-1/2 to NPS 36, if vertical adjustment is required, with steel pipe base stanchion support and cast-iron floor flange.

G. Vertical-Piping Clamps: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Extension Pipe or Riser Clamps (MSS Type 8): For support of pipe risers, NPS 3/4 to NPS 20.
2. Carbon- or Alloy-Steel Riser Clamps (MSS Type 42): For support of pipe risers, NPS 3/4 to NPS 20, if longer ends are required for riser clamps.

H. Hanger-Rod Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Steel Turnbuckles (MSS Type 13): For adjustment up to 6 inches for heavy loads.
2. Steel Clevises (MSS Type 14): For 120 to 450 deg F piping installations.
3. Swivel Turnbuckles (MSS Type 15): For use with MSS Type 11, split pipe rings.
4. Malleable-Iron Sockets (MSS Type 16): For attaching hanger rods to various types of building attachments.
5. Steel Weldless Eye Nuts (MSS Type 17): For 120 to 450 deg F piping installations.

I. Building Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Steel or Malleable Concrete Inserts (MSS Type 18): For upper attachment to suspend pipe hangers from concrete ceiling.
2. Top-Beam C-Clamps (MSS Type 19): For use under roof installations with bar-joist construction to attach to top flange of structural shape.
3. Side-Beam or Channel Clamps (MSS Type 20): For attaching to bottom flange of beams, channels, or angles.
4. Center-Beam Clamps (MSS Type 21): For attaching to center of bottom flange of beams.
5. Welded Beam Attachments (MSS Type 22): For attaching to bottom of beams if loads are considerable and rod sizes are large.
6. C-Clamps (MSS Type 23): For structural shapes.
7. Top-Beam Clamps (MSS Type 25): For top of beams if hanger rod is required tangent to flange edge.
8. Side-Beam Clamps (MSS Type 27): For bottom of steel I-beams.
9. Steel-Beam Clamps with Eye Nuts (MSS Type 28): For attaching to bottom of steel I-beams for heavy loads.
10. Linked-Steel Clamps with Eye Nuts (MSS Type 29): For attaching to bottom of steel I-beams for heavy loads, with link extensions.
11. Malleable Beam Clamps with Extension Pieces (MSS Type 30): For attaching to structural steel.
12. Welded-Steel Brackets: For support of pipes from below, or for suspending from above by using clip and rod. Use one of the following for indicated loads:
    a. Light (MSS Type 31): 750 lb.
    b. Medium (MSS Type 32): 1500 lb .
    c. Heavy (MSS Type 33): 3000 lb.
13. Side-Beam Brackets (MSS Type 34): For sides of steel or wooden beams.
14. Plate Lugs (MSS Type 57): For attaching to steel beams if flexibility at beam is required.
15. Horizontal Travelers (MSS Type 58): For supporting piping systems subject to linear horizontal movement where headroom is limited.

J. Saddles and Shields: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Steel Pipe-Covering Protection Saddles (MSS Type 39): To fill interior voids with insulation that matches adjoining insulation.
2. Protection Shields (MSS Type 40): Of length recommended in writing by manufacturer to prevent crushing insulation.
3. Thermal-Hanger Shield Inserts: For supporting insulated pipe.

K. Spring Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Restraint-Control Devices (MSS Type 47): Where indicated to control piping movement.
2. Spring Cushions (MSS Type 48): For light loads if vertical movement does not exceed 1-1/4 inches.
3. Spring-Cushion Roll Hangers (MSS Type 49): For equipping Type 41 roll hanger with springs.
4. Spring Sway Braces (MSS Type 50): To retard sway, shock, vibration, or thermal expansion in piping systems.
5. Variable-Spring Hangers (MSS Type 51): Preset to indicated load and limit variability factor to 25 percent to absorb expansion and contraction of piping system from hanger.
6. Variable-Spring Base Supports (MSS Type 52): Preset to indicated load and limit variability factor to 25 percent to absorb expansion and contraction of piping system from base support.
7. Variable-Spring Trapeze Hangers (MSS Type 53): Preset to indicated load and limit variability factor to 25 percent to absorb expansion and contraction of piping system from trapeze support.
8. Constant Supports: For critical piping stress and if necessary to avoid transfer of stress from one support to another support, critical terminal, or connected equipment. Include auxiliary stops for erection, hydrostatic test, and load-adjustment capability. These supports include the following types:

    a. Horizontal (MSS Type 54): Mounted horizontally.
    b. Vertical (MSS Type 55): Mounted vertically.
    c. Trapeze (MSS Type 56): Two vertical-type supports and one trapeze member.

L. Comply with MSS SP-69 for trapeze pipe hanger selections and applications that are not specified in piping system Sections.

M. Comply with MFMA-102 for metal framing system selections and applications that are not specified in piping system Sections.

N. Use powder-actuated fasteners or mechanical-expansion anchors instead of building attachments where required in concrete construction.

O. Use pipe positioning systems in pipe spaces behind plumbing fixtures to support supply and waste piping for plumbing fixtures.

3.3. HANGER AND SUPPORT INSTALLATION

A. Steel Pipe Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Install hangers, supports, clamps, and attachments as required to properly support piping from building structure.

B. Trapeze Pipe Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Arrange for grouping of parallel runs of horizontal piping and support together on field-fabricated trapeze pipe hangers.

1. Pipes of Various Sizes: Support together and space trapezes for smallest pipe size or install intermediate supports for smaller diameter pipes as specified above for individual pipe hangers.
2. Field fabricate from ASTM A 36/A 36M, steel shapes selected for loads being supported. Weld steel according to AWS D1.1.

B. Fiberglass Pipe Hanger Installation: Comply with applicable portions of MSS SP-69 and MSS SP-89. Install hangers and attachments as required to properly support piping from building structure.

C. Metal Framing System Installation: Arrange for grouping of parallel runs of piping and support together on field-assembled metal framing systems.

D. Fiberglass Strut System Installation: Arrange for grouping of parallel runs of piping and support together on field-assembled fiberglass struts.

E. Thermal-Hanger Shield Installation: Install in pipe hanger or shield for insulated piping.

F. Fastener System Installation:

1. Install powder-actuated fasteners for use in lightweight concrete or concrete slabs less than 4 inches thick in concrete after concrete is placed and completely cured. Use operators that are licensed by powder-actuated tool manufacturer. Install fasteners according to powder-actuated tool manufacturer's operating manual.
2. Install mechanical-expansion anchors in concrete after concrete is placed and completely cured. Install fasteners according to manufacturer's written instructions.

G. Pipe Stand Installation:

1. Pipe Stand Types except Curb-Mounting Type: Assemble components and mount on smooth roof surface. Do not penetrate roof membrane.
2. Curb-Mounting-Type Pipe Stands: Assemble components or fabricate pipe stand and mount on permanent, stationary roof curb. Refer to Section 077100 "Roof Specialties and Accessories" for curbs.

H. Pipe Positioning System Installation: Install support devices to make rigid supply and waste piping connections to each plumbing fixture. Refer to Section 224000 "Plumbing Fixtures" for plumbing fixtures.

I. Install hangers and supports complete with necessary inserts, bolts, rods, nuts, washers, and other accessories.

J. Each equipment support in first paragraph below requires calculation and detail.

K. Equipment Support Installation: Fabricate from welded-structural-steel shapes.

L. Install hangers and supports to allow controlled thermal and seismic movement of piping systems, to permit freedom of movement between pipe anchors, and to facilitate action of expansion joints, expansion loops, expansion bends, and similar units.

M. Install lateral bracing with pipe hangers and supports to prevent swaying.

N. Install building attachments within concrete slabs or attach to structural steel. Install additional attachments at concentrated loads, including valves, flanges, and strainers, NPS 2-1/2 and larger and at changes in direction of piping. Install concrete inserts before concrete is placed; fasten inserts to forms and install reinforcing bars through openings at top of inserts.

O. Load Distribution: Install hangers and supports so piping live and dead loads and stresses from movement will not be transmitted to connected equipment.

P. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes and so maximum pipe deflections allowed by ASME B31.9 (for building services piping) are not exceeded.

Q. Insulated Piping: Comply with the following:

1. Attach clamps and spacers to piping.
    a. Piping Operating above Ambient Air Temperature: Clamp may project through insulation.
    b. Piping Operating below Ambient Air Temperature: Use thermal-hanger shield insert with clamp sized to match OD of insert.
    c. Do not exceed pipe stress limits according to ASME B31.9 for building services piping.
2. Install MSS SP-58, Type 39, protection saddles if insulation without vapor barrier is indicated. Fill interior voids with insulation that matches adjoining insulation.
    a. Option: Thermal-hanger shield inserts may be used. Include steel weight-distribution plate for pipe NPS 4 and larger if pipe is installed on rollers.
3. Install MSS SP-58, Type 40, protective shields on cold piping with vapor barrier. Shields shall span an arc of 180 degrees.
    a. Option: Thermal-hanger shield inserts may be used. Include steel weight-distribution plate for pipe NPS 4 and larger if pipe is installed on rollers.
4. Shield Dimensions for Pipe: Not less than the following:
    a. NPS 1/4 to NPS 3-1/2 : 12 inches long and 0.048 inch thick.
    b. NPS 4: 12 inches long and 0.06 inch thick.
    c. NPS 5 and NPS 6 : 18 inches long and 0.06 inch thick.
    d. NPS 8 to NPS 14: 24 inches long and 0.075 inch thick.
    e. NPS 16 to NPS 24: 24 inches long and 0.105 inch thick.
5. Pipes NPS 8 and Larger: Include wood inserts.
6. Insert Material: Length at least as long as protective shield.
7. Thermal-Hanger Shields: Install with insulation same thickness as piping insulation.

3.4. EQUIPMENT SUPPORTS

A. Fabricate structural-steel stands to suspend equipment from structure overhead or to support equipment above floor.

B. Grouting: Place grout under supports for equipment and make smooth bearing surface.

C. Provide lateral bracing, to prevent swaying, for equipment supports.

3.5. METAL FABRICATIONS

A. Cut, drill, and fit miscellaneous metal fabrications for trapeze pipe hangers and equipment supports.

B. Fit exposed connections together to form hairline joints. Field weld connections that cannot be shop welded because of shipping size limitations.

C. Field Welding: Comply with AWS D1.1 procedures for shielded metal arc welding, appearance and quality of welds, and methods used in correcting welding work, and with the following:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.
4. Finish welds at exposed connections so no roughness shows after finishing and contours of welded surfaces match adjacent contours.

3.6. ADJUSTING

A. Hanger Adjustments: Adjust hangers to distribute loads equally on attachments and to achieve indicated slope of pipe.

B. Trim excess length of continuous-thread hanger and support rods to 1-1/2 inches.

3.7. PAINTING

A. Touch Up: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.

1. Apply paint by brush or spray to provide minimum dry film thickness of 2.0 mils.

B. Touch Up: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint on miscellaneous metal are specified in Section 099000 Painting and Finishes.

C. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-restore paint to comply with ASTM A 780.

END OF SECTION 220529

SECTION 220533
Heat Tracing for Plumbing Piping

PART 1 - GENERAL

1.1. RELATED DOCUMENTS

A. The following documents apply to all required work for the Project: (1) the Contract Drawings, (2) the Specifications, (3) the General Conditions, (4) the Addendum and (5) the Contract (City of New York Standard Construction Contract).

B. LEED General Requirements.

1. Refer to DDC General Conditions.

a. Section 01 81 13.04 "Sustainable Design Requirements for LEED v4 Buildings."

1.2. SUMMARY

A. This Section includes heat tracing with the following electric heating cables:

1. Self-regulating, parallel resistance.

1.3. SUBMITTALS

A. Refer to DDC General Conditions Section 01 33 00 "Submittal Procedures."

B. Product Data: Include rated capacities, operating characteristics, furnished specialties, and accessories for each type of product indicated.

1. Schedule heating capacity, length of cable, spacing, and electrical power requirement for each electric heating cable required.

C. Field quality-control test reports.

D. Operation and Maintenance Data: For electric heating cables to include in operation and maintenance manuals.

E. Warranty: Special warranty specified in this Section.

1.4. QUALITY ASSURANCE

A. Refer to DDC General Conditions Section 01 40 00 "Quality Requirements."

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to the NYC Department of Buildings, and marked for intended use.

C. All heating-cable components shall be UL Listed, CSA Certified, or FM Approved for use as part of the system to provide pipe freeze protection.

1.5. WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to restore or replace electric heating cable that fails in materials or workmanship within specified warranty period.

1. Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1. SELF-REGULATING, PARALLEL-RESISTANCE HEATING CABLES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. BH Thermal Corporation.
2. Chromalox, Inc.; Wiegard Industrial Division; Emerson Electric Company.
3. Delta-Therm Corporation.
4. Easy Heat Inc.
5. Nelson Heat Trace.
6. Pyrotenax; a division of Tyco Thermal Controls.
7. Raychem; a division of Tyco Thermal Controls.
8. Thermon Manufacturing Co.
9. Trasor Corp.
10. Or Approved Equal.

B. Heating Element: Pair of parallel No. 16 AWG, nickel-coated stranded copper bus wires embedded in crosslinked conductive polymer core, which varies heat output in response to temperature along its length. Terminate with waterproof, factory-assembled nonheating leads with connectors at one end, and seal the opposite end watertight. Cable shall be capable of crossing over itself once without overheating.

C. Electrical Insulating Jacket: Flame-retardant polyolefin.

D. Cable Cover: Tinned-copper braid, and polyolefin outer jacket with UV inhibitor.

E. Maximum Operating Temperature (Power On): 150 deg F.

F. Maximum Exposure Temperature (Power Off): 185 deg F.

G. Maximum Operating Temperature: 300 deg F .

H. Capacities and Characteristics:

1. Maximum Heat Output: 8 W/ft.
2. Piping Diameter: 2-1/2"
3. Volts: 120 V.

4. Phase: 1
5. Hertz: 60

2.2. CONTROLS

A. Remote bulb unit with adjustable temperature range from 30 to 50 deg .

B. Snap action; open-on-rise, single-pole switch with minimum current rating adequate for connected cable.

C. Remote bulb on capillary, resistance temperature device, or thermistor for directly sensing pipe-wall temperature.

D. Corrosion-resistant, waterproof control enclosure.

2.3. ACCESSORIES

A. Cable Installation Accessories: Fiberglass tape, heat-conductive putty, cable ties, silicone end seals and splice kits, and installation clips all furnished by manufacturer, or as recommended in writing by manufacturer.

B. Warning Tape: Continuously printed "Electrical Tracing"; vinyl, at least 3 mils thick, and with pressure-sensitive, permanent, waterproof, self-adhesive back.

1. Width for Markers on Pipes with OD, Including Insulation, Less Than 6 Inches: 3/4 inch minimum.
2. Width for Markers on Pipes with OD, Including Insulation, 6 Inches or Larger: 1-1/2 inches minimum.

PART 3 - EXECUTION

3.1. EXECUTION REQUIREMENTS

A. Refer to DDC General Conditions for execution requirements.

3.2. EXAMINATION

A. Examine surfaces and substrates to receive electric heating cables for compliance with requirements for installation tolerances and other conditions affecting performance.

1. Ensure surfaces and pipes in contact with electric heating cables are free of burrs and sharp protrusions.
2. Proceed with installation only after unsatisfactory conditions have been corrected.

3.3. INSTALLATION

A. Install electric heating cable across expansion joints according to manufacturer's written recommendations using slack cable to allow movement without damage to cable.

B. Install electric heating cables after piping has been tested and before insulation is installed.

C. Install electric heating cables according to IEEE 515.1.

D. Install insulation over piping with electric cables according to Section 230700 "Piping Insulation."

E. Install warning tape on piping insulation where piping is equipped with electric heating cables.

F. Set field-adjustable switches and circuit-breaker trip ranges.

G. Protect installed heating cables, including nonheating leads, from damage.

3.4. CONNECTIONS

A. Ground equipment according to Electrical Specification Sections.

B. Connect wiring according to Electrical Specification Sections.

C. All branch circuits shall be connected to a GFI type circuit breaker.

3.5. FIELD QUALITY CONTROL

A. Testing: Perform tests after cable installation but before application of coverings such as insulation, wall or ceiling construction, or concrete.

1. Test cables for electrical continuity and insulation integrity before energizing.
2. Test cables to verify rating and power input. Energize and measure voltage and current simultaneously.

B. Repeat tests for continuity, insulation resistance, and input power after applying thermal insulation on pipe-mounting cables.

C. Remove and replace malfunctioning units and retest as specified above.

END OF SECTION 220533

1.5. COORDINATION

A. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.

B. Coordinate installation of identifying devices with locations of access panels and doors.

C. Install identifying devices before installing acoustical ceilings and similar concealment.

PART 2 - PRODUCTS

2.1. EQUIPMENT LABELS

A. Metal Labels for Equipment:

1. Material and Thickness: Brass, 0.032-inch, Stainless steel, 0.025-inch , Aluminum, 0.032-inch or anodized aluminum, 0.032-inch minimum thickness, and having predrilled or stamped holes for attachment hardware.
2. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch
3. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.
4. Fasteners: Stainless-steel rivets or self-tapping screws.
5. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

B. Plastic Labels for Equipment:

1. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, and having predrilled holes for attachment hardware.
2. Maximum Temperature: Able to withstand temperatures up to 160 deg F.
3. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.
4. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.
5. Fasteners: Stainless-steel rivets or self-tapping screws.
6. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

C. Label Content: Include equipment's Drawing designation or unique equipment number, and drawing numbers where equipment is indicated (plans, details, and schedules).

D. Equipment Label Schedule: For each item of equipment to be labeled, on 8-1/2-by-11-inch bond paper. Tabulate equipment identification number and identify Drawing numbers where equipment is indicated (plans, details, and schedules). Equipment schedule shall be included in operation and maintenance data.

SECTION 220553
Identification for Plumbing Piping and Equipment

PART 1 - GENERAL

1.1. RELATED DOCUMENTS

A. The following documents apply to all required work for the Project: (1) the Contract Drawings, (2) the Specifications, (3) the General Conditions, (4) the Addendum and (5) the Contract (City of New York Standard Construction Contract).

B. LEED General Requirements.

1. Refer to DDC General Conditions.

a. Section 01 81 13.04 "Sustainable Design Requirements for LEED v4 Buildings."

1.2. QUALITY ASSURANCE

A. Refer to DDC General Conditions Section 01 40 00 "Quality Requirements."

1.3. SUMMARY

A. Section Includes:

1. Equipment labels.
2. Warning signs and labels.
3. Pipe labels.
4. Stencils.
5. Valve tags.
6. Warning tags.

1.4. SUBMITTALS

A. Refer to DDC General Conditions Section 01 33 00 "Submittal Procedures."

B. Product Data: For each type of product indicated.

C. Samples: For color, letter style, and graphic representation required for each identification material and device.

D. Equipment Label Schedule: Include a listing of all equipment to be labeled with the proposed content for each label.

E. Valve numbering scheme.

F. Valve Schedules: For each piping system to include in maintenance manuals.

2.2. WARNING SIGNS AND LABELS

A. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, and having predrilled holes for attachment hardware.

B. Letter Color: White.

C. Background Color: Red.

D. Maximum Temperature: Able to withstand temperatures up to 160 deg F.

E. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.

F. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches (1830 mm), and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.

G. Fasteners: Stainless-steel rivets or self-tapping screws.

H. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

I. Label Content: Include caution and warning information, plus emergency notification instructions.

2.3. PIPE LABELS

A. General Requirements for Manufactured Pipe Labels: Preprinted, color-coded, with lettering indicating service, and showing flow direction.

B. Pretensioned Pipe Labels: Precoiled, semirigid plastic formed to cover full circumference of pipe and to attach to pipe without fasteners or adhesive.

C. Self-Adhesive Pipe Labels: Printed plastic with contact-type, permanent-adhesive backing.

D. Pipe Label Contents: Include identification of piping service using same designations or abbreviations as used on Drawings, pipe size, and an arrow indicating flow direction.

1. Flow-Direction Arrows: Integral with piping system service lettering to accommodate both directions, or as separate unit on each pipe label to indicate flow direction.
2. Lettering Size: At least 1-1/2 inches high.

2.4. STENCILS

A. Stencils: Prepared with letter sizes according to ASME A13.1 for piping; minimum letter height of 1-1/4 inches for ducts; and minimum letter height of 3/4 inch for access panel and door labels, equipment labels, and similar operational instructions.

1. Stencil Material: Aluminum.
2. Stencil Paint: Exterior, gloss, acrylic enamel black unless otherwise indicated. Paint may be in pressurized spray-can form.
3. Identification Paint: Exterior, acrylic enamel in colors according to ASME A13.1 unless otherwise indicated.

2.5. VALVE TAGS

A. Valve Tags: Stamped or engraved with 1/4-inch letters for piping system abbreviation and 1/2-inch numbers.

1. Tag Material: Brass, 19 gauge minimum thickness, and having predrilled or stamped holes for attachment hardware.
2. Fasteners: Brass wire-link or beaded chain; or S-hook.

B. Valve Schedules: For each piping system, on 8-1/2-by-11-inch bond paper. Tabulate valve number, piping system, system abbreviation (as shown on valve tag), location of valve (room or space), normal-operating position (open, closed, or modulating), and variations for identification. Mark valves for emergency shutoff and similar special uses.

1. Valve-tag schedule shall be included in operation and maintenance data.

2.6. WARNING TAGS

A. Warning Tags: Preprinted or partially preprinted, accident-prevention tags, of plasticized card stock with matte finish suitable for writing.

1. Size: 3 by 5-1/4 inches minimum.
2. Fasteners: Brass grommet and wire.
3. Nomenclature: Large-size primary caption such as "DANGER," "CAUTION," or "DO NOT OPERATE."
4. Color: Yellow background with black lettering.

PART 3 - EXECUTION

3.1. EXECUTION REQUIREMENTS

A. Refer to DDC General Conditions for execution requirements.

3.2. PREPARATION

A. Clean piping and equipment surfaces of substances that could impair bond of identification devices, including dirt, oil, grease, release agents, and incompatible primers, paints, and encapsulants.

3.3. EQUIPMENT LABEL INSTALLATION

A. Install or permanently fasten labels on each major item of mechanical equipment.

B. Locate equipment labels where accessible and visible.

3.4. PIPE LABEL INSTALLATION

A. Locate pipe labels where piping is exposed or above accessible ceilings in finished spaces; machine rooms; accessible maintenance spaces such as shafts, tunnels, and plenums; and exterior exposed locations as follows:

1. Near each valve and control device.
2. Near each branch connection, excluding short takeoffs for fixtures and terminal units. Where flow pattern is not obvious, mark each pipe at branch.
3. Near penetrations through walls, floors, ceilings, and inaccessible enclosures.
4. At access doors, manholes, and similar access points that permit view of concealed piping.
5. Near major equipment items and other points of origination and termination.
6. Spaced at maximum intervals of 50 feet along each run. Reduce intervals to 25 feet in areas of congested piping and equipment.
7. On piping above removable acoustical ceilings. Omit intermediately spaced labels.

B. Pipe Label Color Schedule:

1. Domestic Water Piping:

   a. Background Color: Red.
   b. Letter Color: White.

2. Sanitary Waste and Storm Drainage]Piping:

   a. Background Color: Green.
   b. Letter Color: White.

3.5. VALVE-TAG INSTALLATION

A. Install tags on valves and control devices in piping systems, except check valves; valves within factory-fabricated equipment units; shutoff valves; faucets; convenience and lawn-watering hose connections; and similar roughing-in connections of end-use fixtures and units. List tagged valves in a valve schedule.

B. Valve-Tag Application Schedule: Tag valves according to size, shape, and color scheme and with captions similar to those indicated in the following subparagraphs:

1. Valve-Tag Size and Shape:

   a. Cold Water: 2 inches square.
   b. Hot Water: 2 inches square.

2. Valve-Tag Color:

   a. Cold Water: Natural.

b. Hot Water: Green.

3. Letter Color:

a. Cold Water: White.
b. Hot Water: White.

3.6. WARNING-TAG INSTALLATION

A. Write required message on, and attach warning tags to, equipment and other items where required.

END OF SECTION 220553

SECTION 220700
Plumbing Insulation

PART 1 - GENERAL

1.1. RELATED DOCUMENTS

A. The following documents apply to all required work for the Project: (1) the Contract Drawings, (2) the Specifications, (3) the General Conditions, (4) the Addendum and (5) the Contract (City of New York Standard Construction Contract).

1.2. SUMMARY

A. Section Includes:

1. Insulation Materials
2. Mineral fiber.
3. Adhesives.
4. Mastics.
5. Sealants.
6. Factory-applied jackets.
7. Field-applied fabric-reinforcing mesh.
8. Field-applied jackets.
9. Tapes.
10. Corner angles.

B. Related Sections include the following:

1. Section 230700 "Piping Insulation."

1.3. SUBMITTALS

A. Refer to DDC General Conditions Section 01 33 00 "Submittal Procedures."

B. Product Data: For each type of product indicated. Include thermal conductivity, thickness, and jackets (both factory and field applied).

C. Material Test Reports: From a testing agency licensed in the state of New York acceptable to Commissioner indicating, interpreting, and certifying test results for compliance of insulation materials, sealers, attachments, cements, and jackets, with requirements indicated. Include dates of tests and test methods employed.

D. Field quality-control reports.

1.4. QUALITY ASSURANCE

A. Refer to DDC General Conditions Section 01 40 00 "Quality Requirements."

B. Materials and work shall conform to the latest edition of reference specifications specified herein and to applicable codes and requirements of NYC Department of Buildings.

C. Fire-Test-Response Characteristics: Insulation and related materials shall have fire-test-response characteristics indicated, as determined by testing identical products per ASTM E 84, by a testing and inspecting agency acceptable Commissioner. Factory label insulation and jacket materials and adhesive, mastic, tapes, and cement material containers, with appropriate markings of applicable testing and inspecting agency.

1. Insulation Installed Indoors: Flame-spread index of 25 or less, and smoke-developed index of 50 or less.
2. Insulation Installed Outdoors: Flame-spread index of 75 or less, and smoke-developed index of 150 or less.

1.5. DELIVERY, STORAGE, AND HANDLING

A. Packaging: Insulation material containers shall be marked by manufacturer with appropriate ASTM standard designation, type and grade, and maximum use temperature.

1.6. COORDINATION

A. Coordinate size and location of supports, hangers, and insulation shields specified in Section 220529 "Hangers and Supports for Plumbing Piping and Equipment."

B. Coordinate clearance requirements with piping Installer for piping insulation application and equipment Installer for equipment insulation application. Before preparing piping Shop Drawings, establish and maintain clearance requirements for installation of insulation and field-applied jackets and finishes and for space required for maintenance.

C. Coordinate installation and testing of heat tracing.

1.7. SCHEDULING

A. Schedule insulation application after pressure testing systems and, where required, after installing and testing heat tracing. Insulation application may begin on segments that have satisfactory test results.

B. Complete installation and concealment of plastic materials as rapidly as possible in each area of construction.

PART 2 - PRODUCTS

2.1. INSULATION MATERIALS

A. Comply with requirements in Part 3 schedule articles for where insulating materials shall be applied.

B. Products shall not contain asbestos, lead, mercury, or mercury compounds.

C. Products that come in contact with stainless steel shall have a leachable chloride content of less than 50 ppm when tested according to ASTM C 871.

D. Insulation materials for use on austenitic stainless steel shall be acceptable according to ASTM C 795.

E. Foam insulation materials shall not use CFC or HCFC blowing agents in the manufacturing process.

F. Mineral-Fiber Blanket Insulation: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 553, Type II and ASTM C 1290, Type I. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.

G. Mineral-Fiber Board Insulation: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 612, Type IA or Type IB. For equipment applications, provide insulation with factory-applied FSK jacket. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.

H. Mineral-Fiber, Preformed Pipe Insulation:

1. Type I, 850 deg F Materials: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 547, Type I, Grade A, with factory-applied ASJ-SSL. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.

2.2. ADHESIVES

A. Materials shall be compatible with insulation materials, jackets, and substrates and for bonding insulation to itself and to surfaces to be insulated, unless otherwise indicated.

B. Mineral-Fiber Adhesive:

1. Products: Subject to compliance with requirements, products that may be incorporated into the Work include the following:

   a. Childers Products, Division of ITW; CP-82.
   b. Foster Products Corporation, H. B. Fuller Company; 85-20.
   c. ITW TACC, Division of Illinois Tool Works; S-90/80.
   d. Marathon Industries, Inc.; 225.
   e. Mon-Eco Industries, Inc.; 22-25.
   f. Or approved equal.

2. For indoor applications, use adhesive that has a VOC content of 80 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

C. ASJ Adhesive, and FSK and PVDC Jacket Adhesive:

1. Products: Subject to compliance with requirements, products that may be incorporated into the Work include the following:
   a. Childers Products, Division of ITW; CP-82.
   b. Foster Products Corporation, H. B. Fuller Company; 85-20.
   c. ITW TACC, Division of Illinois Tool Works; S-90/80.
   d. Marathon Industries, Inc.; 225.
   e. Mon-Eco Industries, Inc.; 22-25.
   f. Or approved equal.
2. For indoor applications, use adhesive that has a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

2.3. MASTICS

A. Materials shall be compatible with insulation materials, jackets, and substrates:

B. FSK and Metal Jacket Flashing Sealants:

1. Products: Subject to compliance with requirements, products that may be incorporated into the Work include the following:
   a. Childers Products, Division of ITW; CP-76-8.
   b. Foster Products Corporation, H. B. Fuller Company; 95-44.
   c. Marathon Industries, Inc.; 405.
   d. Mon-Eco Industries, Inc.; 44-05.
   e. Vimasco Corporation; 750.
   f. Or approved equal.
2. Materials shall be compatible with insulation materials, jackets, and substrates.
3. Fire- and water-resistant, flexible, elastomeric sealant.
4. Service Temperature Range: Minus 40 to plus 250 deg F.
5. Color: Aluminum.
6. For indoor applications, use sealants that have a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

C. ASJ Flashing Sealants, and Vinyl, PVDC, and PVC Jacket Flashing Sealants:

1. Materials shall be compatible with insulation materials, jackets, and substrates.
2. Fire- and water-resistant, flexible, elastomeric sealant.
3. Service Temperature Range: Minus 40 to plus 250 deg F.
4. Color: White.
5. For indoor applications, use sealants that have a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

2.4. FACTORY-APPLIED JACKETS

A. Insulation system schedules indicate factory-applied jackets on various applications. When factory-applied jackets are indicated, comply with the following:

1. ASJ: White, kraft-paper, fiberglass-reinforced scrim with aluminum-foil backing; complying with ASTM C 1136, Type I.
2. ASJ-SSL: ASJ with self-sealing, pressure-sensitive, acrylic-based adhesive covered by a removable protective strip; complying with ASTM C 1136, Type I.
3. FSK Jacket: Aluminum-foil, fiberglass-reinforced scrim with kraft-paper backing; complying with ASTM C 1136, Type II.

2.5. FIELD-APPLIED FABRIC-REINFORCING MESH

A. Woven Glass-Fiber Fabric for Pipe Insulation: Approximately 2 oz./sq. yd. (68 g/sq. m) with a thread count of 10 strands by 10 strands/sq. inch for covering pipe and pipe fittings.

B. Woven Glass-Fiber Fabric for Equipment Insulation: Approximately 6 oz./sq. yd. with a thread count of 5 strands by 5 strands/sq. inch for covering equipment.

1. Products: Subject to compliance with requirements, products that may be incorporated into the Work include the following:
   a. Childers Products, Division of ITW; Chil-Glas No. 5.
   b. Foster Products Corporation, H. B. Fuller Company; Mast-A-Fab.
   c. Vimasco Corporation; Elastafab 894.
   d. Or approved equal.

2.6. FIELD-APPLIED CLOTHS

A. Woven Glass-Fiber Fabric: Type I, plain weave, and presized a minimum of 8 oz./sq. yd..

2.7. FIELD-APPLIED JACKETS

A. Field-applied jackets shall comply with ASTM C 921, Type I, unless otherwise indicated.

B. Metal Jacket:

1. Products: Subject to compliance with requirements, products that may be incorporated into the Work include the following:
   a. Childers Products, Division of ITW; Metal Jacketing Systems.
   b. PABCO Metals Corporation; Surefit.
   c. RPR Products, Inc.; Insul-Mate.
   d. Or approved equal.
2. Aluminum Jacket: Comply with ASTM B 209, Alloy 3003, 3005, 3105 or 5005, Temper H-14.
   a. Finish and thickness are indicated in field-applied jacket schedules.

b. Moisture Barrier for Indoor Applications: 1-mil- (0.025-mm-) thick, heat-bonded polyethylene and kraft paper.
c. Moisture Barrier for Outdoor Applications: 3-mil- thick, heat-bonded polyethylene and kraft paper thick Polysurlyn.
d. Factory-Fabricated Fitting Covers:

1) Same material, finish, and thickness as jacket.
2) Preformed 2-piece or gore, 45- and 90-degree, short- and long-radius elbows.
3) Tee covers.
4) Flange and union covers.
5) End caps.
6) Beveled collars.
7) Valve covers.
8) Field fabricate fitting covers only if factory-fabricated fitting covers are not available.

3. Stainless-Steel Jacket: ASTM A 167 or ASTM A 240/A 240M.

a. Factory cut and rolled to size.
b. Material, finish, and thickness are indicated in field-applied jacket schedules.
c. Moisture Barrier for Indoor Applications: 1-mil- (0.025-mm-) thick, heat-bonded polyethylene and kraft paper.
d. Moisture Barrier for Outdoor Applications: 3-mil- (0.075-mm-) thick, heat-bonded polyethylene and kraft paper.
e. Factory-Fabricated Fitting Covers:

1) Same material, finish, and thickness as jacket.
2) Preformed 2-piece or gore, 45- and 90-degree, short- and long-radius elbows.
3) Tee covers.
4) Flange and union covers.
5) End caps.
6) Beveled collars.
7) Valve covers.
8) Field fabricate fitting covers only if factory-fabricated fitting covers are not available.

C. Underground Direct-Buried Jacket: 125-mil- thick vapor barrier and waterproofing membrane consisting of a rubberized bituminous resin reinforced with a woven-glass fiber or polyester scrim and laminated aluminum foil.

2.8. TAPES

A. ASJ Tape: White vapor-retarder tape matching factory-applied jacket with acrylic adhesive, complying with ASTM C 1136.

1. Products: Subject to compliance with requirements, products that may be incorporated into the Work include the following:

a. Avery Dennison Corporation, Specialty Tapes Division; Fasson 0835.
b. Compac Corp.; 104 and 105.
c. Ideal Tape Co., Inc., an American Biltrite Company; 428 AWF ASJ.
d. Venture Tape; 1540 CW Plus, 1542 CW Plus, and 1542 CW Plus/SQ.

e. Or approved equal.

2. Width: 3 inches.
3. Thickness: 11.5 mils.
4. Adhesion: 90 ounces force/inch in width.
5. Elongation: 2 percent.
6. Tensile Strength: 40 lbf/inch in width.
7. ASJ Tape Disks and Squares: Precut disks or squares of ASJ tape.

B. FSK Tape: Foil-face, vapor-retarder tape matching factory-applied jacket with acrylic adhesive; complying with ASTM C 1136.

1. Products: Subject to compliance with requirements, products that may be incorporated into the Work include the following:

a. Avery Dennison Corporation, Specialty Tapes Division; Fasson 0827.
b. Compac Corp.; 110 and 111.
c. Ideal Tape Co., Inc., an American Biltrite Company; 491 AWF FSK.
d. Venture Tape; 1525 CW, 1528 CW, and 1528 CW/SQ.
e. Or approved equal.

2. Width: 3 inches.
3. Thickness: 6.5 mils.
4. Adhesion: 90 ounces force/inch in width.
5. Elongation: 2 percent.
6. Tensile Strength: 40 lbf/inch in width.
7. FSK Tape Disks and Squares: Precut disks or squares of FSK tape.

C. Aluminum-Foil Tape: Vapor-retarder tape with acrylic adhesive.

1. Products: Subject to compliance with requirements, products that may be incorporated into the Work include the following:

a. Avery Dennison Corporation, Specialty Tapes Division; Fasson 0800.
b. Compac Corp.; 120.
c. Ideal Tape Co., Inc., an American Biltrite Company; 488 AWF.
d. Venture Tape; 3520 CW.
e. Or approved equal.

2. Width: 2 inches.
3. Thickness: 3.7 mils.
4. Adhesion: 100 ounces force/inch in width.
5. Elongation: 5 percent.
6. Tensile Strength: 34 lbf/inch in width.

2.9. CORNER ANGLES

A. Aluminum Corner Angles: 0.040 inch thick, minimum 1 by 1 inch, aluminum according to ASTM B 209, Alloy 3003, 3005, 3105 or 5005; Temper H-14.

B. Stainless-Steel Corner Angles: 0.024 inch thick, minimum 1 by 1 inch, stainless steel according to ASTM A 167 or ASTM A 240/A 240M, Type 304 or 316.

PART 3 - EXECUTION

3.1. EXECUTION REQUIREMENTS

A. Refer to DDC General Conditions for execution requirements.

3.2. EXAMINATION

A. Examine substrates and conditions for compliance with requirements for installation and other conditions affecting performance of insulation application.

1. Verify that systems and equipment to be insulated have been tested and are free of defects.
2. Verify that surfaces to be insulated are clean and dry.
3. Proceed with installation only after unsatisfactory conditions have been corrected.

3.3. PREPARATION

A. Surface Preparation: Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application.

B. Coordinate insulation installation with the trade installing heat tracing. Comply with requirements for heat tracing that apply to insulation.

C. Mix insulating cements with clean potable water; if insulating cements are to be in contact with stainless-steel surfaces, use demineralized water.

3.4. GENERAL INSTALLATION REQUIREMENTS

A. Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces; free of voids throughout the length of equipment and piping including fittings, valves, and specialties.

B. Install insulation materials, forms, vapor barriers or retarders, jackets, and thicknesses required for each item of equipment and pipe system as specified in insulation system schedules.

C. Install accessories compatible with insulation materials and suitable for the service. Install accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.

D. Install insulation with longitudinal seams at top and bottom of horizontal runs.

E. Install multiple layers of insulation with longitudinal and end seams staggered.

F. Do not weld brackets, clips, or other attachment devices to piping, fittings, and specialties.

G. Keep insulation materials dry during application and finishing.

H. Install insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by insulation material manufacturer.

I. Install insulation with least number of joints practical.

J. Where vapor barrier is indicated, seal joints, seams, and penetrations in insulation at hangers, supports, anchors, and other projections with vapor-barrier mastic.

1. Install insulation continuously through hangers and around anchor attachments.
2. For insulation application where vapor barriers are indicated, extend insulation on anchor legs from point of attachment to supported item to point of attachment to structure. Taper and seal ends at attachment to structure with vapor-barrier mastic.
3. Install insert materials and install insulation to tightly join the insert. Seal insulation to insulation inserts with adhesive or sealing compound recommended by insulation material manufacturer.
4. Cover inserts with jacket material matching adjacent pipe insulation. Install shields over jacket, arranged to protect jacket from tear or puncture by hanger, support, and shield.

K. Apply adhesives, mastics, and sealants at manufacturer's recommended coverage rate and wet and dry film thicknesses.

L. Install insulation with factory-applied jackets as follows:

1. Draw jacket tight and smooth.
2. Cover circumferential joints with 3-inch- wide strips, of same material as insulation jacket. Secure strips with adhesive and outward clinching staples along both edges of strip, spaced 4 inches o.c.
3. Overlap jacket longitudinal seams at least 1-1/2 inches. Install insulation with longitudinal seams at bottom of pipe. Clean and dry surface to receive self-sealing lap. Staple laps with outward clinching staples along edge at 2 inches o.c.
   a. For below ambient services, apply vapor-barrier mastic over staples.
4. Cover joints and seams with tape as recommended by insulation material manufacturer to maintain vapor seal.
5. Where vapor barriers are indicated, apply vapor-barrier mastic on seams and joints and at ends adjacent to pipe flanges and fittings.

M. Cut insulation in a manner to avoid compressing insulation more than 75 percent of its nominal thickness.

N. Finish installation with systems at operating conditions. Repair joint separations and cracking due to thermal movement.

O. Repair damaged insulation facings by applying same facing material over damaged areas. Extend patches at least 4 inches beyond damaged areas. Adhere, staple, and seal patches similar to butt joints.

P. For above ambient services, do not install insulation to the following:

1. Vibration-control devices.
2. Testing agency labels and stamps.
3. Nameplates and data plates.
4. Manholes.
5. Handholes.
6. Cleanouts.

3.5. PENETRATIONS

A. Insulation Installation at Roof Penetrations: Install insulation continuously through roof penetrations.

1. Seal penetrations with flashing sealant.
2. For applications requiring only indoor insulation, terminate insulation above roof surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
3. Extend jacket of outdoor insulation outside roof flashing at least 2 inches (50 mm) below top of roof flashing.
4. Seal jacket to roof flashing with flashing sealant.

B. Insulation Installation at Underground Exterior Wall Penetrations: Terminate insulation flush with sleeve seal. Seal terminations with flashing sealant.

C. Insulation Installation at Aboveground Exterior Wall Penetrations: Install insulation continuously through wall penetrations.

1. Seal penetrations with flashing sealant.
2. For applications requiring only indoor insulation, terminate insulation inside wall surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
3. Extend jacket of outdoor insulation outside wall flashing and overlap wall flashing at least 2 inches.
4. Seal jacket to wall flashing with flashing sealant.

D. Insulation Installation at Interior Wall and Partition Penetrations (That Are Not Fire Rated): Install insulation continuously through walls and partitions.

E. Insulation Installation at Fire-Rated Wall and Partition Penetrations: Install insulation continuously through penetrations of fire-rated walls and partitions.

1. Comply with requirements in Section 078413 "Firestops and Smokeseals" firestopping and fire-resistive joint sealers.

F. Insulation Installation at Floor Penetrations:

1. Pipe: Install insulation continuously through floor penetrations.
2. Seal penetrations through fire-rated assemblies. Comply with requirements in Section 078413 "Firestops and Smokeseals."

3.6. EQUIPMENT, TANK, AND VESSEL INSULATION INSTALLATION

A. Mineral Fiber, Pipe and Tank Insulation Installation for Tanks and Vessels: Secure insulation with adhesive and anchor pins and speed washers.

1. Apply adhesives according to manufacturer's recommended coverage rates per unit area, for percent coverage of tank and vessel surfaces as recommended by manufacturer.
2. Groove and score insulation materials to fit as closely as possible to equipment, including contours. Bevel insulation edges for cylindrical surfaces for tight joints. Stagger end joints.
3. Protect exposed corners with secured corner angles.
4. Install adhesively attached or self-sticking insulation hangers and speed washers on sides of tanks and vessels as follows:
   a. Do not weld anchor pins to ASME-labeled pressure vessels.
   b. Select insulation hangers and adhesive that are compatible with service temperature and with substrate.
   c. On tanks and vessels, maximum anchor-pin spacing is 3 inches from insulation end joints, and 16 inches o.c. in both directions.
   d. Do not overcompress insulation during installation.
   e. Cut and miter insulation segments to fit curved sides and domed heads of tanks and vessels.
   f. Impale insulation over anchor pins and attach speed washers.
   g. Cut excess portion of pins extending beyond speed washers or bend parallel with insulation surface. Cover exposed pins and washers with tape matching insulation facing.
5. Secure each layer of insulation with stainless-steel or aluminum bands. Select band material compatible with insulation materials.
6. Where insulation hangers on equipment and vessels are not permitted or practical and where insulation support rings are not provided, install a girdle network for securing insulation. Stretch prestressed aircraft cable around the diameter of vessel and make taut with clamps, turnbuckles, or breather springs. Place one circumferential girdle around equipment approximately 6 inches from each end. Install wire or cable between two circumferential girdles 12 inches o.c. Install a wire ring around each end and around outer periphery of center openings, and stretch prestressed aircraft cable radially from the wire ring to nearest circumferential girdle. Install additional circumferential girdles along the body of equipment or tank at a minimum spacing of 48 inches o.c. Use this network for securing insulation with tie wire or bands.
7. Stagger joints between insulation layers at least 3 inches.
8. Install insulation in removable segments on equipment access doors, manholes, handholes, and other elements that require frequent removal for service and inspection.
9. Bevel and seal insulation ends around manholes, handholes, ASME stamps, and nameplates.

10. For equipment with surface temperatures below ambient, apply mastic to open ends, joints, seams, breaks, and punctures in insulation.

3.7. GENERAL PIPE INSULATION INSTALLATION

A. Requirements in this article generally apply to all insulation materials except where more specific requirements are specified in various pipe insulation material installation articles.

B. Insulation Installation on Fittings, Valves, Strainers, Flanges, and Unions:

1. Install insulation over fittings, valves, strainers, flanges, unions, and other specialties with continuous thermal and vapor-retarder integrity, unless otherwise indicated.

2. Insulate pipe elbows using preformed fitting insulation or mitered fittings made from same material and density as adjacent pipe insulation. Each piece shall be butted tightly against adjoining piece and bonded with adhesive. Fill joints, seams, voids, and irregular surfaces with insulating cement finished to a smooth, hard, and uniform contour that is uniform with adjoining pipe insulation.

3. Insulate tee fittings with preformed fitting insulation or sectional pipe insulation of same material and thickness as used for adjacent pipe. Cut sectional pipe insulation to fit. Butt each section closely to the next and hold in place with tie wire. Bond pieces with adhesive.

4. Insulate valves using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. For valves, insulate up to and including the bonnets, valve stuffing-box studs, bolts, and nuts. Fill joints, seams, and irregular surfaces with insulating cement.

5. Insulate strainers using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. Fill joints, seams, and irregular surfaces with insulating cement. Insulate strainers so strainer basket flange or plug can be easily removed and replaced without damaging the insulation and jacket. Provide a removable reusable insulation cover. For below ambient services, provide a design that maintains vapor barrier.

6. Insulate flanges and unions using a section of oversized preformed pipe insulation. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker.

7. Cover segmented insulated surfaces with a layer of finishing cement and coat with a mastic. Install vapor-barrier mastic for below ambient services and a breather mastic for above ambient services. Reinforce the mastic with fabric-reinforcing mesh. Trowel the mastic to a smooth and well-shaped contour.

8. Stencil or label the outside insulation jacket of each union with the word "UNION." Match size and color of pipe labels.

C. Insulate instrument connections for thermometers, pressure gages, pressure temperature taps, test connections, flow meters, sensors, switches, and transmitters on insulated pipes, vessels, and equipment. Shape insulation at these connections by tapering it to and around the connection with insulating cement and finish with finishing cement, mastic, and flashing sealant.

D. Install removable insulation covers at locations indicated. Installation shall conform to the following:

1. Make removable flange and union insulation from sectional pipe insulation of same thickness as that on adjoining pipe. Install same insulation jacket as adjoining pipe insulation.
2. When flange and union covers are made from sectional pipe insulation, extend insulation from flanges or union long at least two times the insulation thickness over adjacent pipe insulation on each side of flange or union. Secure flange cover in place with stainless-steel or aluminum bands. Select band material compatible with insulation and jacket.
3. Construct removable valve insulation covers in same manner as for flanges except divide the two-part section on the vertical center line of valve body.
4. When covers are made from block insulation, make two halves, each consisting of mitered blocks wired to stainless-steel fabric. Secure this wire frame, with its attached insulation, to flanges with tie wire. Extend insulation at least 2 inches over adjacent pipe insulation on each side of valve. Fill space between flange or union cover and pipe insulation with insulating cement. Finish cover assembly with insulating cement applied in two coats. After first coat is dry, apply and trowel second coat to a smooth finish.

3.8. MINERAL-FIBER INSULATION INSTALLATION

A. Insulation Installation on Straight Pipes and Tubes:

1. Secure each layer of preformed pipe insulation to pipe with wire or bands and tighten bands without deforming insulation materials.
2. Where vapor barriers are indicated, seal longitudinal seams, end joints, and protrusions with vapor-barrier mastic and joint sealant.
3. For insulation with factory-applied jackets on above ambient surfaces, secure laps with outward clinched staples at 6 inches o.c.
4. For insulation with factory-applied jackets on below ambient surfaces, do not staple longitudinal tabs but secure tabs with additional adhesive as recommended by insulation material manufacturer and seal with vapor-barrier mastic and flashing sealant.

B. Insulation Installation on Pipe Flanges:

1. Install preformed pipe insulation to outer diameter of pipe flange.
2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with mineral-fiber blanket insulation.
4. Install jacket material with manufacturer's recommended adhesive, overlap seams at least 1 inch (25 mm), and seal joints with flashing sealant.

C. Insulation Installation on Pipe Fittings and Elbows:

1. Install preformed sections of same material as straight segments of pipe insulation when available.

2. When preformed insulation elbows and fittings are not available, install mitered sections of pipe insulation, to a thickness equal to adjoining pipe insulation. Secure insulation materials with wire or bands.

D. Insulation Installation on Valves and Pipe Specialties:

1. Install preformed sections of same material as straight segments of pipe insulation when available.
2. When preformed sections are not available, install mitered sections of pipe insulation to valve body.
3. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
4. Install insulation to flanges as specified for flange insulation application.

3.9. FIELD-APPLIED JACKET INSTALLATION

A. Where FSK jackets are indicated, install as follows:

1. Draw jacket material smooth and tight.
2. Install lap or joint strips with same material as jacket.
3. Secure jacket to insulation with manufacturer's recommended adhesive.
4. Install jacket with 1-1/2-inch (38-mm) laps at longitudinal seams and 3-inch- (75-mm-) wide joint strips at end joints.
5. Seal openings, punctures, and breaks in vapor-retarder jackets and exposed insulation with vapor-barrier mastic.

B. Where metal jackets are indicated, install with 2-inch overlap at longitudinal seams and end joints. Overlap longitudinal seams arranged to shed water. Seal end joints with weatherproof sealant recommended by insulation manufacturer. Secure jacket with stainless-steel bands 12 inches (300 mm) o.c. and at end joints.

3.10. FINISHES

A. Equipment and Pipe Insulation with ASJ, Glass-Cloth, or Other Paintable Jacket Material: Paint jacket with paint system identified below and as specified in Section 099000 "Painting and Finishing."

1. Flat Acrylic Finish: Two coats over a primer that is compatible with jacket material and finish coat paint. Add fungicidal agent to render fabric mildew proof.
   a. Finish Coat Material: Interior, flat, latex-emulsion size.

B. Flexible Elastomeric Thermal Insulation: After adhesive has fully cured, apply two coats of insulation recommended protective coating.

C. Color: Final color as selected by Commissioner. Vary first and second coats to allow visual inspection of the completed Work.

D. Do not field paint aluminum or stainless-steel jackets.

3.11. FIELD QUALITY CONTROL

A. Testing Agency: Engage a testing agency to perform tests and inspections.

B. Perform tests and inspections.

C. Tests and Inspections:

1. Inspect field-insulated equipment, randomly selected by Commissioner, by removing field-applied jacket and insulation in layers in reverse order of their installation. Extent of inspection shall be limited to one location(s) for each type of equipment defined in the "Equipment Insulation Schedule" Article. For large equipment, remove only a portion adequate to determine compliance.

2. Inspect pipe, fittings, strainers, and valves, randomly selected by Commissioner, by removing field-applied jacket and insulation in layers in reverse order of their installation. Extent of inspection shall be limited to three locations of straight pipe, three locations of threaded fittings, three locations of welded fittings, two locations of threaded strainers, two locations of welded strainers, three locations of threaded valves, and three locations of flanged valves for each pipe service defined in the "Piping Insulation Schedule, General" Article.

D. All insulation applications will be considered defective Work if sample inspection reveals noncompliance with requirements.

3.12. EQUIPMENT INSULATION SCHEDULE

A. Insulation materials and thicknesses are identified below.

B. Insulate indoor and outdoor equipment in paragraphs below that is not factory insulated.

C. Heat-exchanger (water-to-water for domestic water heating service) insulation shall be the following:

1. Mineral-Fiber Pipe and Tank: 2 inches thick.

D. Domestic water, hydropneumatic tank insulation shall be the following:

1. Mineral-Fiber Pipe and Tank: 1 inch thick.

E. ASHRAE/IESNA 90.1 requires an R-value of 12.5 for domestic hot-water storage tanks.

F. Domestic hot-water storage tank insulation shall be the following,:

1. Mineral-fiber pipe and tank: 2 inch thick.

3.13. PIPING INSULATION SCHEDULE, GENERAL

A. Items Not Insulated: Unless otherwise indicated, do not install insulation on the following:

1. Drainage piping located in crawl spaces.
2. Underground piping.

3. Chrome-plated pipes and fittings unless there is a potential for personnel injury.

3.14. INDOOR PIPING INSULATION SCHEDULE

A. Domestic Cold Water:

1. All sizes: Insulation shall be the following:
   a. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1/2 inch thick.
2. Service main: Insulation shall be the following:
   a. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1 inch (25 mm) thick.

B. Domestic Hot and Recirculated Hot Water:

1. 1-½ inch and Smaller: Insulation shall be the following:
   a. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1 inch thick.
2. Larger than 1-1/2": Insulation shall be the following:
   a. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1-½ inch thick.

C. Stormwater and Overflow:

1. Mineral-Fiber, Preformed Pipe Insulation, Type I: ½ inch thick.

D. Sanitary Waste Piping Where Heat Tracing Is Installed:

1. All Pipe Sizes: Insulation shall be the following:
   a. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1-½ inch thick.

E. Condensate and Equipment Drain Water below 60 Deg F:

1. All Pipe Sizes: Insulation shall be the following:
   a. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1 inch thick.

3.15. OUTDOOR, ABOVEGROUND PIPING INSULATION SCHEDULE

A. Domestic Water Piping:

1. All Pipe Sizes: Insulation shall be the following:
   a. Mineral-Fiber, Preformed Pipe Insulation, Type I: 3 inches thick.

B. Domestic Hot and Recirculated Hot Water:

1. All Pipe Sizes: Insulation shall be the following:
   a. Mineral-Fiber, Preformed Pipe Insulation, Type I: 4 inches thick.

3.16. OUTDOOR, UNDERGROUND PIPING INSULATION SCHEDULE

A. Sanitary Waste Piping, All Sizes, Where Heat Tracing Is Installed: Cellular glass, 2 inches thick.

3.17. INDOOR, FIELD-APPLIED JACKET SCHEDULE

A. Install jacket over insulation material. For insulation with factory-applied jacket, install the field-applied jacket over the factory-applied jacket.

B. Equipment, Concealed:

1. Aluminum, Smooth Corrugated Stucco Embossed: 0.016 inch thick.

C. Equipment, Exposed, up to 48 Inches in Diameter or with Flat Surfaces up to 72 Inches:

1. Aluminum, Smooth: 0.016 inch (0.41 mm) thick.

D. Equipment, Exposed, Larger Than 48 Inches in Diameter or with Flat Surfaces Larger Than 72 Inches :

1. Painted Aluminum, Smooth with 1-1/4-Inch- Deep Corrugations 0.032 inch (0.81 mm) thick.

E. Piping, Concealed:

1. Aluminum, Smooth: 0.016 inch thick.

F. Piping, Exposed:

1. Aluminum, Smooth: 0.016 inch thick.

3.18. OUTDOOR, FIELD-APPLIED JACKET SCHEDULE

A. Install jacket over insulation material. For insulation with factory-applied jacket, install the field-applied jacket over the factory-applied jacket.

B. Equipment, Concealed:

1. Aluminum, Smooth 0.032 inch (0.81 mm) thick.

C. Equipment, Exposed, up to 48 Inches in Diameter or with Flat Surfaces up to 72 Inches:

1. Painted Aluminum, Smooth 0.032 inch (0.81 mm) thick.

D. Equipment, Exposed, Larger Than 48 Inches in Diameter or with Flat Surfaces Larger Than 72 Inches:

1. Painted Aluminum, Smooth Stucco Embossed with 1-1/4-Inch- (32-mm-) Deep Corrugations 0.040 inch (1.0 mm) thick.

E. Piping, Concealed:

1. None.

F. Piping, Exposed:

1. Painted Aluminum, Smooth 0.016 inch thick.

3.19. UNDERGROUND, FIELD-INSTALLED INSULATION JACKET

A. For underground direct-buried piping applications, install underground direct-buried jacket over insulation material.

END OF SECTION 220700

SECTION 22 08 00
COMMISSIONING OF PLUMBING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The following documents apply to all required work for the project: (1) the contract drawings, (2) the Specifications, (3) the General Conditions, (4) the Addendum and (5) the Contract (City of New York Standard Construction Contract).

1.2 SUMMARY

A. This section includes commissioning process requirements for Plumbing systems, assemblies, and equipment.

1.3 DESCRIPTION

A. Commissioning: Commissioning is a systematic process of ensuring that all building systems, including the mechanical and electrical systems, have been installed in the prescribed manner, are functionally checked and capable of being operated and maintained to perform with the design intent and have documentation to support proper installation and operation. The Commissioning Agent (CxA) shall provide the City of New York with an unbiased, objective view of the system's installation, operation and performance. This process does not eliminate or reduce the responsibility of the Contractor to provide a complete design or installing Sub-Contractors to provide a finished product. Commissioning is intended to enhance the quality of each system installation, startup and transfer to beneficial use by the City of New York.

B. Commissioning during the construction phase is intended to achieve the following specific objectives, according to the Contract Documents:

1. Verify that applicable equipment and systems are installed according to the manufacturer's recommendations and to industry accepted minimum standards and that they receive adequate operational checkout by installing Sub-Contractors.
2. Verify and document proper performance of equipment and systems.
3. Verify that Operation & Service documentation is complete and transferred to City of New York.
4. Verify that the City of New York's operating personnel are adequately oriented.
5. Perform a post occupancy review with O&M staff within 10 months after Substantial Completion.

C. The Commissioning process shall be a team effort and encompass, as well as coordinate, the traditionally separate functions of system documentation, system installation, equipment startup, control system calibration, testing, balancing and verification and performance checkouts.

D. The CxA will work closely with the construction team, cooperating on and coordinating all Cx activities with the City of New York, Contractor, Sub-Contractors, manufacturers and equipment suppliers.

E. The Cx process shall not reduce the responsibility of the Contractor to comply with the Contract Documents.

1.4 DEFINITIONS

A. Refer to DDC General Conditions for definitions.

1.5 SUBMITTALS

A. Refer to DDC General Conditions for CxA's role.

B. Refer to DDC General Conditions for specific submittal requirements. In addition, provide the following:

1. Certificates of readiness
2. Certificates of completion of installation, prestart, and startup activities.
3. O&M manuals
4. Test reports

1.6 QUALITY ASSURANCE

A. Test Equipment Calibration Requirements: The Contractor will comply with test equipment manufacturer's calibration procedures and intervals. Recalibrate test instruments immediately after instruments have been repaired resulting from being dropped or damaged. Affix calibration tags to test instruments. Furnish calibration records to CxA upon request.

1.7 COORDINATION

A. Refer to DDC General Conditions for requirements pertaining to coordination during the commissioning process.

PART II - PRODUCTS

2.1 TEST EQUIPMENT

A. The Contractor shall ensure that the equipment and system perform startup, initial checkout and functional performance testing as outlined in the DDC General Conditions, except for equipment specific to and used by Sub-Contractor performing TAB work in their commissioning responsibilities. A sufficient quantity of two-way radios shall be provided by the Contractor.

B. Special equipment, tools and instruments (specific to a piece of equipment and only available from vendor) required for testing shall be included in the price to the City of New York and left on site, except for stand-alone data logging equipment that may be used by the CxA.

C. Test equipment and software required by any equipment manufacturer for programming and/or start-up, whether specified or not, shall be provided by the manufacturer of the equipment. The Contractor shall ensure that the manufacturer provide the test equipment, demonstrate its use, and assist in the commissioning process as needed. Test equipment (and software) shall become the property of the City of New York upon completion of the commissioning process.

D. If required and necessary, data logging equipment and software required for testing will be provided by the CxA, but shall not become the property of the City of New York.

E. All testing equipment shall be of sufficient quality and accuracy to test and/or measure system performance with the tolerances specified in the Specifications. If not otherwise noted, the following minimum requirements apply: Temperature sensors and digital thermometers shall have a certified calibration within the past year to accuracy of 0.5°F and a resolution of ±0.1°F. Pressure sensors shall have an accuracy of ±2.0% of the value range being measured (not full range of meter) and have been calibrated within the last year.

PART III - EXECUTION

3.1 GENERAL DOCUMENTATION REQUIREMENTS

A. With assistance from the Contractor, the CxA will prepare Pre-Functional Checklists for commissioned components, equipment, and systems.

B. Red-lined Drawings:

1. The Contractor will verify all equipment, systems, instrumentation, wiring and components are shown correctly on red-lined drawings.
2. Preliminary red-lined drawings must be made available to the Commissioning Team for use prior to the start of Functional Performance Testing.
3. Changes, as a result of Functional Testing, must be incorporated into the final as-built drawings, which will be created from the red-lined drawings.
4. The Contractor will create the as-built drawings.

C. Operation and Service Data:

1. The Contractor shall cuase the Sub-Contractor to provide a copy of O&M literature within 45 days of each submittal acceptance for use during the commissioning process for all commissioned equipment and systems.
2. The CxA will review the O&M literature once for conformance to project requirements.
3. The CxA will receive a copy of the final approved O&M literature from the Contractor once corrections have been made by the Sub-Contractor.

D. Demonstration and Instruction:

1. The Contractor will provide demonstration and instruction as required by the specifications.
2. A complete instruction plan and schedule must be submitted by the Contractor to the CxA four weeks (4) prior to any instruction.
3. An instruction agenda for each instruction session must be submitted to the CxA one (1) week prior the instructing session.
4. The CxA shall be notified at least 72 hours in advance of scheduled tests so that testing may be observed by the CxA. A copy of the test record shall be provided to the CxA and Commissioner.

5. Engage a Factory-authorized service representative to demonstrate to the City of New York service personnel to adjust, operate, and maintain specific equipment.
6. Instruct the City of New York service personnel on procedures and schedules for starting and stopping, trouble shooting, servicing, and maintaining equipment.
7. Review data in O&M Manuals.

3.2 CONTRACTOR RESPONSIBILITIES FOR SUB-CONTRACTOR PERFORMANCE

A. The Contractor shall cause the Sub-Contractor to have the following instruction responsibilities in performing plumbing System work: The commissioning responsibilities are as follows (all references apply to commissioned equipment/systems only):

1. Perform commissioning test at the direction of the CxA.
2. Attend construction phase controls coordination meetings.
3. Attend domestic water balancing review and coordination meetings.
4. Participate in Plumbing systems, assemblies, equipment, and component service orientation and inspection as directed by the CxA.
5. Provide information requested by the CxA for final commissioning documentation.
6. Include requirements for submittal data, operation and maintenance data, and instruction in each purchase order or sub-contract written.
7. Prepare preliminary schedule for Plumbing system orientations and inspections, operation and maintenance manual submissions, orientation sessions, pipe and duct system testing, flushing and cleaning, equipment start-up, testing and balancing and task completion for the Commissioner. Distribute preliminary schedule to commissioning team members.
8. Update schedule as required throughout the construction period.
9. During the startup and initial checkout process, execute the related portions of the pre-functional checklists for all commissioned equipment.
10. Assist the CxA in all verification and functional performance tests.
11. Provide measuring instruments and logging devices to record test data, and provide data acquisition equipment to record data for the complete range of testing for the required test period.
12. Gather operation and maintenance literature on all equipment, and assemble in binders as required by the specifications. Submit to CxA (45) days after submittal acceptance.
13. Coordinate with the CxA to provide (72) hour advance notice so that the witnessing of equipment and system start-up and testing can begin.
14. Notify the CxA a minimum of (2) weeks in advance of the time for start of the balancing work. Attend the initial balancing meeting for review of the balancing procedures.
15. Participate in, and schedule vendors and Sub-Contractors to participate in the instruction sessions.
16. Provide written notification to the CxA that the following work has been completed in accordance with the contract documents, and that the equipment, systems, and sub-system are operating as required.
    a. Plumbing equipment including backflow preventers, domestic water heaters, pumps, plumbing fixtures, and all other equipment furnished under Division 22.

b. Gas piping, sanitary waste and vent piping, storm drainage piping, sump pumps and, sewage ejectors.

17. The Contractor shall ensure that the equipment suppliers documents the performance of their equipment.

18. Provide a complete set of red-lined drawings to the CxA prior to the start of Functional Performance Testing.

19. The Contractor shall ensure that the Sub-Contractor perform Test, Adjust and Balance work:
    a. Attend initial commissioning coordination meeting scheduled by the CxA.
    b. Submit the site specific balancing plan to the CxA and Commissioner for review and acceptance.
    c. Attend the balancing review meeting scheduled by the CxA. Be prepared to discuss the procedures that shall be followed in balancing the Plumbing system.
    d. At the completion of the balancing work, and the submittal of the final balancing report, notify the Commissioner.
    e. Participate in verification of the balancing report, which will consist of repeating measurements contained in the balancing reports. Assist in diagnostic purposes when directed.

20. The Contractor shall ensure equipment Suppliers perform the following tasks:
    a. Provide all requested submittal data, including detailed start-up procedures and specific responsibilities of the City of New York, to keep warranties in force.
    b. Assist in equipment testing per agreements with respective Sub-Contractors.
    c. Provide information requested by CxA regarding equipment sequence of operation and testing procedures.

21. Provide instruction for the City of New York service personnel using qualified personnel, as specified.

22. Refer to DDC General Conditions for additional responsibilities.

3.3 CxA's RESPONSIBILITIES

A. Refer to DDC General Conditions for CxA's Responsibilities.

3.4 TESTING PREPARATION

A. Certify in writing to the CxA that Plumbing systems, subsystems, and equipment have been installed, calibrated, and started and are operating according to the Contract Documents.

B. Certify in writing to the CxA that Plumbing instrumentation and control systems have been completed and calibrated, that they are operating according to the Contract Documents, and that pretest set points have been recorded.

C. Certify in writing that balancing procedures have been completed and that testing, adjusting, and balancing reports have been submitted, discrepancies corrected, and corrective work approved.

D. Set systems, subsystems, and equipment into operating mode to be tested (e.g., normal shutdown, normal auto position, normal manual position, unoccupied cycle, emergency power, and alarm conditions).

E. Inspect and verify the position of each device and interlock identified on checklists.

F. Check safety cutouts, alarms, and interlocks with smoke control and life-safety systems during each mode of operation.

G. Testing Instrumentation: Install measuring instruments and logging devices to record test data as directed by the CxA.

3.5 DOMESTIC WATER BALANCING VERIFICATION

A. Prior to performance of Domestic Water Balancing work, provide copies of reports, sample forms, checklists, and certificates to the CxA.

B. Notify the CxA at least ten (10) days in advance of testing and balancing work, and provide access for the CxA to witness balancing work.

C. Provide technicians, instrumentation, and tools to verify testing and balancing of Plumbing systems at the direction of the CxA

1. The CxA will notify the Sub-Contractor performing balancing work ten (10) days in advance of the date of field verification. Notice will not include data points to be verified.
2. The Contractor shall cause the Sub-Contractor performing balancing work shall use the same instruments (by model and serial number) that were used when original data were collected.
3. Failure of an item includes a deviation of more than 10 percent. Failure of more than 10 percent of selected items shall result in rejection of final balancing report.
4. Remedy the deficiency and notify the CxA so verification of failed portions can be performed.

3.6 GENERAL TESTING REQUIREMENTS

A. Provide technicians, instrumentation, and tools to perform commissioning test at the direction of the CxA.

B. Scope of Plumbing testing shall include entire Plumbing installation. Testing shall include measuring capacities and effectiveness of operational and control functions.

C. Test all operating modes, interlocks, control responses, and responses to abnormal or emergency conditions, and verify proper response of building automation system controllers and sensors.

D. The CxA along with the Contractor performing plumbing work and the Sub-Contractor performing balancing work shall prepare detailed testing plans, procedures, and checklists for Plumbing systems, subsystems, and equipment.

E. Tests will be performed using design conditions whenever possible.

F. Simulated conditions may need to be imposed using an artificial load when it is not practical to test under design conditions. Before simulating conditions, calibrate testing instruments. Provide equipment to simulate loads. Set simulated conditions as directed by the CxA and document simulated conditions and methods of simulation. After tests, return settings to normal operating conditions.

G. The CxA may direct that set points be altered when simulating conditions is not practical.

H. The CxA may direct that sensor values be altered with a signal generator when design or simulating conditions and altering set points are not practical.

I. If tests cannot be completed because of a deficiency outside the scope of the Plumbing system, document the deficiency and report it to the City of New York. After deficiencies are resolved, reschedule tests.

J. If the testing plan indicates specific seasonal testing, complete appropriate initial performance tests and documentation and schedule seasonal tests.

3.7 PLUMBING SYSTEMS, SUBSYSTEMS, AND EQUIPMENT TESTING PROCEDURES

A. Equipment Testing and Acceptance Procedures: Testing and Acceptance requirements are specified in Division 22. Provide submittals, test data, inspector records, and certifications to the CxA.

B. Plumbing Instrumentation and Control System Testing: Field testing plans and testing requirements are specified in Division 22. Assist the CxA with preparation of testing plans.

C. Pipe system cleaning, flushing, hydrostatic tests and chemical treatment: The Contractor performing plumbing work shall prepare a pipe system cleaning, flushing, and hydrostatic testing plan. Provide cleaning, flushing, testing, and treating plan and final reports to the CxA.

D. Plumbing Distribution System Testing: The Contractor shall provide technicians, instrumentation, tools, and equipment to test performance of domestic water distribution system.

E. Vibration and Sound Tests: The Contractor shall provide technicians, instrumentation, tools, and equipment to test performance of vibration isolation and seismic controls.

F. The work included in the commissioning process involves a complete and thorough evaluation of the operation and performance of all components, systems and subsystems. The systems shall be evaluated shall include, but not limited to:

1. Domestic Hot Water Heater System
2. Fuel Gas System for Boilers
3. Sump Pumps
4. Solar Hot Water Heaters

3.8 SEASONAL TESTING

A. Refer to DDC General Conditions for requirements pertaining to seasonal testing.

3.9 OPERATION AND MAINTENANCE MANUALS

A. The Operation and Maintenance Manuals shall conform to Contract Documents requirements.

B. Refer to DDC General Conditions for requirements for the Contractor and CxA roles in the Operation and Maintenance Manual contribution, review and approval process.

3.10 INSTRUCTION OF SERVICE PERSONNEL

A. Refer to DDC General Conditions for requirements pertaining to instruction.

B. The Contractor shall cause the plumbing Sub-Contractor to have the following instruction responsibilities:

1. Provide the CxA with an instruction plan two weeks before the planned instruction.
2. Provide the City of New York service personnel with comprehensive orientation and instruction in the understanding of the systems and the operation and service of each piece of Plumbing equipment.
3. During any demonstration, should the system fail to perform in accordance with the requirements of the O&M manual or sequence of operations, the system will be repaired or adjusted as necessary and the demonstration repeated.
4. The appropriate trade or manufacturer's representative shall provide the instructions on each major piece of equipment. This person may be the start-up technician for the piece of equipment, the installing Sub-Contractor or manufacturer's representative. Practical building operating expertise as well as in-depth knowledge of all modes of operation of the specific piece of equipment is required. More than one party may be required to execute the instruction.
5. The instruction sessions shall follow the outline in the Table of Contents of the operation and maintenance manual and illustrate whenever possible the use of the O&M manuals for reference. Instruction shall include but not limited to:
   a. Use the printed installation, operation and maintenance instruction material included in the O&M manuals.
   b. Include a review of the written O&M instructions emphasizing safe and proper operating requirements, preventative maintenance, special tools needed and spare parts inventory suggestions. The instruction shall include start-up, operation in all modes possible, shut-down, seasonal changeover and any emergency procedures.
   c. Discuss relevant health and safety issues and concerns.
   d. Discuss warranties and guarantees.
   e. Cover common troubleshooting problems and solutions.
   f. Explain information included in the O&M manuals and the location of all plans and manuals in the facility.
   g. Discuss any peculiarities of equipment installation or operation.
6. Hands-on instruction shall include start-up, operation in all modes possible, including manual, shut-down and any emergency procedures and preventative maintenance for all pieces of equipment.
7. The Contractor shall ensure that the Sub-Contractor fully explain and demonstrate the operation, function and overrides of any local packaged controls.
8. Instruction shall occur after functional testing is complete, unless approved otherwise by the Commissioner.

END OF SECTION 22 08 00

SECTION 221113
Facility Water Distribution Piping

PART 1 - GENERAL

1.1. RELATED DOCUMENTS

A. The following documents apply to all required work for the Project: (1) the Contract Drawings, (2) the Specifications, (3) the General Conditions, (4) the Addendum and (5) the Contract (City of New York Standard Construction Contract).

B. LEED General Requirements.

1. Refer to DDC General Conditions.

a. Section 01 81 13.04 "Sustainable Design Requirements for LEED v4 Buildings."

1.2. SUMMARY

A. This Section includes water-distribution piping and related components outside the building for water service.

B. Utility-furnished products include water meters that will be furnished to the site, ready for installation.

C. Related Sections:

1. 220500 "Common Results for Plumbing" for commonly used joining material, piping-system common requirements, sleeves and mechanical sleeve seals.

2. 221116 "Domestic Water Piping" for potable-water piping inside the building.

3. 260526 "Grounding and Bonding for Electrical Systems" for ground equipment.

4. 260519 "Low-Voltage Electrical Power Conductors and Cables" for wire connections.

5. 310000 "Earthwork" for excavating, trenching, and backfilling.

1.3. DEFINITIONS

A. EPDM: Ethylene propylene diene terpolymer rubber.

B. LLDPE: Linear, low-density polyethylene plastic.

C. PA: Polyamide (nylon) plastic.

D. PE: Polyethylene plastic.

E. PP: Polypropylene plastic.

F. PVC: Polyvinyl chloride plastic.

G. RTRF: Reinforced thermosetting resin (fiberglass) fittings.

H. RTRP: Reinforced thermosetting resin (fiberglass) pipe.

1.4. SUBMITTALS

A. Refer to DDC General Conditions Section 01 33 00 "Submittal Procedures."

B. Product Data: For each type of product indicated.

C. Coordination Drawings: For piping and specialties including relation to other services in same area, drawn to scale. Show piping and specialty sizes and valves, meter and specialty locations, and elevations.

D. Field quality-control test reports.

E. Operation and Maintenance Data: For water valves and specialties to include in emergency, operation, and maintenance manuals.

1.5. QUALITY ASSURANCE

A. Refer to DDC General Conditions Section 01 40 00 "Quality Requirements."

B. Regulatory Requirements:

1. Comply with requirements of utility company supplying water. Include tapping of water mains and backflow prevention.
2. Comply with standards of NYC Building Code for potable-water-service piping, including materials, installation, testing, and disinfection.
3. Comply with standards of NYC Building Code for fire-suppression water-service piping, including materials, hose threads, installation, and testing.

C. Piping materials shall bear label, stamp, or other markings of specified testing agency.

D. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to the Commissioner, and marked for intended use.

E. NSF Compliance:

1. Comply with NSF 61 for materials for water-service piping and specialties for domestic water.

1.6. DELIVERY, STORAGE, AND HANDLING

A. Preparation for Transport: Prepare valves, including fire hydrants, according to the following:

1. Ensure that valves are dry and internally protected against rust and corrosion.
2. Protect valves against damage to threaded ends and flange faces.
3. Set valves in best position for handling. Set valves closed to prevent rattling.

B. During Storage: Use precautions for valves, according to the following:

1. Do not remove end protectors unless necessary for inspection; then reinstall for storage.
2. Protect from weather. Store indoors and maintain temperature higher than ambient dew-point temperature. Support off the ground or pavement in watertight enclosures when outdoor storage is necessary.

C. Handling: Use sling to handle valves and fire hydrants if size requires handling by crane or lift. Rig valves to avoid damage to exposed parts. Do not use handwheels or stems as lifting or rigging points.

D. Deliver piping with factory-applied end caps. Maintain end caps through shipping, storage, and handling to prevent pipe-end damage and to prevent entrance of dirt, debris, and moisture.

E. Protect stored piping from moisture and dirt. Elevate above grade. Do not exceed structural capacity of floor when storing inside.

F. Protect flanges, fittings, and specialties from moisture and dirt.

G. Store plastic piping protected from direct sunlight. Support to prevent sagging and bending.

1.7. COORDINATION

A. Coordinate connection to water main with utility company.

PART 2 - PRODUCTS

2.1. DUCTILE-IRON PIPE AND FITTINGS

A. Mechanical-Joint, Ductile-Iron Pipe: AWWA C151, with mechanical-joint bell and plain spigot end unless grooved or flanged ends are indicated.

1. Mechanical-Joint, Ductile-Iron Fittings: AWWA C110, ductile- or gray-iron standard pattern or AWWA C153, ductile-iron compact pattern.
2. Glands, Gaskets, and Bolts: AWWA C111, ductile- or gray-iron glands, rubber gaskets, and steel bolts.

B. Pipe and fittings in first paragraph and subparagraphs below are available in NPS 3 to NPS 48 (DN 80 to DN 1200).

C. Push-on-Joint, Ductile-Iron Pipe: AWWA C151, with push-on-joint bell and plain spigot end unless grooved or flanged ends are indicated.

1. Push-on-Joint, Ductile-Iron Fittings: AWWA C110, ductile- or gray-iron standard pattern or AWWA C153, ductile-iron compact pattern.
2. Gaskets: AWWA C111, rubber.

D. Grooved-Joint, Ductile-Iron Pipe: AWWA C151, with cut, rounded-grooved ends.

1. Grooved-End, Ductile-Iron Pipe Appurtenances:

a. Grooved-End, Ductile-Iron Fittings: ASTM A 47/A 47M, malleable-iron castings or ASTM A 536, ductile-iron castings with dimensions matching pipe.
b. Grooved-End, Ductile-Iron-Piping Couplings: AWWA C606, for ductile-iron-pipe dimensions. Include ferrous housing sections, gasket suitable for water, and bolts and nuts.

E. Flanges: ASME 16.1, Class 125, cast iron.

2.2. SPECIAL PIPE FITTINGS

A. Ductile-Iron Rigid Expansion Joints:

1. Description: Three-piece, ductile-iron assembly consisting of telescoping sleeve with gaskets and restrained-type, ductile-iron, bell-and-spigot end sections complying with AWWA C110 or AWWA C153. Select and assemble components for expansion indicated. Include AWWA C111, ductile-iron glands, rubber gaskets, and steel bolts.
2. Pressure Rating: 250 psig (1725 kPa) minimum.

B. Ductile-Iron Flexible Expansion Joints:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. EBAA Iron, Inc.
b. Hays Fluid Controls; a division of ROMAC Industries Inc.
c. Star Pipe Products.
d. Or Approved Equal.

2. Description: Compound, ductile-iron fitting with combination of flanged and mechanical-joint ends complying with AWWA C110 or AWWA C153. Include two gasketed ball-joint sections and one or more gasketed sleeve sections. Assemble components for offset and expansion indicated. Include AWWA C111, ductile-iron glands, rubber gaskets, and steel bolts.

a. Pressure Rating: 250 psig minimum.

C. Ductile-Iron Deflection Fittings:

1. Description: Compound, ductile-iron coupling fitting with sleeve and 1 or 2 flexing sections for up to 15-degree deflection, gaskets, and restrained-joint ends complying with AWWA C110 or AWWA C153. Include AWWA C111, ductile-iron glands, rubber gaskets, and steel bolts.

a. Pressure Rating: 250 psig minimum.

2.3. JOINGING MATERIALS

A. Refer to Section 220500 "Common Results for Plumbing" for commonly used joining materials.

2.4. PIPING SPECIALTIES

A. Transition Fittings: Manufactured fitting or coupling same size as, with pressure rating at least equal to and ends compatible with, piping to be joined.

B. Tubular-Sleeve Pipe Couplings:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. Cascade Waterworks Manufacturing.
   b. Dresser, Inc.; Dresser Piping Specialties.
   c. Ford Meter Box Company, Inc. (The); Pipe Products Div.
   d. Hays Fluid Controls; a division of ROMAC Industries Inc.
   e. JCM Industries.
   f. Smith-Blair, Inc.
   g. Viking Johnson.
   h. Or Approved Equal.

2. Description: Metal, bolted, sleeve-type, reducing or transition coupling, with center sleeve, gaskets, end rings, and bolt fasteners and with ends of same sizes as piping to be joined.

   a. Standard: AWWA C219.
   b. Center-Sleeve Material: Manufacturer's standard.
   c. Gasket Material: Natural or synthetic rubber.
   d. Pressure Rating: 200 psig minimum.
   e. Metal Component Finish: Corrosion-resistant coating or material.

C. Split-Sleeve Pipe Couplings:

1. Description: Metal, bolted, split-sleeve-type, reducing or transition coupling with sealing pad and closure plates, O-ring gaskets, and bolt fasteners.

   a. Standard: AWWA C219.
   b. Sleeve Material: Manufacturer's standard.
   c. Sleeve Dimensions: Of thickness and width required to provide pressure rating.
   d. Gasket Material: O-rings made of EPDM rubber, unless otherwise indicated.
   e. Pressure Rating: 200 psig (1380 kPa) minimum.
   f. Metal Component Finish: Corrosion-resistant coating or material.

D. Flexible Connectors:

1. Nonferrous-Metal Piping: Bronze hose covered with bronze wire braid; with copper-tube, pressure-type, solder-joint ends or bronze flanged ends brazed to hose.
2. Ferrous-Metal Piping: Stainless-steel hose covered with stainless-steel wire braid; with ASME B1.20.1, threaded steel pipe nipples or ASME B16.5, steel pipe flanges welded to hose.

E. Dielectric Fittings: Combination of copper alloy and ferrous; threaded, solder, or plain end types; and matching piping system materials.

1. Dielectric Unions: Factory-fabricated union assembly, designed for 250-psig minimum working pressure at 180 deg F. Include insulating material that isolates dissimilar metals and ends with inside threads according to ASME B1.20.1.
2. Dielectric Flanges: Factory-fabricated companion-flange assembly, for 150- or 300-psig minimum working pressure to suit system pressures.
3. Dielectric-Flange Insulation Kits: Field-assembled companion-flange assembly, full-face or ring type. Components include neoprene or phenolic gasket, phenolic or polyethylene bolt sleeves, phenolic washers, and steel backing washers.

a. Provide separate companion flanges and steel bolts and nuts for 150- or 300-psig minimum working pressure to suit system pressures.

4. Dielectric Couplings: Galvanized-steel couplings with inert and noncorrosive thermoplastic lining, with threaded ends and 300-psig minimum working pressure at 225 deg F.
5. Dielectric Nipples: Electroplated steel nipples with inert and noncorrosive thermoplastic lining, with combination of plain, threaded, or grooved end types, and 300-psig minimum working pressure at 225 deg F.

2.5. GATE VALVES

A. AWWA, Cast-Iron Gate Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. American AVK Co.; Valves & Fittings Div.
   b. American Cast Iron Pipe Co.; American Flow Control Div.
   c. American Cast Iron Pipe Co.; Waterous Co. Subsidiary.
   d. Crane Co.; Crane Valve Group; Stockham Div.
   e. East Jordan Iron Works, Inc.
   f. McWane, Inc.; Clow Valve Co. Div. (Oskaloosa).
   g. McWane, Inc.; Kennedy Valve Div.
   h. McWane, Inc.; M & H Valve Company Div.
   i. McWane, Inc.; Tyler Pipe Div.; Utilities Div.
   j. Mueller Co.; Water Products Div.
   k. NIBCO INC.
   l. U.S. Pipe and Foundry Company.
   m. Or Approved Equal.

2. Nonrising-Stem, Metal-Seated Gate Valves:

   a. Description: Gray- or ductile-iron body and bonnet; with cast-iron or bronze double-disc gate, bronze gate rings, bronze stem, and stem nut.

      1) Standard: AWWA C500.
      2) Minimum Pressure Rating: 200 psig .
      3) End Connections: Mechanical joint.
      4) Interior Coating: Complying with AWWA C550.

3. Nonrising-Stem, Resilient-Seated Gate Valves:

   a. Description: Gray- or ductile-iron body and bonnet; with bronze or gray- or ductile-iron gate, resilient seats, bronze stem, and stem nut.

      1) Standard: AWWA C509.
      2) Minimum Pressure Rating: 200 psig.
      3) End Connections: Mechanical joint.
      4) Interior Coating: Complying with AWWA C550.

4. OS&Y, Rising-Stem, Metal-Seated Gate Valves:

   a. Description: Cast- or ductile-iron body and bonnet, with cast-iron double disc, bronze disc and seat rings, and bronze stem.

1) Standard: AWWA C500.
2) Minimum Pressure Rating: 200 psig.
3) End Connections: Flanged.

5. OS&Y, Rising-Stem, Resilient-Seated Gate Valves:

a. Description: Cast- or ductile-iron body and bonnet, with bronze or gray- or ductile-iron gate, resilient seats, and bronze stem.

1) Standard: AWWA C509.
2) Minimum Pressure Rating: 200 psig.
3) End Connections: Flanged.

B. UL/FMG, Cast-Iron Gate Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. American Cast Iron Pipe Co.; American Flow Control Div.
b. American Cast Iron Pipe Co.; Waterous Co. Subsidiary.
c. Crane Co.; Crane Valve Group; Stockham Div.
d. McWane, Inc.; Clow Valve Co. Div. (Oskaloosa).
e. McWane, Inc.; Kennedy Valve Div.
f. McWane, Inc.; M & H Valve Company Div.
g. Mueller Co.; Water Products Div.
h. NIBCO INC.
i. U.S. Pipe and Foundry Company.
j. Or Approved Equal.

2. OS&Y, Rising-Stem Gate Valves:

a. Description: Iron body and bonnet and bronze seating material.

1) Standards: UL 262 and FMG approved.
2) Minimum Pressure Rating: 175 psig .
3) End Connections: Flanged.

C. Bronze Gate Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Crane Co.; Crane Valve Group; Crane Valves.
b. Crane Co.; Crane Valve Group; Jenkins Valves.
c. Crane Co.; Crane Valve Group; Stockham Div.
d. Hammond Valve.
e. Milwaukee Valve Company.
f. NIBCO INC.
g. Red-White Valve Corporation.
h. Or Approved Equal.

2. OS&Y, Rising-Stem Gate Valves:

a. Description: Bronze body and bonnet and bronze stem.

1) Standards: UL 262 and FMG approved.
2) Minimum Pressure Rating: 175 psig.
3) End Connections: Threaded.

3. Nonrising-Stem Gate Valves:

a. Description: Class 125, Type 1, bronze with solid wedge, threaded ends, and malleable-iron handwheel.

1) Standard: MSS SP-80.

2.6. GATE VALVE ACCESSORIES AND SPECIALTIES

A. Tapping-Sleeve Assemblies:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. American Cast Iron Pipe Co.; Waterous Co. Subsidiary.
b. East Jordan Iron Works, Inc.
c. Flowserve.
d. McWane, Inc.; Clow Valve Co. Div. (Oskaloosa).
e. McWane, Inc.; Kennedy Valve Div.
f. McWane, Inc.; M & H Valve Company Div.
g. Mueller Co.; Water Products Div.
h. U.S. Pipe and Foundry Company.
i. Or Approved Equal.

2. Description: Sleeve and valve compatible with drilling machine.

a. Standard: MSS SP-60.
b. Tapping Sleeve: Cast- or ductile-iron or stainless-steel, two-piece bolted sleeve with flanged outlet for new branch connection. Include sleeve matching size and type of pipe material being tapped and with recessed flange for branch valve.
c. Valve: AWWA, cast-iron, nonrising-stem, resilient-seated gate valve with one raised face flange mating tapping-sleeve flange.

B. Valve Boxes: Comply with AWWA M44 for cast-iron valve boxes. Include top section, adjustable extension of length required for depth of burial of valve, plug with lettering "WATER," and bottom section with base that fits over valve and with a barrel approximately 5 inches in diameter.

1. Operating Wrenches: Steel, tee-handle with one pointed end, stem of length to operate deepest buried valve, and socket matching valve operating nut.

2.7. CURB VALVES

A. Manufacturers:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Amcast Industrial Corporation; Lee Brass Co.
b. Ford Meter Box Company, Inc. (The); Pipe Products Div.
c. Jones, James Company.

d. Master Meter, Inc.
e. McDonald, A. Y. Mfg. Co.
f. Mueller Co.; Water Products Div.
g. Red Hed Manufacturing & Supply.
h. Or Approved Equal.

B. Service-Saddle Assemblies: Comply with AWWA C800. Include saddle and valve compatible with tapping machine.

1. Service Saddle: Copper alloy with seal and AWWA C800, threaded outlet for corporation valve.
2. Corporation Valve: Bronze body and ground-key plug, with AWWA C800, threaded inlet and outlet matching service piping material.
3. Manifold: Copper fitting with two to four inlets as required, with ends matching corporation valves and outlet matching service piping material.

C. Curb Valves: Comply with AWWA C800. Include bronze body, ground-key plug or ball, and wide tee head, with inlet and outlet matching service piping material.

D. Service Boxes for Curb Valves: Similar to AWWA M44 requirements for cast-iron valve boxes. Include cast-iron telescoping top section of length required for depth of burial of valve, plug with lettering "WATER," and bottom section with base that fits over curb valve and with a barrel approximately 3 inches in diameter.

1. Shutoff Rods: Steel, tee-handle with one pointed end, stem of length to operate deepest buried valve, and slotted end matching curb valve.

2.8. WATER METERS

A. Water meters will be furnished by utility company.

B. Manufacturers:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Elster
b. AMCO Water Metering Systems.
c. Badger Meter, Inc.
d. Carlon Meter.
e. Hays Fluid Controls; a division of ROMAC Industries Inc.
f. McCrometer.
g. Mueller Co.; Hersey Meters.
h. Neptune Technology Group Inc.
i. Sensus Metering Systems.
j. Or Approved Equal.

C. Compound-Type Water Meters:

1. Description:

a. Standard: AWWA C702.
b. Registration: Flow in gallons .

D. Remote Registration System:

1. Description: Utility company standard; encoder type. Include meter modified with signal-transmitting assembly, low-voltage connecting wiring, and remote register assembly.

a. Standard: AWWA C707.
b. Registration: Flow in gallons.
c. Data-Acquisition Units: Comply with utility company requirements for type and quantity.
d. Visible Display Units: Comply with utility company requirements for type and quantity.

2.9. BACKFLOW PREVENTERS

A. Double-Check, Backflow-Prevention Assemblies, RPZ:

1. Standard: NYC DEP.
2. Operation: Continuous-pressure applications, unless otherwise indicated.
3. Pressure Loss: 5 psig maximum, through middle 1/3 of flow range.
4. Size: See drawings.
5. Design Flow Rate: See drawings.
6. Pressure Loss at Design Flow Rate: 8 psi maximum.
7. Configuration: Designed for horizontal, flow.
8. Accessories: Ball valves with threaded ends on inlet and outlet of NPS 2 and smaller; OS&Y gate valves with flanged ends on inlet and outlet of NPS 2-1/2 and larger.

B. Backflow Preventer Test Kits:

1. Description: Factory calibrated, with gages, fittings, hoses, and carrying case with test-procedure instructions.

PART 3 - EXECUTION

3.1. EXECUTION REQUIREMENTS

A. Refer to DDC General Conditions for execution requirements.

3.2. EARTHWORK

A. Refer to Section 310000 "Earthwork" for excavating, trenching, and backfilling.

3.3. PIPING APPLICATIONS

A. General: Use pipe, fittings, and joining methods for piping systems according to the following applications.

B. Transition couplings and special fittings with pressure ratings at least equal to piping pressure rating may be used, unless otherwise indicated.

C. Do not use flanges or unions for underground piping.

D. Flanges, unions, grooved-end-pipe couplings, and special fittings may be used, instead of joints indicated, on aboveground piping and piping in vaults.

E. Underground water-service piping NPS 3 to NPS 8 shall be the following:

1. Ductile-iron, mechanical-joint pipe; ductile-iron, mechanical-joint fittings; and mechanical.

F. Aboveground water-service piping NPS 3 to NPS 8 shall be the following:

1. Ductile-iron, grooved-end pipe; ductile-iron, grooved-end appurtenances; and grooved joints.

3.4. VALVE APPLICATIONS

A. General Application: Use mechanical-joint-end valves for NPS 3 and larger underground installation. Use threaded- or flanged-end valves for installation in vaults or above ground.

B. Drawings indicate valve types to be used. Where specific valve types are not indicated, the following requirements apply:

1. Underground Valves, NPS 3 and Larger: AWWA, cast-iron, nonrising-stem, metal or resilient-seated gate valves with valve box.
2. Use the following for valves in vaults and aboveground:
   a. Gate Valves, NPS 3 (DN 80) and Larger: AWWA, cast iron, OS&Y rising stem, metal seated or AWWA, cast iron, OS&Y rising stem, resilient seated.

C. Detector Check Valves: Use for water-service piping in vaults and aboveground to detect unauthorized use of water.

3.5. PIPING SYSTEMS – COMMON REQUIREMENTS

A. See Section 220500 "Common Results for Plumbing" for piping-system common requirements.

3.6. PIPING INSTALLATION

A. Water-Main Connection: Tap water main according to requirements of water utility company and of size and in location indicated.

B. Make connections larger than NPS 2 with tapping machine according to the following:

1. Install tapping sleeve and tapping valve according to MSS SP-60.
2. Install tapping sleeve on pipe to be tapped. Position flanged outlet for gate valve.
3. Use tapping machine compatible with valve and tapping sleeve; cut hole in main. Remove tapping machine and connect water-service piping.
4. Install gate valve onto tapping sleeve. Comply with MSS SP-60. Install valve with stem pointing up and with valve box.

C. Make connections NPS 2 and smaller with drilling machine according to the following:

1. Install service-saddle assemblies and corporation valves in size, quantity, and arrangement required by utility company standards.
2. Install service-saddle assemblies on water-service pipe to be tapped. Position outlets for corporation valves.

3. Use drilling machine compatible with service-saddle assemblies and corporation valves. Drill hole in main. Remove drilling machine and connect water-service piping.
4. Install corporation valves into service-saddle assemblies.
5. Install manifold for multiple taps in water main.
6. Install curb valve in water-service piping with head pointing up and with service box.

D. Install ductile-iron, water-service piping according to AWWA C600 and AWWA M41.

E. Bury piping with depth of cover over top at least 48 inches below level of maximum frost penetration, and according to the following:

F. Install piping by tunneling or jacking, or combination of both, under streets and other obstructions that cannot be disturbed.

G. Extend water-service piping and connect to water-supply source and building-water-piping systems at outside face of building wall in locations and pipe sizes indicated.

1. Terminate water-service piping at building wall until building-water-piping systems are installed. Terminate piping with caps, plugs, or flanges as required for piping material. Make connections to building-water-piping systems when those systems are installed.

H. Sleeves are specified in Section 220500 "Common Results for Plumbing."

I. Install underground piping with restrained joints at horizontal and vertical changes in direction. Use restrained-joint piping, thrust blocks, anchors, tie-rods and clamps, and other supports.

J. See Section 221116 "Domestic Water Piping" for potable-water piping inside the building.

3.7. JOINT CONSTRUCTION

A. Make pipe joints according to the following:

1. Ductile-Iron Piping, Gasketed Joints for Water-Service Piping: AWWA C600 and AWWA M41.
2. Ductile-Iron Piping, Gasketed Joints for Fire-Service-Main Piping: UL 194.
3. Ductile-Iron Piping, Grooved Joints: Cut-groove pipe. Assemble joints with grooved-end, ductile-iron-piping couplings, gaskets, lubricant, and bolts according to coupling manufacturer's written instructions.
4. Dissimilar Materials Piping Joints: Use adapters compatible with both piping materials, with OD, and with system working pressure. Refer to Section 220500 "Common Results for Plumbing" for joining piping of dissimilar metals.

3.8. ANCHORAGE INSTALLATION

A. Anchorage, General: Install water-distribution piping with restrained joints. Anchorages and restrained-joint types that may be used include the following:

1. Concrete thrust blocks.
2. Locking mechanical joints.
3. Set-screw mechanical retainer glands.
4. Bolted flanged joints.

5. Heat-fused joints.
6. Pipe clamps and tie rods.

B. Install anchorages for tees, plugs and caps, bends, crosses, valves, and hydrant branches. Include anchorages for the following piping systems:

1. Gasketed-Joint, Ductile-Iron, Water-Service Piping: According to AWWA C600.

C. Apply full coat of asphalt or other acceptable corrosion-resistant material to surfaces of installed ferrous anchorage devices.

3.9. VALVE INSTALLATION

A. AWWA Gate Valves: Comply with AWWA C600 and AWWA M44. Install each underground valve with stem pointing up and with valve box.

B. AWWA Valves Other Than Gate Valves: Comply with AWWA C600 and AWWA M44.

C. MSS Valves: Install as component of connected piping system.

D. Corporation Valves and Curb Valves: Install each underground curb valve with head pointed up and with service box.

3.10. WATER METER INSTALLATION

A. Install water meters, piping, and specialties according to utility company's written instructions.

B. Water Meters: Install compound-type water meters, NPS 3 (DN 80) and larger, in meter vaults. Include shutoff valves on water meter inlets and outlets and valved bypass around meters. Support meters, valves, and piping on brick or concrete piers.

3.11. ROUGHING-IN FOR WATER METERS

A. Rough-in piping and specialties for water meter installation according to utility company's written instructions.

3.12. BACKFLOW PREVENTER INSTALLATION

A. Install backflow preventers of type, size, and capacity indicated. Include valves and test cocks. Install according to requirements of Commissioner.

B. Do not install backflow preventers that have relief drain in vault or in other spaces subject to flooding.

C. Do not install bypass piping around backflow preventers.

D. Support NPS 2-1/2 and larger backflow preventers, valves, and piping near floor and on brick or concrete piers.

3.13. CONNECTIONS

A. Piping installation requirements are specified in other Plumbing Sections. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Connect water-distribution piping to existing street water main.

C. Connect water-distribution piping to interior domestic water piping.

D. Ground equipment according to Section 260526 "Grounding and Bonding for Electrical Systems."

E. Connect wiring according to Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

3.14. FIELD QUALITY CONTROL

A. Unless otherwise indicated the following tests shall be performed by the Contractor.

B. Piping Tests: Conduct piping tests before joints are covered and after concrete thrust blocks have hardened sufficiently. Fill pipeline 24 hours before testing and apply test pressure to stabilize system. Use only potable water.

C. Hydrostatic Tests: Test at not less than one-and-one-half times working pressure for two hours.

1. Increase pressure in 50-psig increments and inspect each joint between increments. Hold at test pressure for 1 hour; decrease to 0 psig. Slowly increase again to test pressure and hold for 1 more hour. Maximum allowable leakage is 2 quarts (1.89 L) per hour per 100 joints. Remake leaking joints with new materials and repeat test until leakage is within allowed limits.

D. Prepare reports of testing activities.

3.15. IDENTIFICATION

A. Install continuous underground detectable warning tape during backfilling of trench for underground water-distribution piping. Locate below finished grade, directly over piping. Underground warning tapes are specified in Section 310000 "Earthwork."

3.16. CLEANING

A. Clean and disinfect water-distribution piping as follows:

1. Purge new water-distribution piping systems and parts of existing systems that have been altered, extended, or restored before use.
2. Use purging and disinfecting procedure prescribed by NYC Department of Buildings or, if method is not prescribed by NYC Department of Buildings, use procedure described in AWWA C651 or do as follows:

a. Fill system or part of system with water/chlorine solution containing at least 50 ppm of chlorine; isolate and allow to stand for 24 hours.

b. Drain system or part of system of previous solution and refill with water/chlorine solution containing at least 200 ppm of chlorine; isolate and allow to stand for 3 hours.
c. After standing time, flush system with clean, potable water until no chlorine remains in water coming from system.
d. Submit water samples in sterile bottles to NYC Department of Buildings. Repeat procedure if biological examination shows evidence of contamination.

B. Prepare reports of purging and disinfecting activities.

END OF SECTION 221113

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SECTION 221114
Facility Natural-Gas Piping

PART 1 - GENERAL

1.1. RELATED DOCUMENTS

A. The following documents apply to all required work for the Project: (1) the Contract Drawings, (2) the Specifications, (3) the General Conditions, (4) the Addendum and (5) the Contract (City of New York Standard Construction Contract).

B. LEED General Requirements.

1. Refer to DDC General Conditions.

a. Section 01 81 13.04 "Sustainable Design Requirements for LEED v4 Buildings."

1.2. SUMMARY

A. Section Includes:

1. Pipes, tubes, and fittings.
2. Piping specialties.
3. Piping and tubing joining materials.
4. Valves.
5. Pressure regulators.
6. Service meters (Provided by utility company).
7. Mechanical sleeve seals.
8. Grout.
9. Concrete bases.
10. Gas Booster

1.3. DEFINITIONS

A. Finished Spaces: Spaces other than mechanical and electrical equipment rooms, furred spaces, pipe and duct shafts, unheated spaces immediately below roof, spaces above ceilings, unexcavated spaces, crawlspaces, and tunnels.

B. Exposed, Interior Installations: Exposed to view indoors. Examples include finished occupied spaces and mechanical equipment rooms.

C. Exposed, Exterior Installations: Exposed to view outdoors or subject to outdoor ambient temperatures and weather conditions. Examples include rooftop locations.

1.4. PERFORMANCE REQUIREMENTS

A. Minimum Operating-Pressure Ratings:

1. Piping and Valves: 100 psig minimum unless otherwise indicated.
2. Service Regulators: 65 psig minimum unless otherwise indicated.
3. Minimum Operating Pressure of Service Meter: 5 psig.

B. Natural-Gas System Pressure within Building: 0.5 psig (3.45 kPa) or less.

1.5. SUBMITTALS

A. Refer to DDC General Conditions Section 01 33 00 "Submittal Procedures."

B. Product Data: For each type of the following:

1. Piping specialties.
2. Corrugated, stainless-steel tubing with associated components.
3. Valves. Include pressure rating, capacity, settings, and electrical connection data of selected models.
4. Pressure regulators. Indicate pressure ratings and capacities.
5. Service meters. Indicate pressure ratings and capacities. Include bypass fittings and meter bars.
6. Dielectric fittings.
7. Mechanical sleeve seals.
8. Escutcheons.

C. Shop Drawings: For facility natural-gas piping layout. Include plans, piping layout and elevations, sections, and details for fabrication of pipe anchors, hangers, supports for multiple pipes, alignment guides, expansion joints and loops, and attachments of the same to building structure. Detail location of anchors, alignment guides, and expansion joints and loops.

1. Shop Drawing Scale: 1/4 inch per foot (1:50).
2. Detail mounting, supports, and valve arrangements for service meter assembly and pressure regulator assembly.

D. Engineering Submittal: For natural-gas piping and equipment indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer licensed in the State of New York, responsible for their preparation.

1. Detail fabrication and assembly of seismic restraints.
2. Design Calculations: Calculate requirements for selecting seismic restraints.

E. Coordination Drawings: Plans and details, drawn to scale, on which natural-gas piping is shown and coordinated with other installations, using input from installers of the items involved.

F. Site Survey: Plans, drawn to scale, on which natural-gas piping is shown and coordinated with other services and utilities.

G. Qualification Data: For qualified professional engineer licensed in the State of New York.

H. License Welding certificate issued by the City of New York as per Article 4.07 of the 2008 New York City Fuel Code.

I. Field quality-control reports.

J. Operation and Maintenance Data: For motorized gas valves pressure regulators and service meters to include in emergency, operation, and maintenance manuals.

1.6. QUALITY ASSURANCE

A. Refer to DDC General Conditions Section 01 40 00 "Quality Requirements."

B. Materials and work shall conform to the latest edition of reference specifications specified herein and to applicable codes and requirements of NYC Department of Buildings.

C. Steel Support Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

D. Pipe Welding Qualifications: Qualify procedures and operators according to ASME Boiler and Pressure Vessel Code.

E. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

1.7. DELIVERY, STORAGE, AND HANDLING

A. Handling Flammable Liquids: Remove and dispose of liquids from existing natural-gas piping according to requirements of NYC Department of Buildings.

B. Deliver pipes and tubes with factory-applied end caps. Maintain end caps through shipping, storage, and handling to prevent pipe end damage and to prevent entrance of dirt, debris, and moisture.

C. Store and handle pipes and tubes having factory-applied protective coatings to avoid damaging coating, and protect from direct sunlight.

D. Protect stored PE pipes and valves from direct sunlight.

1.8. PROJECT CONDITIONS

A. Perform site survey, research public utility records, and verify existing utility locations. Contact utility-locating service for area where Project is located.

1.9. COORDINATION

A. Coordinate sizes and locations of concrete bases with actual equipment provided.

B. Coordinate requirements for access panels and doors for valves installed concealed behind finished surfaces. Comply with requirements in Section 083113 "Access Doors."

PART 2 - PRODUCTS

2.1. PIPES, TUBES, AND FITTINGS

A. Steel Pipe: ASTM A 53/A 53M, black steel, Schedule 40, Type E or S, Grade B.

1. Malleable-Iron Threaded Fittings: ASME B16.3, Class 150, standard pattern.
2. Wrought-Steel Welding Fittings: ASTM A 234/A 234M for butt welding and socket welding.
3. Unions: ASME B16.39, Class 150, malleable iron with brass-to-iron seat, ground joint, and threaded ends.
4. Forged-Steel Flanges and Flanged Fittings: ASME B16.5, minimum Class 150, including bolts, nuts, and gaskets of the following material group, end connections, and facings:

    a. Material Group: 1.1.
    b. End Connections: Threaded or butt welding to match pipe.
    c. Lapped Face: Not permitted underground.
    d. Gasket Materials: ASME B16.20, metallic, flat, asbestos free, aluminum o-rings, and spiral-wound metal gaskets.
    e. Bolts and Nuts: ASME B18.2.1, carbon steel aboveground and stainless steel underground.

5. Protective Coating for Underground Piping: Factory-applied, three-layer coating of epoxy, adhesive, and PE.

    a. Joint Cover Kits: Epoxy paint, adhesive, and heat-shrink PE sleeves.

6. Mechanical Couplings:

    a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

        1) Dresser Piping Specialties; Division of Dresser, Inc.
        2) Smith-Blair, Inc.
        3) Victaulic
        4) Or Approved Equal

    b. Steel flanges and tube with epoxy finish.
    c. Buna-nitrile seals.
    d. Steel bolts, washers, and nuts.
    e. Coupling shall be capable of joining PE pipe to PE pipe, steel pipe to PE pipe, or steel pipe to steel pipe.
    f. Steel body couplings installed underground on plastic pipe shall be factory equipped with anode.

2.2. PIPING SPECIALTIES

A. Appliance Flexible Connectors:

1. Indoor, Fixed-Appliance Flexible Connectors: Comply with ANSI Z21.24.
2. Indoor, Movable-Appliance Flexible Connectors: Comply with ANSI Z21.69.
3. Operating-Pressure Rating: 0.5 psig (3.45 kPa).

4. End Fittings: Zinc-coated steel.
5. Threaded Ends: Comply with ASME B1.20.1.
6. Maximum Length: 72 inches (1830 mm).

B. Quick-Disconnect Devices: Comply with ANSI Z21.41.

1. Copper-alloy convenience outlet and matching plug connector.
2. Nitrile seals.
3. Hand operated with automatic shutoff when disconnected.
4. For indoor applications.
5. Adjustable, retractable restraining cable.

C. Y-Pattern Strainers:

1. Body: ASTM A 126, Class B, cast iron with bolted cover and bottom drain connection.
2. End Connections: Threaded ends for NPS 2 (DN 50) and smaller; flanged ends for NPS 2-1/2 (DN 65) and larger.
3. Strainer Screen: 60-mesh startup strainer, and perforated stainless-steel basket with 50 percent free area.
4. CWP Rating: 125 psig (862 kPa).

D. Basket Strainers:

1. Body: ASTM A 126, Class B, high-tensile cast iron with bolted cover and bottom drain connection.
2. End Connections: Threaded ends for NPS 2 (DN 50) and smaller; flanged ends for NPS 2-1/2 (DN 65) and larger.
3. Strainer Screen: 60-mesh startup strainer, and perforated stainless-steel basket with 50 percent free area.
4. CWP Rating: 125 psig (862 kPa).

E. T-Pattern Strainers:

1. Body: Ductile or malleable iron with removable access coupling and end cap for strainer maintenance.
2. End Connections: Grooved ends.
3. Strainer Screen: 60-mesh startup strainer, and perforated stainless-steel basket with 57 percent free area.
4. CWP Rating: 750 psig (5170 kPa).

F. Weatherproof Vent Cap: Cast- or malleable-iron increaser fitting with corrosion-resistant wire screen, with free area at least equal to cross-sectional area of connecting pipe and threaded-end connection.

2.3. JOINING MATERIALS

A. Joint Compound and Tape: Suitable for natural gas.

B. Welding Filler Metals: Comply with AWS D10.12/D10.12M for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.

C. Brazing Filler Metals: Alloy with melting point greater than 1000 deg F (540 deg C) complying with AWS A5.8/A5.8M. Brazing alloys containing more than 0.05 percent phosphorus are prohibited.

2.4. MANUAL GAS SHUTOFF VALVES

A. See "Aboveground Manual Gas Shutoff Valve Schedule" Articles for where each valve type is applied in various services.

B. General Requirements for Metallic Valves, NPS 2 (DN 50) and Smaller: Comply with ASME B16.33.

1. CWP Rating: 125 psig (862 kPa).
2. Threaded Ends: Comply with ASME B1.20.1.
3. Dryseal Threads on Flare Ends: Comply with ASME B1.20.3.
4. Tamperproof Feature: Locking feature for valves indicated in "Aboveground Manual Gas Shutoff Valve Schedule" Articles.
5. Listing: Listed and labeled by an NRTL acceptable to NYC Department of Buildings for valves 1 inch (25 mm) and smaller.
6. Service Mark: Valves 1-1/4 inches (32 mm) to NPS 2 (DN 50) shall have initials "WOG" permanently marked on valve body.

C. General Requirements for Metallic Valves, NPS 2-1/2 (DN 65) and Larger: Comply with ASME B16.38.

1. CWP Rating: 125 psig (862 kPa).
2. Flanged Ends: Comply with ASME B16.5 for steel flanges.
3. Tamperproof Feature: Locking feature for valves indicated in "Aboveground Manual Gas Shutoff Valve Schedule" Articles.
4. Service Mark: Initials "WOG" shall be permanently marked on valve body.

D. One-Piece, Bronze Ball Valve with Bronze Trim: MSS SP-110.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. BrassCraft Manufacturing Company; a Masco company.
   b. Conbraco Industries, Inc.; Apollo Div.
   c. Lyall, R. W. & Company, Inc.
   d. McDonald, A. Y. Mfg. Co.
   e. Perfection Corporation; a subsidiary of American Meter Company.
   f. Or approved equal.
2. Body: Bronze, complying with ASTM B 584.
3. Ball: Chrome-plated brass.
4. Stem: Bronze; blowout proof.
5. Seats: Reinforced TFE; blowout proof.
6. Packing: Separate packnut with adjustable-stem packing threaded ends.
7. Ends: Threaded, flared, or socket as indicated in "Aboveground Manual Gas Shutoff Valve Schedule" Articles.
8. CWP Rating: 600 psig (4140 kPa).
9. Listing: Valves NPS 1 (DN 25) and smaller shall be listed and labeled by an NRTL acceptable to Commissioner.
10. Service: Suitable for natural-gas service with "WOG" indicated on valve body.

E. Two-Piece, Full-Port, Bronze Ball Valves with Bronze Trim: MSS SP-110.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. BrassCraft Manufacturing Company; a Masco company.
   b. Conbraco Industries, Inc.; Apollo Div.
   c. Lyall, R. W. & Company, Inc.
   d. McDonald, A. Y. Mfg. Co.
   e. Perfection Corporation; a subsidiary of American Meter Company.
   f. Or Approved Equal
2. Body: Bronze, complying with ASTM B 584.
3. Ball: Chrome-plated bronze.
4. Stem: Bronze; blowout proof.
5. Seats: Reinforced TFE; blowout proof.
6. Packing: Threaded-body packnut design with adjustable-stem packing.
7. Ends: Threaded, flared, or socket as indicated in "Aboveground Manual Gas Shutoff Valve Schedule" Articles.
8. CWP Rating: 600 psig (4140 kPa).
9. Listing: Valves NPS 1 (DN 25) and smaller shall be listed and labeled by an NRTL acceptable to NYC Department of Buildings.
10. Service: Suitable for natural-gas service with "WOG" indicated on valve body.

F. Two-Piece, Regular-Port Bronze Ball Valves with Bronze Trim: MSS SP-110.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. BrassCraft Manufacturing Company; a Masco company.
   b. Conbraco Industries, Inc.; Apollo Div.
   c. Lyall, R. W. & Company, Inc.
   d. McDonald, A. Y. Mfg. Co.
   e. Perfection Corporation; a subsidiary of American Meter Company.
   f. Or Approved Equal
2. Body: Bronze, complying with ASTM B 584.
3. Ball: Chrome-plated bronze.
4. Stem: Bronze; blowout proof.
5. Seats: Reinforced TFE.
6. Packing: Threaded-body packnut design with adjustable-stem packing.
7. Ends: Threaded, flared, or socket as indicated in "Aboveground Manual Gas Shutoff Valve Schedule" Articles.
8. CWP Rating: 600 psig (4140 kPa).
9. Listing: Valves NPS 1 (DN 25) and smaller shall be listed and labeled by an NRTL acceptable to NYC Department of Buildings.
10. Service: Suitable for natural-gas service with "WOG" indicated on valve body.

G. Bronze Plug Valves: MSS SP-78.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Lee Brass Company.

b. McDonald, A. Y. Mfg. Co.
c. Nibco
d. Or Approved Equal

2. Body: Bronze, complying with ASTM B 584.
3. Plug: Bronze.
4. Ends: Threaded, socket, or flanged as indicated in "Aboveground Manual Gas Shutoff Valve Schedule" Articles.
5. Operator: Square head or lug type with tamperproof feature where indicated.
6. Pressure Class: 125 psig (862 kPa).
7. Listing: Valves NPS 1 (DN 25) and smaller shall be listed and labeled by an NRTL acceptable to NYC Department of Buildings.
8. Service: Suitable for natural-gas service with "WOG" indicated on valve body.

H. Cast-Iron, Nonlubricated Plug Valves: MSS SP-78.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. McDonald, A. Y. Mfg. Co.
b. Mueller Co.; Gas Products Div.
c. Xomox Corporation; a Crane company.
d. Or Approved Equal

2. Body: Cast iron, complying with ASTM A 126, Class B.
3. Plug: Bronze or nickel-plated cast iron.
4. Seat: Coated with thermoplastic.
5. Stem Seal: Compatible with natural gas.
6. Ends: Threaded or flanged as indicated in "Aboveground Manual Gas Shutoff Valve Schedule" Articles.
7. Operator: Square head or lug type with tamperproof feature where indicated.
8. Pressure Class: 125 psig (862 kPa).
9. Listing: Valves NPS 1 (DN 25) and smaller shall be listed and labeled by an NRTL acceptable to NYC Department of Buildings.
10. Service: Suitable for natural-gas service with "WOG" indicated on valve body.

I. Cast-Iron, Lubricated Plug Valves: MSS SP-78.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Flowserve.
b. Homestead Valve; a division of Olson Technologies, Inc.
c. McDonald, A. Y. Mfg. Co.
d. Milliken Valve Company.
e. Mueller Co.; Gas Products Div.
f. R&M Energy Systems, A Unit of Robbins & Myers, Inc.
g. Or Approved Equal

2. Body: Cast iron, complying with ASTM A 126, Class B.
3. Plug: Bronze or nickel-plated cast iron.
4. Seat: Coated with thermoplastic.
5. Stem Seal: Compatible with natural gas.

6. Ends: Threaded or flanged as indicated in "Aboveground Manual Gas Shutoff Valve Schedule" Articles.
7. Operator: Square head or lug type with tamperproof feature where indicated.
8. Pressure Class: 125 psig (862 kPa).
9. Listing: Valves NPS 1 (DN 25) and smaller shall be listed and labeled by an NRTL acceptable to NYC Department of Buildings.
10. Service: Suitable for natural-gas service with "WOG" indicated on valve body.

J. Valve Boxes:

1. Cast-iron, two-section box.
2. Top section with cover with "GAS" lettering.
3. Bottom section with base to fit over valve and barrel a minimum of 5 inches (125 mm) in diameter.
4. Adjustable cast-iron extensions of length required for depth of bury.
5. Include tee-handle, steel operating wrench with socket end fitting valve nut or flat head, and with stem of length required to operate valve.

2.5. PRESSURE REGULATORS

A. General Requirements:

1. Single stage and suitable for natural gas.
2. Steel jacket and corrosion-resistant components.
3. Elevation compensator.
4. End Connections: Threaded for regulators NPS 2 (DN 50) and smaller; flanged for regulators NPS 2-1/2 (DN 65) and larger.

B. Line Pressure Regulators: Comply with ANSI Z21.80.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Actaris.
   b. American Meter Company.
   c. Eclipse Combustion, Inc.
   d. Fisher Control Valves and Regulators; Division of Emerson Process Management.
   e. Invensys.
   f. Maxitrol Company.
   g. Richards Industries; Jordan Valve Div.
   h. Or Approved Equal
2. Body and Diaphragm Case: Cast iron or die-cast aluminum.
3. Springs: Zinc-plated steel; interchangeable.
4. Diaphragm Plate: Zinc-plated steel.
5. Seat Disc: Nitrile rubber resistant to gas impurities, abrasion, and deformation at the valve port.
6. Orifice: Aluminum; interchangeable.
7. Seal Plug: Ultraviolet-stabilized, mineral-filled nylon.
8. Single-port, self-contained regulator with orifice no larger than required at maximum pressure inlet, and no pressure sensing piping external to the regulator.
9. Pressure regulator shall maintain discharge pressure setting downstream, and not exceed 150 percent of design discharge pressure at shutoff.

10. Overpressure Protection Device: Factory mounted on pressure regulator.
11. Atmospheric Vent: Factory- or field-installed, stainless-steel screen in opening if not connected to vent piping.
12. Maximum Inlet Pressure: 2 psig (13.8 kPa).

2.6. GENERAL

A. Building Gas System Pressure

1. Low pressure as supplied by Utility Company,
2. Gas Booster:
   a. Furnish and install natural gas booster low capacity. Entire booster shall be hermetically sealed. Gas booster to include standard shaft 208V, ½ HP 3 HP 60 HZ 3,500 RPM class 1, group D explosion proof motor with thermal overload protection and junction box.

2.7. DIELECTRIC FITTINGS

A. Dielectric Unions:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Capitol Manufacturing Company.
   b. Central Plastics Company.
   c. Hart Industries International, Inc.
   d. McDonald, A. Y. Mfg. Co.
   e. Watts Regulator Co.; Division of Watts Water Technologies, Inc.
   f. Wilkins; Zurn Plumbing Products Group.
   g. Or Approved Equal.
2. Minimum Operating-Pressure Rating: 150 psig (1034 kPa).
3. Combination fitting of copper alloy and ferrous materials.
4. Insulating materials suitable for natural gas.
5. Combination fitting of copper alloy and ferrous materials with threaded, brazed-joint, plain, or welded end connections that match piping system materials.

B. Dielectric Flanges:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Capitol Manufacturing Company.
   b. Central Plastics Company.
   c. Watts Regulator Co.; Division of Watts Water Technologies, Inc.
   d. Wilkins; Zurn Plumbing Products Group.
   e. Or Approved Equal
2. Minimum Operating-Pressure Rating: 150 psig (1034 kPa).
3. Combination fitting of copper alloy and ferrous materials.
4. Insulating materials suitable for natural gas.

5. Combination fitting of copper alloy and ferrous materials with threaded, brazed-joint, plain, or welded end connections that match piping system materials.

C. Dielectric-Flange Kits:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Advance Products & Systems, Inc.
   b. Calpico Inc.
   c. Central Plastics Company.
   d. Pipeline Seal and Insulator, Inc.
   e. Or Approved Equal
2. Minimum Operating-Pressure Rating: 150 psig (1034 kPa).
3. Companion-flange assembly for field assembly.
4. Include flanges, full-face- or ring-type neoprene or phenolic gasket, phenolic or PE bolt sleeves, phenolic washers, and steel backing washers.
5. Insulating materials suitable for natural gas.
6. Combination fitting of copper alloy and ferrous materials with threaded, brazed-joint, plain, or welded end connections that match piping system materials.

2.8. 2.8 SLEEVES

A. Steel Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, galvanized steel, plain ends.

B. Cast-Iron Pipe Sleeves: Cast or fabricated "wall pipe," equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop, unless otherwise indicated.

2.9. MECHANICAL SLEEVE SEALS

A. Description: Modular sealing element unit, designed for field assembly, to fill annular space between pipe and sleeve.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Advance Products & Systems, Inc.
   b. Calpico Inc.
   c. Metraflex Company (The).
   d. Pipeline Seal and Insulator, Inc.
   e. Or Approved Equal
2. Sealing Elements: EPDM interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe and sleeve.
3. Pressure Plates: Carbon steel.
4. Connecting Bolts and Nuts: Carbon steel with corrosion-resistant coating of length required to secure pressure plates to sealing elements. Include one nut and bolt for each sealing element.

2.10. GROUT

A. Description: ASTM C 1107, Grade B, nonshrink and nonmetallic, dry hydraulic-cement grout.

1. Characteristics: Post-hardening, volume adjusting, nonstaining, noncorrosive, nongaseous, and recommended for interior and exterior applications.
2. Design Mix: 5000-psi (34.5-MPa), 28-day compressive strength.
3. Packaging: Premixed and factory packaged.

2.11. LABELING AND IDENTIFYING

A. Detectable Warning Tape: Acid- and alkali-resistant, PE film warning tape manufactured for marking and identifying underground utilities, a minimum of 6 inches (150 mm) wide and 4 mils (0.1 mm) thick, continuously inscribed with a description of utility, with metallic core encased in a protective jacket for corrosion protection, detectable by metal detector when tape is buried up to 30 inches (750 mm) deep; colored yellow.

PART 3 - EXECUTION

3.1. EXECUTION REQUIREMENTS

A. Refer to DDC General Conditions for execution requirements.

3.2. EXAMINATION

A. Examine roughing-in for natural-gas piping system to verify actual locations of piping connections before equipment installation.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.3. PREPARATION

A. Close equipment shutoff valves before turning off natural gas to premises or piping section.

B. Inspect natural-gas piping according to NFPA 54 to determine that natural-gas utilization devices are turned off in piping section affected.

C. Comply with NFPA 54 requirements for prevention of accidental ignition.

3.4. INDOOR PIPING INSTALLATION

A. Comply with NFPA 54 for installation and purging of natural-gas piping.

B. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements are used to size pipe and calculate friction loss, expansion, and other design considerations. Install piping as indicated unless deviations to layout are approved on Coordination Drawings.

C. Arrange for pipe spaces, chases, slots, sleeves, and openings in building structure during progress of construction, to allow for mechanical installations.

D. Install piping in concealed locations unless otherwise indicated and except in equipment rooms and service areas.

E. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

F. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.

G. Locate valves for easy access.

H. Install natural-gas piping at uniform grade of 2 percent down toward drip and sediment traps.

I. Install piping free of sags and bends.

J. Install fittings for changes in direction and branch connections.

K. Install escutcheons at penetrations of interior walls, ceilings, and floors.

1. New Piping:

a. Piping with Fitting or Sleeve Protruding from Wall: One-piece, deep-pattern type.
b. Piping at Wall and Floor Penetrations in Finished Spaces: One-piece, cast-brass type with polished chrome-plated finish.
c. Piping at Wall and Floor Penetrations in Finished Spaces: One-piece, stamped-steel type.
d. Piping at Ceiling Penetrations in Finished Spaces: One-piece, stamped-steel type and set screw.
e. Piping in Unfinished Service Spaces: One-piece, stamped-steel type with set screw or spring clips.
f. Piping in Equipment Rooms: One-piece, cast-brass type.
g. Piping in Equipment Rooms: One-piece, stamped-steel type with set screw or spring clips.

L. Fire-Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with firestop materials. Comply with requirements in Section 078413 "Firestops and Smokeseals."

M. Verify final equipment locations for roughing-in.

N. Comply with requirements in Sections specifying gas-fired appliances and equipment for roughing-in requirements.

O. Drips and Sediment Traps: Install drips at points where condensate may collect, including service-meter outlets. Locate where accessible to permit cleaning and emptying. Do not install where condensate is subject to freezing.

1. Construct drips and sediment traps using tee fitting with bottom outlet plugged or capped. Use nipple a minimum length of 3 pipe diameters, but not less than 3 inches (75 mm) long and same size as connected pipe. Install with space below bottom of drip to remove plug or cap.

P. Extend relief vent connections for service regulators, line regulators, and overpressure protection devices to outdoors and terminate with weatherproof vent cap.

Q. Conceal pipe installations in walls, pipe spaces, utility spaces, above ceilings, below grade or floors, and in floor channels unless indicated to be exposed to view.

R. Concealed Location Installations: Except as specified below, install concealed natural-gas piping and piping installed under the building in containment conduit constructed of steel pipe with welded joints as described in Part 2. Install a vent pipe from containment conduit to outdoors and terminate with weatherproof vent cap.

1. Above Accessible Ceilings: Natural-gas piping, fittings, valves, and regulators may be installed in accessible spaces without containment conduit.
2. In Floors: Install natural-gas piping with welded or brazed joints and protective coating in cast-in-place concrete floors. Cover piping to be cast in concrete slabs with minimum of 1-1/2 inches (38 mm) of concrete. Piping may not be in physical contact with other metallic structures such as reinforcing rods or electrically neutral conductors. Do not embed piping in concrete slabs containing quick-set additives or cinder aggregate.
3. In Floor Channels: Install natural-gas piping in floor channels. Channels must have cover and be open to space above cover for ventilation.
4. In Walls or Partitions: Protect tubing installed inside partitions or hollow walls from physical damage using steel striker barriers at rigid supports.
    a. Exception: Tubing passing through partitions or walls does not require striker barriers.
5. Prohibited Locations:
    a. Do not install natural-gas piping in or through circulating air ducts, ventilating ducts, or elevator shafts.
    b. Do not install natural-gas piping in solid walls or partitions.

S. Use eccentric reducer fittings to make reductions in pipe sizes. Install fittings with level side down.

T. Connect branch piping from top or side of horizontal piping.

U. Install unions in pipes NPS 2 (DN 50) and smaller, adjacent to each valve, at final connection to each piece of equipment. Unions are not required at flanged connections.

V. Do not use natural-gas piping as grounding electrode.

W. Install strainer on inlet of each line-pressure regulator and automatic or electrically operated valve.

X. Install pressure gage upstream and downstream from each line regulator.

3.5. SERVICE-METER ASSEMBLY INSTALLATION

A. Install service-meter assemblies aboveground, on concrete bases if required.

B. Install metal shutoff valves upstream from service regulators. Shutoff valves are not required at second regulators if two regulators are installed in series.

C. Install strainer on inlet of service-pressure regulator and meter set.

D. Install service regulators mounted outside with vent outlet horizontal or facing down. Install screen in vent outlet if not integral with service regulator.

E. Install metal shutoff valves upstream from service meters. Install dielectric fittings downstream from service meters.

F. Install service meters downstream from pressure regulators.

3.6. VALVE INSTALLATION

A. Install manual gas shutoff valve for each gas appliance ahead of corrugated stainless-steel tubing, aluminum, or copper connector.

B. Install underground valves with valve boxes.

C. Install regulators and overpressure protection devices with maintenance access space adequate for servicing and testing.

D. Install anode for metallic valves in underground PE piping.

3.7. PIPING JOINT CONSTRUCTION

A. Ream ends of pipes and tubes and remove burrs.

B. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.

C. Threaded Joints:

1. Thread pipe with tapered pipe threads complying with ASME B1.20.1.
2. Cut threads full and clean using sharp dies.
3. Ream threaded pipe ends to remove burrs and restore full inside diameter of pipe.
4. Apply appropriate tape or thread compound to external pipe threads unless dryseal threading is specified.
5. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.

D. Welded Joints:

1. Construct joints according to AWS D10.12/D10.12M, using qualified processes and welding operators.
2. Bevel plain ends of steel pipe.

3. Patch factory-applied protective coating as recommended by manufacturer at field welds and where damage to coating occurs during construction.

3.8. HANGER AND SUPPORT INSTALLATION

A. Install seismic restraints on piping. Comply with requirements for seismic-restraint devices specified in Section 230548 "Vibration and Seismic Controls for HVAC Piping and Equipment."

B. Comply with requirements for pipe hangers and supports specified in Section 230529 "Hangers and Supports for HVAC Piping and Equipment."

C. Install hangers for horizontal steel piping with the following maximum spacing and minimum rod sizes:

1. NPS 1 (DN 25) and Smaller: Maximum span, 96 inches (2438 mm); minimum rod size, 3/8 inch (10 mm).
2. NPS 1-1/4 (DN 32): Maximum span, 108 inches (2743 mm); minimum rod size, 3/8 inch (10 mm).
3. NPS 1-1/2 and NPS 2 (DN 40 and DN 50): Maximum span, 108 inches (2743 mm); minimum rod size, 3/8 inch (10 mm).
4. NPS 2-1/2 to NPS 3-1/2 (DN 65 to DN 90): Maximum span, 10 feet (3 m); minimum rod size, 1/2 inch (13 mm).
5. NPS 4 (DN 100) and Larger: Maximum span, 10 feet (3 m); minimum rod size, 5/8 inch (15.8 mm).

D. Install hangers for horizontal drawn-temper copper tubing with the following maximum spacing and minimum rod sizes:

1. NPS 3/8 (DN 10): Maximum span, 48 inches (1220 mm); minimum rod size, 3/8 inch (10 mm).
2. NPS 1/2 and NPS 5/8 (DN 15 and DN 18): Maximum span, 72 inches (1830 mm); minimum rod size, 3/8 inch (10 mm).
3. NPS 3/4 and NPS 7/8 (DN 20 and DN 22): Maximum span, 84 inches (2134 mm); minimum rod size, 3/8 inch (10 mm).
4. NPS 1 (DN 25): Maximum span, 96 inches (2440 mm); minimum rod size, 3/8 inch (10 mm).

3.9. CONNECTIONS

A. Connect to utility's gas main according to utility's procedures and requirements.

B. Install natural-gas piping electrically continuous, and bonded to gas appliance equipment grounding conductor of the circuit powering the appliance according to NFPA 70.

C. Install piping adjacent to appliances to allow service and maintenance of appliances.

D. Connect piping to appliances using manual gas shutoff valves and unions. Install valve within 72 inches (1800 mm) of each gas-fired appliance and equipment. Install union between valve and appliances or equipment.

E. Sediment Traps: Install tee fitting with capped nipple in bottom to form drip, as close as practical to inlet of each appliance.

3.10. LABELING AND IDENTIFYING

A. Comply with requirements in Section 230553 "Identification for HVAC Piping and Equipment" for piping and valve identification.

B. Install detectable warning tape directly above gas piping, 12 inches (300 mm) below finished grade, except 6 inches (150 mm) below subgrade under pavements and slabs.

3.11. PAINTING

A. Comply with requirements in painting sections 099000 for painting interior and exterior natural-gas piping.

B. Paint exposed, exterior metal piping, valves, service regulators, service meters and meter bars, earthquake valves, and piping specialties, except components, with factory-applied paint or protective coating.

1. Alkyd System: MPI EXT 5.1D.

   a. Prime Coat: Alkyd anticorrosive metal primer.
   b. Intermediate Coat: Exterior alkyd enamel matching topcoat.
   c. Topcoat: Exterior alkyd enamel (flat).
   d. Color: Gray.

C. Paint exposed, interior metal piping, valves, service regulators, service meters and meter bars, earthquake valves, and piping specialties, except components, with factory-applied paint or protective coating.

1. Latex Over Alkyd Primer System: MPI INT 5.1Q.

   a. Prime Coat: Alkyd anticorrosive metal primer.
   b. Intermediate Coat: Interior latex matching topcoat.
   c. Topcoat: Interior latex (flat).
   d. Color: Gray.

2. Alkyd System: MPI INT 5.1E.

   a. Prime Coat: Alkyd anticorrosive metal primer.
   b. Intermediate Coat: Interior alkyd matching topcoat.
   c. Topcoat: Interior alkyd (flat).
   d. Color: Gray.

D. Damage and Touchup: Restore marred and damaged factory-applied finishes with materials and by procedures to match original factory finish.

3.12. CONCRETE BASES

A. Concrete Bases: Anchor equipment to concrete base according to seismic codes at Project.

1. Construct concrete bases of dimensions indicated, but not less than 4 inches (100 mm) larger in both directions than supported unit.
2. Install epoxy-coated anchor bolts for supported equipment that extend through concrete base, and anchor into structural concrete floor.
3. Place and secure anchorage devices. Use supported equipment manufacturer's setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
4. Install anchor bolts to elevations required for proper attachment to supported equipment.
5. Refer to Section 033000 for Structural data.

3.13. FIELD QUALITY CONTROL

A. Contractor shall Perform tests and inspections.

B. Tests and Inspections:

1. Test, inspect, and purge natural gas according to NFPA 54 and NYC Department of Buildings.

C. Natural-gas piping will be considered defective if it does not pass tests and inspections.

D. Prepare test and inspection reports.

3.14. INSTRUCTION

A. Engage a factory-authorized service representative to instruct building's operating personnel to adjust, operate, and maintain earthquake valves.

3.15. INDOOR PIPING SCHEDULE FOR SYSTEM PRESSURES LESS THAN 0.5 PSIG (3.45 kPa)

A. Aboveground, branch piping NPS 1 (DN 25) and smaller shall be the following:

1. Steel pipe with malleable-iron fittings and threaded joints.

B. Aboveground, distribution piping shall be one of the following:

1. Steel pipe with malleable-iron fittings and threaded joints.
2. Steel pipe with wrought-steel fittings and welded joints.

C. Containment Conduit: Steel pipe with wrought-steel fittings and welded joints. Coat pipe and fittings with protective coating for steel piping.

D. Containment Conduit Vent Piping: Steel pipe with malleable-iron fittings and threaded or wrought-steel fittings with welded joints. Coat underground pipe and fittings with protective coating for steel piping.

3.16. ABOVEGROUND MANUAL GAS SHUTOFF VALVE SCHEDULE

A. Valves for pipe sizes NPS 2 (DN 50) and smaller at service meter shall be one of the following:

1. One-piece, bronze ball valve with bronze trim.
2. Two-piece, full port, bronze ball valves with bronze trim.
3. Bronze plug valve.

B. Valves for pipe sizes NPS 2-1/2 (DN 65) and larger at service meter shall be one of the following:

1. Two-piece, full-port, bronze ball valves with bronze trim.
2. Bronze plug valve.
3. Cast-iron, nonlubricated plug valve.

C. Distribution piping valves for pipe sizes NPS 2 (DN 50) and smaller shall be one of the following:

1. One-piece, bronze ball valve with bronze trim.
2. Two-piece, full-port, bronze ball valves with bronze trim.
3. Bronze plug valve.

D. Distribution piping valves for pipe sizes NPS 2-1/2 (DN 65) and larger shall be one of the following:

1. Two-piece, full-port, bronze ball valves with bronze trim.
2. Bronze plug valve.
3. Cast-iron, lubricated plug valve.

E. Valves in branch piping for single appliance shall be one of the following:

1. One-piece, bronze ball valve with bronze trim.
2. Two-piece, full-port, bronze ball valves with bronze trim.
3. Bronze plug valve.

END OF SECTION 221114

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SECTION 221116
Domestic Water Piping

PART 1 - GENERAL

1.1. RELATED DOCUMENTS

A. The following documents apply to all required work for the Project: (1) the Contract Drawings, (2) the Specifications, (3) the General Conditions, (4) the Addendum and (5) the Contract (City of New York Standard Construction Contract).

B. LEED General Requirements.

1. Refer to DDC General Conditions.

a. Section 01 81 13.04 "Sustainable Design Requirements for LEED v4 Buildings."

1.2. SUMMARY

A. Section Includes:

1. Under-building slab and aboveground domestic water pipes, tubes, fittings, and specialties inside the building.
2. Specialty valves.
3. Flexible connectors.
4. Escutcheons.
5. Sleeves and sleeve seals.
6. Wall penetration systems.

B. Related Section:

1. Section 221113 "Facility Water Distribution Piping" for water-service piping and water meters outside the building from source to the point where water-service piping enters the building.

1.3. PERFORMANCE REQUIREMENTS

A. Seismic Performance: Domestic water piping and support and installation shall withstand effects of earthquake motions determined according to ASCE/SEI 7.

1.4. SUBMITTALS

A. Refer to DDC General Conditions Section 01 33 00 "Submittal Procedures."

B. Product Data: For the following products:

1. Specialty valves.
2. Transition fittings.

3. Dielectric fittings.
4. Flexible connectors.
5. Water meters.
6. Escutcheons.
7. Sleeves and sleeve seals.
8. Water penetration systems.

C. Water Samples: Specified in "Cleaning" Article.

D. Coordination Drawings: For piping in equipment rooms and other congested areas, drawn to scale, on which the following items are shown and coordinated with each other, using input from Installers of the items involved:

1. Fire-suppression-water piping.
2. Domestic water piping.
3. HVAC hydronic piping.

E. Field quality-control reports.

1.5. QUALITY ASSURANCE

A. Refer to DDC General Conditions Section 01 40 00 "Quality Requirements."

B. Piping materials shall bear label, stamp, or other markings of specified testing agency.

C. Comply with NSF 61 for potable domestic water piping and components.

D. Materials and work shall conform to the latest edition of reference specifications specified herein and to applicable codes and requirements of NYC Department of Buildings.

1.6. COORDINATION

A. Coordinate sizes and locations of concrete bases with actual equipment provided.

PART 2 - PRODUCTS

2.1. PIPING MATERIALS

A. Comply with requirements in "Piping Schedule" Article for applications of pipe, tube, fitting materials, and joining methods for specific services, service locations, and pipe sizes.

2.2. COPPER TUBE AND FITTINGS

A. Hard Copper Tube: ASTM B 88, Type L (ASTM B 88M, Type B) water tube, drawn temper.

1. Cast-Copper Solder-Joint Fittings: ASME B16.18, pressure fittings.
2. Wrought-Copper Solder-Joint Fittings: ASME B16.22, wrought-copper pressure fittings.

3. Copper Unions: MSS SP-123, cast-copper-alloy, hexagonal-stock body, with ball-and-socket, metal-to-metal seating surfaces, and solder-joint or threaded ends.

4. Grooved-Joint Copper-Tube Appurtenances:

   a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

      1) Anvil International.
      2) Shurjoint Piping Products.
      3) Victaulic Company.
      4) Or Approved Equal.

   b. Copper Grooved-End Fittings: ASTM B 75 copper tube or ASTM B 584 bronze castings.
   c. Grooved-End-Tube Couplings: Copper-tube dimensions and design similar to AWWA C606. Include ferrous housing sections, EPDM-rubber gaskets suitable for hot and cold water, and bolts and nuts.

B. Soft Copper Tube: ASTM B 88, Type K and ASTM B 88, Type L water tube, annealed temper.

1. Copper Solder-Joint Fittings: ASME B16.22, wrought-copper pressure fittings.

2.3. DUCTILE-IRON PIPE AND FITTINGS

A. Mechanical-Joint, Ductile-Iron Pipe: AWWA C151, with mechanical-joint bell and plain spigot end unless grooved or flanged ends are indicated.

B. Push-on-Joint, Ductile-Iron Pipe: AWWA C151, with push-on-joint bell and plain spigot end unless grooved or flanged ends are indicated.

2.4. PIPING JOINING MATERIALS

A. Pipe-Flange Gasket Materials: AWWA C110, rubber, flat face, 1/8 inch thick or ASME B16.21, nonmetallic and asbestos free, unless otherwise indicated; full-face or ring type unless otherwise indicated.

B. Metal, Pipe-Flange Bolts and Nuts: ASME B18.2.1, carbon steel unless otherwise indicated.

C. Solder Filler Metals: ASTM B 32, lead-free alloys. Include water-flushable flux according to ASTM B 813.

D. Brazing Filler Metals: AWS A5.8/A5.8M, BCuP Series, copper-phosphorus alloys for general-duty brazing unless otherwise indicated.

2.5. TRANSITION FITTINGS

A. General Requirements:

1. Same size as pipes to be joined.
2. Pressure rating at least equal to pipes to be joined.
3. End connections compatible with pipes to be joined.

B. Fitting-Type Transition Couplings: Manufactured piping coupling or specified piping system fitting.

C. Sleeve-Type Transition Coupling: AWWA C219.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Cascade Waterworks Manufacturing.
b. Dresser, Inc.; Dresser Piping Specialties.
c. Ford Meter Box Company, Inc. (The).
d. JCM Industries.
e. Romac Industries, Inc.
f. Smith-Blair, Inc; a Sensus company.
g. Viking Johnson; c/o Mueller Co.
h. Or Approved Equal.

2.6. DIELECTRIC FITTINGS

A. General Requirements: Assembly of copper alloy and ferrous materials or ferrous material body with separating nonconductive insulating material suitable for system fluid, pressure, and temperature.

B. Dielectric Unions:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Capitol Manufacturing Company.
b. EPCO Sales, Inc.
c. Hart Industries International, Inc.
d. Watts Regulator Co.; a division of Watts Water Technologies, Inc.
e. Zurn Plumbing Products Group; Wilkins Water Control Products.
f. Or Approved Equal

2. Description:

a. Pressure Rating: 250 psig at 180 deg F (82 deg C).
b. End Connections: Solder-joint copper alloy and threaded ferrous.

C. Dielectric Flanges:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Capitol Manufacturing Company.
b. EPCO Sales, Inc.
c. Watts Regulator Co.; a division of Watts Water Technologies, Inc.
d. Or Approved Equal

2. Description:

a. Factory-fabricated, bolted, companion-flange assembly.
b. Pressure Rating: 175 psig minimum.
c. End Connections: Solder-joint copper alloy and threaded ferrous; threaded solder-joint copper alloy and threaded ferrous.

D. Dielectric-Flange Kits:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Advance Products & Systems, Inc.
b. Calpico, Inc.
c. Pipeline Seal and Insulator, Inc.
d. Or Approved Equal

2. Description:

a. Nonconducting materials for field assembly of companion flanges.
b. Pressure Rating: 175 psig
c. Gasket: Neoprene or phenolic.
d. Bolt Sleeves: Phenolic or polyethylene.
e. Washers: Phenolic with steel backing washers.

E. Dielectric Couplings:

3. Description:

a. Galvanized-steel coupling.
b. Pressure Rating: 300 psig at 225 deg F.
c. End Connections: Female threaded.
d. Lining: Inert and noncorrosive, thermoplastic.

F. Dielectric Nipples:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Perfection Corporation; a subsidiary of American Meter Company.
b. Precision Plumbing Products, Inc.
c. Victaulic Company.
d. Or Approved Equal

2. Description:

a. Electroplated steel nipple complying with ASTM F 1545.
b. Pressure Rating: 300 psig at 225 deg F.
c. End Connections: Male threaded or grooved.
d. Lining: Inert and noncorrosive, propylene.

2.7. FLEXIBLE CONNECTORS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Flex-Hose Co., Inc.
2. Flexicraft Industries.
3. Flex Pression, Ltd.
4. Flex-Weld, Inc.
5. Hyspan Precision Products, Inc.
6. Mercer Rubber Co.
7. Metraflex, Inc.
8. Proco Products, Inc.
9. Tozen Corporation.
10. Unaflex, Inc.
11. Universal Metal Hose; a Hyspan company
12. Or Approved Equal

B. Bronze-Hose Flexible Connectors: Corrugated-bronze tubing with bronze wire-braid covering and ends brazed to inner tubing.

1. Working-Pressure Rating: Minimum 200 psig.
2. End Connections NPS 2 and Smaller: Threaded copper pipe or plain-end copper tube.
3. End Connections NPS 2-1/2 and Larger: Flanged copper alloy.

C. Stainless-Steel-Hose Flexible Connectors: Corrugated-stainless-steel tubing with stainless-steel wire-braid covering and ends welded to inner tubing.

1. Working-Pressure Rating: Minimum 200 psig.
2. End Connections NPS 2 and Smaller: Threaded steel-pipe nipple.
3. End Connections NPS 2-1/2 and Larger: Flanged steel nipple.

2.8. ESCUTCHEONS

A. General: Manufactured ceiling, floor, and wall escutcheons and floor plates.

B. One Piece, Cast Brass: Polished, chrome-plated finish with setscrews.

C. One Piece, Deep Pattern: Deep-drawn, box-shaped brass with chrome-plated finish.

D. One Piece, Stamped Steel: Chrome-plated finish with setscrew or spring clips.

E. Split Casting, Cast Brass: Polished, chrome-plated finish with concealed hinge and setscrew.

F. Split Plate, Stamped Steel: Chrome-plated finish with concealed hinge, setscrew or spring clips.

G. One-Piece Floor Plates: Cast-iron flange with holes for fasteners.

H. Split-Casting Floor Plates: Cast brass with concealed hinge.

2.9. SLEEVES

A. Cast-Iron Wall Pipes: Fabricated of cast iron, and equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop unless otherwise indicated.

B. Galvanized-Steel-Sheet Sleeves: 0.0239-inch minimum thickness; round tube closed with welded longitudinal joint.

C. Galvanized-Steel-Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, zinc-coated, with plain ends.

D. Stack Sleeve Fittings: Manufactured, cast-iron sleeve with integral clamping flange. Include clamping ring and bolts and nuts for membrane flashing.

1. Underdeck Clamp: Clamping ring with setscrews.

2.10. SLEEVE SEALS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Advance Products & Systems, Inc.
2. Calpico, Inc.
3. Metraflex, Inc.
4. Pipeline Seal and Insulator, Inc.
5. Or Approved Equal

B. Description: Modular sealing element unit, designed for field assembly, used to fill annular space between pipe and sleeve.

1. Sealing Elements: EPDM-rubber interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.
2. Pressure Plates: Stainless steel.
3. Connecting Bolts and Nuts: Stainless steel of length required to secure pressure plates to sealing elements.

2.11. WALL PENETRATION SYSTEMS

A. Description: Wall-sleeve assembly, consisting of housing and gland, gaskets, and pipe sleeve.

1. Carrier-Pipe Deflection: Up to 5 percent without leakage.
2. Housing: Ductile-iron casting with hub, waterstop, anchor ring, and locking devices. Include gland, bolts, and nuts.
3. Housing-to-Sleeve Gasket: EPDM rubber.
4. Housing-to-Carrier-Pipe Gasket: AWWA C111, EPDM rubber.
5. Pipe Sleeve: AWWA C151, ductile-iron pipe.

2.12. GROUT

A. Standard: ASTM C 1107, Grade B, post-hardening and volume-adjusting, dry, hydraulic-cement grout.

B. Characteristics: Nonshrink; recommended for interior and exterior applications.

C. Design Mix: 5000-psi, 28-day compressive strength.

D. Packaging: Premixed and factory packaged.

PART 3 - EXECUTION

3.1. EXECUTION REQUIREMENTS

A. Refer to DDC General Conditions for execution requirements.

3.2. EARTHWORK

A. Comply with requirements in Section 31000 "Earthwork" for excavating, trenching, and backfilling.

3.3. PIPING INSTALLATION

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of domestic water piping. Indicated locations and arrangements are used to size pipe and calculate friction loss, expansion, and other design considerations. Install piping as indicated unless deviations to layout are approved on Coordination Drawings.

B. Install copper tubing under building slab according to CDA's "Copper Tube Handbook."

C. Install ductile-iron piping under building slab with restrained joints according to AWWA C600 and AWWA M41.

D. Install underground copper tube in PE encasement according to ASTM A 674 or AWWA C105.

E. Install shutoff valve, hose-end drain valve, strainer, pressure gage, and test tee with valve, inside the building at each domestic water service entrance. Comply with requirements in Section 220519 "Meters and Gages for Plumbing Piping" for pressure gages and Section 221119 "Domestic Water Piping Specialties" for drain valves and strainers.

F. Install shutoff valve immediately upstream of each dielectric fitting.

G. Install water-pressure-reducing valves downstream from shutoff valves. Comply with requirements in Section 221119 "Domestic Water Piping Specialties" for pressure-reducing valves.

H. Install domestic water piping level without pitch and plumb.

I. Install seismic restraints on piping.

J. Install piping concealed from view and protected from physical contact by building occupants unless otherwise indicated and except in equipment rooms and service areas.

K. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

L. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal, and coordinate with other services occupying that space.

M. Install piping adjacent to equipment and specialties to allow service and maintenance.

N. Install piping to permit valve servicing.

O. Install nipples, unions, special fittings, and valves with pressure ratings the same as or higher than system pressure rating used in applications below unless otherwise indicated.

P. Install piping free of sags and bends.

Q. Install fittings for changes in direction and branch connections.

R. Install unions in copper tubing at final connection to each piece of equipment, machine, and specialty.

S. Install pressure gages on suction and discharge piping from each plumbing pump and packaged booster pump. Comply with requirements in Section 220519 "Meters and Gages for Plumbing Piping" for pressure gages.

T. Install thermostats in hot-water circulation piping.

U. Install thermometers on inlet and outlet piping from each water heater. Comply with requirements in Section 220519 "Meters and Gages for Plumbing Piping" for thermometers.

3.4. JOINT CONSTRUCTION

A. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.

B. Remove scale, slag, dirt, and debris from inside and outside of pipes, tubes, and fittings before assembly.

C. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:

1. Apply appropriate tape or thread compound to external pipe threads.
2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged.

D. Brazed Joints: Join copper tube and fittings according to CDA's "Copper Tube Handbook," "Brazed Joints" Chapter.

E. Soldered Joints: Apply ASTM B 813, water-flushable flux to end of tube. Join copper tube and fittings according to ASTM B 828 or CDA's "Copper Tube Handbook."

F. Extruded-Tee Connections: Form tee in copper tube according to ASTM F 2014. Use tool designed for copper tube; drill pilot hole, form collar for outlet, dimple tube to form seating stop, and braze branch tube into collar.

G. Copper-Tubing Grooved Joints: Roll groove end of tube. Assemble coupling with housing, gasket, lubricant, and bolts. Join copper tube and grooved-end fittings according to AWWA C606 for roll-grooved joints.

H. Ductile-Iron-Piping Grooved Joints: Cut groove end of pipe. Assemble coupling with housing, gasket, lubricant, and bolts. Join ductile-iron pipe and grooved-end fittings according to AWWA C606 for ductile-iron-pipe, cut-grooved joints.

I. Flanged Joints: Select appropriate asbestos-free, nonmetallic gasket material in size, type, and thickness suitable for domestic water service. Join flanges with gasket and bolts according to ASME B31.9.

J. Dissimilar-Material Piping Joints: Make joints using adapters compatible with materials of both piping systems.

3.5. VALVE INSTALLATION

A. General-Duty Valves: Comply with requirements in Section 220523 "General-Duty Valves for Plumbing Piping" for valve installations.

B. Install shutoff valve close to water main on each branch and riser serving plumbing fixtures or equipment, on each water supply to equipment, and on each water supply to plumbing fixtures that do not have supply stops. Use ball or gate valves for piping NPS 2 and smaller. Use butterfly or gate valves for piping NPS 2-1/2 and larger.

C. Install drain valves for equipment at base of each water riser, at low points in horizontal piping, and where required to drain water piping. Drain valves are specified in Section 221119 "Domestic Water Piping Specialties."

1. Hose-End Drain Valves: At low points in water mains, risers, and branches.
2. Stop-and-Waste Drain Valves: Instead of hose-end drain valves where indicated.

D. Install balancing valve in each hot-water circulation return branch and discharge side of each pump and circulator. Set balancing valves partly open to restrict but not stop flow. Use ball valves for piping NPS 2 and smaller and butterfly valves for piping NPS 2-1/2 and larger. Comply with requirements in Section 221119 "Domestic Water Piping Specialties" for balancing valves.

E. Install calibrated balancing valves in each hot-water circulation return branch and discharge side of each pump and circulator. Set calibrated balancing valves partly open to restrict but not stop flow. Comply with requirements in Section 221119 "Domestic Water Piping Specialties" for calibrated balancing valves.

3.6. TRANSITION FITTING INSTALLATION

A. Install transition couplings at joints of dissimilar piping.

B. Transition Fittings in Underground Domestic Water Piping:

1. NPS 1-1/2 and Smaller: Fitting-type coupling.
2. NPS 2 and Larger: Sleeve-type coupling.

C. Transition Fittings in Aboveground Domestic Water Piping NPS 2 (DN 50) and Smaller: Plastic-to-metal transition fittings or unions.

3.7. DIELECTRIC FITTING INSTALLATION

A. Install dielectric fittings in piping at connections of dissimilar metal piping and tubing.

B. Dielectric Fittings for NPS 2 and Smaller: Use dielectric unions.

C. Dielectric Fittings for NPS 2-1/2 to NPS 4: Use dielectric flanges.

D. Dielectric Fittings for NPS 5 and Larger: Use dielectric flange kits.

3.8. FLEXIBLE CONNECTOR INSTALLATION

A. Install flexible connectors in suction and discharge piping connections to each domestic water pump and in suction and discharge manifold connections to each domestic water booster pump.

B. Install bronze-hose flexible connectors in copper domestic water tubing.

C. Install stainless-steel-hose flexible connectors in steel domestic water piping.

3.9. WATER METER INSTALLATION

A. Rough-in domestic water piping for water meter installation, and install water meters according to utility company's requirements.

3.10. HANGER AND SUPPORT INSTALLATION

A. Comply with requirements in Section 220529 "Hangers and Supports for Plumbing Piping and Equipment" for pipe hanger and support products and installation.

1. Vertical Piping: MSS Type 8 or 42, clamps.
2. Individual, Straight, Horizontal Piping Runs:

   a. 100 Feet and Less: MSS Type 1, adjustable, steel clevis hangers.
   b. Longer Than 100 Feet : MSS Type 43, adjustable roller hangers.

c. Longer Than 100 Feet If Indicated: MSS Type 49, spring cushion rolls.

3. Multiple, Straight, Horizontal Piping Runs 100 Feet or Longer: MSS Type 44, pipe rolls. Support pipe rolls on trapeze.
4. Base of Vertical Piping: MSS Type 52, spring hangers.

B. Support vertical piping and tubing at base and at each floor.

C. Rod diameter may be reduced one size for double-rod hangers, to a minimum of 3/8 inch.

D. Install hangers for copper tubing with the following maximum horizontal spacing and minimum rod diameters:

1. NPS 3/4 and Smaller: 60 inches with 3/8-inch rod.
2. NPS 1 and NPS 1-1/4: 72 inches with 3/8-inch rod.
3. NPS 1-1/2 and NPS 2 : 96 inches with 3/8-inch rod.
4. NPS 2-1/2: 108 inches with 1/2-inch rod.
5. NPS 3 to NPS 5: 10 feet with 1/2-inch rod.
6. NPS 6: 10 feet with 5/8-inch rod.
7. NPS 8: 10 feet with 3/4-inch rod.

E. Install supports for vertical copper tubing every 10 feet.

F. Support piping and tubing not listed in this article according to MSS SP-69 and manufacturer's written instructions.

3.11. CONNECTIONS

A. Coordinate piping installations and specialty arrangements with schematics on Drawings and with requirements specified. If Drawings are explicit enough, these requirements may be reduced or omitted.

B. Drawings indicate general arrangement of piping, fittings, and specialties.

C. Install piping adjacent to equipment and machines to allow service and maintenance.

D. Connect domestic water piping to exterior water-service piping. Use transition fitting to join dissimilar piping materials.

E. Connect domestic water piping to water-service piping with shutoff valve; extend and connect to the following:

1. Domestic Water Booster Pumps: Cold-water suction and discharge piping.
2. Water Heaters: Cold-water inlet and hot-water outlet piping in sizes indicated, but not smaller than sizes of water heater connections.
3. Plumbing Fixtures: Cold- and hot-water supply piping in sizes indicated, but not smaller than required by plumbing code. Comply with requirements in plumbing fixture sections for connection sizes.

4. Equipment: Cold- and hot-water supply piping as indicated, but not smaller than equipment connections. Provide shutoff valve and union for each connection. Use flanges instead of unions for NPS 2-1/2 and larger.

3.12. ESCUTCHEON INSTALLATION

A. Install escutcheons for penetrations of walls, ceilings, and floors.

B. Escutcheons for New Piping:

1. Piping with Fitting or Sleeve Protruding from Wall: One piece, deep pattern.
2. Bare Piping at Wall and Floor Penetrations in Finished Spaces: One piece, cast brass with polished chrome-plated finish.
3. Bare Piping at Ceiling Penetrations in Finished Spaces: One piece or split casting, cast brass with polished chrome-plated finish.
4. Bare Piping in Unfinished Service Spaces: One piece, cast brass with rough-brass finish.
5. Bare Piping in Equipment Rooms: One piece, cast brass.
6. Bare Piping at Floor Penetrations in Equipment Rooms: One-piece floor plate.

3.13. SLEEVE INSTALLATION

A. General Requirements: Install sleeves for pipes and tubes passing through penetrations in floors, partitions, roofs, and walls.

B. Sleeves are not required for core-drilled holes.

C. Permanent sleeves are not required for holes formed by removable PE sleeves.

D. Cut sleeves to length for mounting flush with both surfaces unless otherwise indicated.

E. Install sleeves in new partitions, slabs, and walls as they are built.

F. For interior wall penetrations, seal annular space between sleeve and pipe or pipe insulation using joint sealants appropriate for size, depth, and location of joint. Comply with requirements in 079200 Section "Interior Joint Sealers" for joint sealants.

G. For exterior wall penetrations above grade, seal annular space between sleeve and pipe using joint sealants appropriate for size, depth, and location of joint. Comply with requirements in 079200 Section "Interior Joint Sealers" for joint sealants.

H. For exterior wall penetrations below grade, seal annular space between sleeve and pipe using wall penetration systems specified in this Section.

I. Seal space outside of sleeves in concrete slabs and walls with grout.

J. Revise first paragraph below as required for seismic design conditions. Coordinate sleeve requirements with pipe insulation specified in Section 220700 "Plumbing Insulation."

K. Install sleeves that are large enough to provide 1/4-inch annular clear space between sleeve and pipe or pipe insulation unless otherwise indicated.

L. Install sleeve materials according to the following applications:

1. Sleeves for Piping Passing through Concrete Floor Slabs: Steel pipe.
2. Sleeves for Piping Passing through Concrete Floor Slabs of Mechanical Equipment Areas or Other Wet Areas: Steel pipe.

    a. Extend sleeves 2 inches above finished floor level.
    b. For pipes penetrating floors with membrane waterproofing, extend cast-iron sleeve fittings below floor slab as required to secure clamping ring if ring is specified. Secure flashing between clamping flanges. Install section of cast-iron soil pipe to extend sleeve to 2 inches above finished floor level.

3. Sleeves for Piping Passing through Gypsum-Board Partitions:

    a. Steel pipe sleeves for pipes smaller than NPS 6.
    b. Galvanized-steel sheet sleeves for pipes NPS 6 and larger.
    c. Exception: Sleeves are not required for water supply tubes and waste pipes for individual plumbing fixtures if escutcheons will cover openings.

4. Sleeves for Piping Passing through Concrete Roof Slabs: Steel pipe.
5. Sleeves for Piping Passing through Exterior Concrete Walls:

    a. Steel pipe sleeves for pipes smaller than NPS 6.
    b. Cast-iron wall pipe sleeves for pipes NPS 6 and larger.
    c. Install sleeves that are large enough to provide 1-inch (25-mm) annular clear space between sleeve and pipe or pipe insulation when sleeve seals are used.
    d. Do not use sleeves when wall penetration systems are used.

6. Sleeves for Piping Passing through Interior Concrete Walls:

    a. Steel pipe sleeves for pipes smaller than NPS 6.
    b. Galvanized-steel sheet sleeves for pipes NPS 6 and larger.

M. Fire-Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with firestop materials. Comply with requirements in Section 078413 "Firestops and Smokeseals" for firestop materials and installations.

3.14. SLEEVE SEAL INSTALLATION

A. Install sleeve seals in sleeves in exterior concrete walls at water-service piping entries into building.

B. Select type and number of sealing elements required for pipe material and size. Position pipe in center of sleeve. Assemble sleeve seal components and install in annular space between pipe and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

3.15. WALL PENETRATION SYSTEM INSTALLATION

A. Install wall penetration systems in new, exterior concrete walls.

B. Assemble wall penetration system components with sleeve pipe. Install so that end of sleeve pipe and face of housing are flush with wall. Adjust locking devices to secure sleeve pipe in housing.

3.16. IDENTIFICATION

A. Identify system components. Comply with requirements in Section 220553 "Identification for Plumbing Piping and Equipment" for identification materials and installation.

B. Label pressure piping with system operating pressure.

3.17. FIELD QUALITY CONTROL

A. Contractor shall Perform tests and inspections.

B. Piping Inspections:

1. Do not enclose, cover, or put piping into operation until it has been inspected and approved by Commissioner.
2. During installation, notify Commissioner at least one day before inspection must be made. Perform tests specified below in presence of Commissioner:
    a. Roughing-in Inspection: Arrange for inspection of piping before concealing or closing-in after roughing-in and before setting fixtures.
    b. Final Inspection: Arrange final inspection for Commissioner to observe tests specified below and to ensure compliance with requirements.
3. Reinspection: If Commissioner finds that piping will not pass tests or inspections, make required corrections and arrange for reinspection.
4. Reports: Prepare inspection reports and have them signed by Commissioner.

C. Piping Tests:

1. Fill domestic water piping. Check components to determine that they are not air bound and that piping is full of water.
2. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or restoreed. If testing is performed in segments, submit a separate report for each test, complete with diagram of portion of piping tested.
3. Leave new, altered, extended, or replaced domestic water piping uncovered and unconcealed until it has been tested and approved. Expose work that was covered or concealed before it was tested.
4. Cap and subject piping to static water pressure of 50 psig above operating pressure, without exceeding pressure rating of piping system materials but not less than 150 psig . Isolate test source and allow to stand for four hours. Leaks and loss in test pressure constitute defects that must be restoreed.

5. Restore leaks and defects with new materials and retest piping or portion thereof until satisfactory results are obtained.
6. Prepare reports for tests and for corrective action required.

D. Domestic water piping will be considered defective if it does not pass tests and inspections.

E. Prepare test and inspection reports.

3.18. ADJUSTING

A. Perform the following adjustments before operation:

1. Close drain valves, hydrants, and hose bibbs.
2. Open shutoff valves to fully open position.
3. Open throttling valves to proper setting.
4. Adjust balancing valves in hot-water-circulation return piping to provide adequate flow.
    a. Manually adjust ball-type balancing valves in hot-water-circulation return piping to provide flow of hot water in each branch.
    b. Adjust calibrated balancing valves to flows indicated.
5. Remove plugs used during testing of piping and for temporary sealing of piping during installation.
6. Remove and clean strainer screens. Close drain valves and replace drain plugs.
7. Remove filter cartridges from housings and verify that cartridges are as specified for application where used and are clean and ready for use.
8. Check plumbing specialties and verify proper settings, adjustments, and operation.

3.19. CLEANING

A. Clean and disinfect potable and non-potable domestic water piping as follows:

1. Purge new piping and parts of existing piping that have been altered, extended, or restoreed before using.
2. Use purging and disinfecting procedures prescribed by Commissioner; if methods are not prescribed, use procedures described in either AWWA C651 or AWWA C652:

B. Clean non-potable domestic water piping as follows:

1. Purge new piping and parts of existing piping that have been altered, extended, or restoreed before using.
2. Use purging procedures prescribed by Commissioner or; if methods are not prescribed, follow procedures described below:
    a. Flush piping system with clean, potable water until dirty water does not appear at outlets.
    b. Submit water samples in sterile bottles to Commissioner. Repeat procedures if biological examination shows contamination.

C. Prepare and submit reports of purging and disinfecting activities.

D. Clean interior of domestic water piping system. Remove dirt and debris as work progresses.

3.20. PIPING SCHEDULE

A. Transition and special fittings with pressure ratings at least equal to piping rating may be used in applications below unless otherwise indicated.

B. Flanges and unions may be used for aboveground piping joints unless otherwise indicated.

C. Fitting Option: Extruded-tee connections and brazed joints may be used on aboveground copper tubing.

D. Under-building-slab, domestic water, building service piping, NPS 3 (DN 80) and smaller shall be the following:

1. Soft copper tube, ASTM B 88, Type K wrought-copper solder-joint fittings; and brazed joints.

E. Under-building-slab, domestic water, building-service piping, NPS 4 to NPS 8 and larger shall be the following:

1. Soft copper tube, ASTM B 88, Type K; wrought-copper solder-joint fittings; and brazed joints.

F. Under-building-slab, domestic water piping, NPS 2 and smaller, shall be the following:

1. Hard copper tube, ASTM B 88, Type L wrought-copper solder-joint fittings; and brazed joints.

G. Aboveground domestic water piping, NPS 2 and smaller, shall be the following:

1. Hard copper tube, ASTM B 88, Type L cast-or wrought- copper solder-joint fittings; and soldered joints.

H. Aboveground domestic water piping, NPS 2-1/2 to NPS 4, shall be one of the following:

1. Hard copper tube, ASTM B 88, Type L cast- or wrought- copper solder-joint fittings; and soldered joints.
2. Hard copper tube, ASTM B 88, Type L grooved-joint copper-tube appurtenances; and grooved joints.

I. Aboveground domestic water piping, NPS 5 to NPS 8, shall be one of the following:

1. Hard copper tube, ASTM B 88, Type L cast- or wrought- copper solder-joint fittings; and brazed joints.
2. Hard copper tube, ASTM B 88, Type L; grooved-joint copper-tube appurtenances; and grooved joints.

3.21. VALVE SCHEDULE

A. Drawings indicate valve types to be used. Where specific valve types are not indicated, the following requirements apply:

1. Shutoff Duty: Use ball or gate valves for piping NPS 2 and smaller. Use butterfly, ball, or gate valves with flanged ends for piping NPS 2-1/2 and larger.
2. Throttling Duty: Use ball or globe valves for piping NPS 2 and smaller. Use butterfly or ball valves with flanged ends for piping NPS 2-1/2 and larger.
3. Hot-Water Circulation Piping, Balancing Duty: Calibrated balancing valves.
4. Drain Duty: Hose-end drain valves.

B. Use check valves to maintain correct direction of domestic water flow to and from equipment.

C. Iron grooved-end valves may be used with grooved-end piping.

END OF SECTION 221116

SECTION 221119
Domestic Water Piping Specialties

PART 1 - GENERAL

1.1. RELATED DOCUMENTS

A. The following documents apply to all required work for the Project: (1) the Contract Drawings, (2) the Specifications, (3) the General Conditions, (4) the Addendum and (5) the Contract (City of New York Standard Construction Contract).

B. LEED General Requirements.

1. Refer to DDC General Conditions.

a. Section 01 81 13.04 "Sustainable Design Requirements for LEED v4 Buildings."

1.2. SUMMARY

A. This Section includes the following domestic water piping specialties:

1. Vacuum breakers.
2. Backflow preventers.
3. Balancing valves.
4. Temperature-actuated water mixing valves.
5. Strainers.
6. Outlet boxes.
7. Hose stations.
8. Hose bibs.
9. Wall hydrants.
10. Drain valves.
11. Water hammer arresters.
12. Air vents.

B. Related Sections include the following:

1. Section 220500 "Common Work Results for Plumbing" for piping joining materials, joint construction, and basic installation requirements.

2. Section 220519 "Meters and Gages for Plumbing Piping" for thermometers, pressure gages, and flow meters in domestic water piping.

3. Section 220553 "Identification for Plumbing Piping Equipment" for nameplates and signs.
4. Section 221116 "Domestic Water Piping" for water meters.
5. Section 260519 "Low-Voltage Electrical Power Conductors and Cables" for wire connections.
6. Section 260526 "Grounding and Bonding for Electrical Systems" for ground equipment.

1.3. PERFORMANCE REQUIREMENTS

A. Minimum Working Pressure for Domestic Water Piping Specialties: 125 psig, unless otherwise indicated.

1.4. SUBMITTALS

A. Refer to DDC General Conditions Section 01 33 00 "Submittal Procedures."

B. Product Data: For each type of product indicated.

C. Shop Drawings: Diagram power, signal, and control wiring.

D. Field quality-control test reports.

E. Operation and Maintenance Data: For domestic water piping specialties to include in emergency, operation, and maintenance manuals.

1.5. QUALITY ASSURANCE

A. Refer to DDC General Conditions Section 01 40 00 "Quality Requirements."

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to the Commissioner, and marked for intended use.

C. NSF Compliance:

1. Comply with NSF 14, "Plastics Piping Components and Related Materials," for plastic domestic water piping components.
2. Comply with NSF 61, "Drinking Water System Components - Health Effects; Sections 1 through 9."

D. Materials and work shall conform to applicable codes and requirements of NYC Department of Buildings.

PART 2 - PRODUCTS

2.1. VACUUM BREAKERS

A. Pipe-Applied, Atmospheric-Type Vacuum Breakers :

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Ames Co.
b. Cash Acme.
c. Conbraco Industries, Inc.
d. FEBCO; SPX Valves & Controls.

e. Rain Bird Corporation.
f. Toro Company (The); Irrigation Div.
g. Watts Industries, Inc.; Water Products Div.
h. Zurn Plumbing Products Group; Wilkins Div.
i. Or Approved Equal

2. Standard: ASSE 1001.
3. Size: NPS 1/4 to NPS 3, as required to match connected piping.
4. Body: Bronze.
5. Inlet and Outlet Connections: Threaded.
6. Finish: Chrome plated.

B. Hose-Connection Vacuum Breakers :

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Arrowhead Brass Products, Inc.
b. Cash Acme.
c. Conbraco Industries, Inc.
d. Legend Valve.
e. MIFAB, Inc.
f. Prier Products, Inc.
g. Watts Industries, Inc.; Water Products Div.
h. Woodford Manufacturing Company.
i. Zurn Plumbing Products Group; Light Commercial Operation.
j. Zurn Plumbing Products Group; Wilkins Div.
k. Or Approved Equal

2. Standard: ASSE 1011.
3. Body: Bronze, nonremovable, with manual drain.
4. Outlet Connection: Garden-hose threaded complying with ASME B1.20.7.
5. Finish: Chrome or nickel plated.

C. Pressure Vacuum Breakers:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Ames Co.
b. Conbraco Industries, Inc.
c. FEBCO; SPX Valves & Controls.
d. Flomatic Corporation.
e. Toro Company (The); Irrigation Div.
f. Watts Industries, Inc.; Water Products Div.
g. Zurn Plumbing Products Group; Wilkins Div.
h. Or Approved Equal

2. Standard: ASSE 1020.
3. Operation: Continuous-pressure applications.

4. Pressure Loss: 5 psig maximum, through middle 1/3 of flow range.
5. Accessories:

    a. Valves: Ball type, on inlet and outlet.

2.2. BACKFLOW PREVENTERS

A. Reduced Pressure Principle Assembly:

1. Standard: ASSE 1015 and NYC MEA
2. Operation: Continuous-pressure applications, unless otherwise indicated.
3. Pressure Loss: 5 psig maximum, through middle 1/3 of flow range.
4. Body: Stainless Steel.
5. End Connections: flanged.
6. Configuration: Designed for horizontal, straight through flow.
7. Accessories:

    a. Valves: with grooved end butterfly valves with integral supervisory switches.

B. Double-Check, Detector-Assembly Backflow Preventers:

1. Standard: ASSE 1048 and FMG approved UL listed and NYC MEA.
2. Operation: Continuous-pressure applications.
3. Pressure Loss: 5 psig maximum, through middle 1/3 of flow range.
4. Body: 304 (Schedule 40) Stainless Steel.
5. End Connections: Flanged.
6. Configuration: Designed for horizontal, straight through flow.
7. Accessories:

    a. Valves: Outside screw and yoke gate-type with flanged ends on inlet and outlet.
    b. Bypass: With displacement-type water meter, shutoff valves, and reduced-pressure backflow preventer.

2.3. BALANCING VALVES

A. Copper-Alloy Calibrated Balancing Valves :

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Armstrong International, Inc.
    b. Flo Fab Inc.
    c. ITT Industries; Bell & Gossett Div.
    d. NIBCO INC.
    e. TAC Americas.
    f. Taco, Inc.
    g. Watts Industries, Inc.; Water Products Div.
    h. Or Approved Equal

2. Type: Y-pattern globe valve with two readout ports and memory setting indicator.

3. Body: Brass or bronze
4. Size: Same as connected piping, but not larger than NPS 2.
5. Accessories: Meter hoses, fittings, valves, differential pressure meter, and carrying case.

B. Cast-Iron Calibrated Balancing Valves :

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. Armstrong International, Inc.
   b. Flo Fab Inc.
   c. ITT Industries; Bell & Gossett Div.
   d. NIBCO INC.
   e. TAC Americas.
   f. Watts Industries, Inc.; Water Products Div.
   g. Or Approved Equal

2. Type: Adjustable with Y-pattern globe valve, two readout ports, and memory-setting indicator.
3. Size: Same as connected piping, but not smaller than NPS 2-1/2.

C. Accessories: Meter hoses, fittings, valves, differential pressure meter, and carrying case.

D. Memory-Stop Balancing Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. Conbraco Industries, Inc.
   b. Crane Co.; Crane Valve Group; Crane Valves.
   c. Crane Co.; Crane Valve Group; Jenkins Valves.
   d. Crane Co.; Crane Valve Group; Stockham Div.
   e. Hammond Valve.
   f. Milwaukee Valve Company.
   g. NIBCO INC.
   h. Red-White Valve Corp.
   i. Or Approved Equal

2. Standard: MSS SP-110 for two-piece, copper-alloy ball valves.
3. Pressure Rating: 400-psig minimum CWP.
4. Size: NPS 2 or smaller.
5. Body: Copper alloy.
6. Port: Standard or full port.
7. Ball: Chrome-plated brass.
8. Seats and Seals: Replaceable.
9. End Connections: Solder joint or threaded.
10. Handle: Vinyl-covered steel with memory-setting device.

2.4. TEMPERATURE-ACTUATED WATER MIXING VALVES

A. Primary, Thermostatic, Water Mixing Valves :

1. Basis-of-Design Product: Subject to compliance with requirements, provide T.A.C TAHP #7 or a comparable product by one of the following:

   a. Armstrong International, Inc.
   b. Lawler Manufacturing Company, Inc.
   c. Leonard Valve Company.
   d. Powers; a Watts Industries Co.
   e. Symmons Industries, Inc.
   f. Or Approved Equal

2. Standard: ASSE 1017.
3. Pressure Rating: 125 psig .
4. Type: Exposed-mounting electronically controlled water mixing valve.
5. Material: Bronze body with corrosion-resistant interior components.
6. Connections: Threaded inlets and outlet.
7. Accessories: Manual temperature control, check stops on hot- and cold-water supplies, and adjustable, temperature-control handle.
8. Valve Pressure Rating: 125 psig minimum, unless otherwise indicated.
9. Tempered-Water Setting: 110 deg. F
10. Tempered-Water Design Flow Rate: 45 gpm (max. 64).
11. Selected Valve Flow Rate at 45-psig (310-kPa)
12. Pressure Drop at Design Flow Rate: 1 psig.
13. Valve Finish: Rough bronze.
14. Piping Finish: Copper.

2.5. STRAINERS FOR DOMESTIC WATER PIPING

A. Y-Pattern Strainers :

1. Pressure Rating: 125 psig minimum, unless otherwise indicated.
2. Body: Bronze for NPS 2 and smaller; cast iron with interior lining complying with AWWA C550 or FDA-approved, epoxy coating and for NPS 2-1/2 and larger.
3. End Connections: Threaded for NPS 2 and smaller; flanged for NPS 2-1/2 and larger.
4. Screen: Stainless steel with round perforations, unless otherwise indicated.
5. Perforation Size:

   a. Strainers NPS 2 and Smaller: 0.020 inch (0.51 mm) 0.033 inch (0.84 mm) 0.062 inch (1.57 mm).
   b. Strainers NPS 2-1/2 to NPS 4: 0.045 inch (1.14 mm) 0.062 inch (1.57 mm) 0.125 inch (3.18 mm).
   c. Strainers NPS 5 (DN 125) and Larger: 0.10 inch (2.54 mm) 0.125 inch (3.18 mm) 0.25 inch (6.35 mm).

6. Drain: Pipe plug Factory-installed, hose-end drain valve.

2.6. HOSE BIBBS

A. Hose Bibbs :

1. Standard: ASME A112.18.1 for sediment faucets.
2. Body Material: Bronze.
3. Seat: Bronze, replaceable.
4. Supply Connections: NPS 3/4 threaded or solder-joint inlet.
5. Outlet Connection: Garden-hose thread complying with ASME B1.20.7.
6. Pressure Rating: 125 psig.
7. Vacuum Breaker: Integral nonremovable, drainable, hose-connection vacuum breaker complying with ASSE 1011.
8. Finish for Equipment Rooms: Rough bronze, or chrome or nickel plated.
9. Finish for Service Areas: Chrome or nickel plated.
10. Finish for Finished Rooms: Chrome or nickel plated.
11. Operation for Equipment Rooms: Wheel handle or operating key.
12. Operation for Service Areas: Wheel handle.
13. Operation for Finished Rooms: Operating key.
14. Include operating key with each operating-key hose bibb.
15. Include integral wall flange with each chrome- or nickel-plated hose bibb.

2.7. WALL HYDRANTS

A. Nonfreeze Wall Hydrants :

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Josam Company.
   b. MIFAB, Inc.
   c. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
   d. Zurn Plumbing Products Group.
   e. Or Approved Equal
2. Standard: ASME A112.21.3M for concealed-outlet, self-draining wall hydrants.
3. Pressure Rating: 125 psig (860 kPa).
4. Operation: Loose key.
5. Casing and Operating Rod: Of length required to match wall thickness. Include wall clamp.
6. Inlet: NPS 3/4 .
7. Outlet: Concealed, with integral vacuum breaker and garden-hose thread complying with ASME B1.20.7.
8. Box: Deep, flush mounting with cover.
9. Box and Cover Finish: Polished nickel bronze.
10. Outlet: Exposed, with integral vacuum breaker and garden-hose thread complying with ASME B1.20.7.
11. Nozzle and Wall-Plate Finish: Polished nickel bronze.
12. Operating Keys(s): One with each wall hydrant.

B. Nonfreeze, Hot- and Cold-Water Wall Hydrants:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. Josam Company.
   b. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
   c. Zurn Plumbing Products Group.
   d. Or Approved Equal

2. Standard: ASME A112.21.3M for concealed-outlet, self-draining wall hydrants.
3. Pressure Rating: 125 psig.
4. Operation: Loose key.
5. Casings and Operating Rods: Of length required to match wall thickness. Include wall clamps.
6. Inlets: NPS 3/4.
7. Outlet: Concealed.
8. Box: Deep, flush mounting with cover.
9. Box and Cover Finish: Polished nickel bronze.
10. Vacuum Breaker: Nonremovable, manual-drain-type, hose-connection vacuum breaker complying with ASSE 1011 and with garden-hose thread complying with ASME B1.20.7 on outlet.
11. Operating Keys(s): One with each wall hydrant.

C. Vacuum Breaker Wall Hydrants :

1. Standard: ASSE 1019, Type A or Type B.
2. Type: Freeze-resistant, automatic draining with integral air-inlet valve.
3. Classification: Type B, for automatic draining with hose removed or with hose attached and nozzle closed.
4. Pressure Rating: 125 psig.
5. Operation: Loose key or wheel handle.
6. Casing and Operating Rod: Of length required to match wall thickness. Include wall clamp.
7. Inlet: NPS 3/4.
8. Outlet: Exposed with garden-hose thread complying with ASME B1.20.7.

2.8. DRAIN VALVES

A. Ball-Valve-Type, Hose-End Drain Valves :

1. Standard: MSS SP-110 for standard-port, two-piece ball valves.
2. Pressure Rating: 400-psig minimum CWP.
3. Size: NPS 3/4.
4. Body: Copper alloy.
5. Ball: Chrome-plated brass.
6. Seats and Seals: Replaceable.
7. Handle: Vinyl-covered steel.
8. Inlet: Threaded or solder joint.
9. Outlet: Threaded, short nipple with garden-hose thread complying with ASME B1.20.7 and cap with brass chain.

B. Gate-Valve-Type, Hose-End Drain Valves :

1. Standard: MSS SP-80 for gate valves.

2. Pressure Rating: Class 125.
3. Size: NPS 3/4.
4. Body: ASTM B 62 bronze.
5. Inlet: NPS 3/4 threaded or solder joint.
6. Outlet: Garden-hose thread complying with ASME B1.20.7 and cap with brass chain.

C. Stop-and-Waste Drain Valves :

1. Standard: MSS SP-110 for ball valves or MSS SP-80 for gate valves.
2. Pressure Rating: 200-psig minimum CWP or Class 125.
3. Size: NPS 3/4.
4. Body: Copper alloy or ASTM B 62 bronze.
5. Drain: NPS 1/8 side outlet with cap.

2.9. WATER HAMMER ARRESTERS

A. Water Hammer Arresters :

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. AMTROL, Inc.
b. Josam Company.
c. MIFAB, Inc.
d. Sioux Chief Manufacturing Company, Inc.
e. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
f. Tyler Pipe; Wade Div.
g. Watts Drainage Products Inc.
h. Zurn Plumbing Products Group; Specification Drainage Operation.
i. Or Approved Equal

2. Standard: ASSE 1010 or PDI-WH 201.
3. Type: Copper tube with piston.
4. Size: ASSE 1010, Sizes AA and A through F or PDI-WH 201, Sizes A through F.

2.10. AIR VENTS

A. Bolted-Construction Automatic Air Vents :

1. Body: Bronze.
2. Pressure Rating: 125-psig minimum pressure rating at 140 deg F.
3. Float: Replaceable, corrosion-resistant metal.
4. Mechanism and Seat: Stainless steel.
5. Size: NPS 1/2 minimum inlet.
6. Inlet and Vent Outlet End Connections: Threaded.

B. Welded-Construction Automatic Air Vents :

1. Body: Stainless steel.

2. Pressure Rating: 150-psig minimum pressure rating.
3. Float: Replaceable, corrosion-resistant metal.
4. Mechanism and Seat: Stainless steel.
5. Size: NPS 3/8 minimum inlet.
6. Inlet and Vent Outlet End Connections: Threaded.

PART 3 - EXECUTION

3.1. EXECUTION REQUIREMENTS

A. Refer to DDC General Conditions for execution requirements.

3.2. INSTALLATION

A. Install backflow preventers in each water supply to mechanical equipment and systems and to other equipment and water systems that may be sources of contamination. Comply with NYC Department of Buildings.

1. Locate backflow preventers in same room as connected equipment or system.
2. Install drain for backflow preventers with atmospheric-vent drain connection with air-gap fitting, fixed air-gap fitting, or equivalent positive pipe separation of at least two pipe diameters in drain piping and pipe to floor drain. Locate air-gap device attached to or under backflow preventer. Simple air breaks are not acceptable for this application.
3. Do not install bypass piping around backflow preventers.

B. Install water regulators with inlet and outlet shutoff valves. Install pressure gages on inlet and outlet.

C. Install water control valves with inlet and outlet shutoff valves . Install pressure gages on inlet and outlet.

D. Install balancing valves in locations where they can easily be adjusted.

E. Install temperature-actuated water mixing valves with check stops or shutoff valves on inlets and with shutoff valve on outlet.

1. Install thermometers and water regulators if specified.
2. Install cabinet-type units recessed in or surface mounted on wall as specified.

F. Install Y-pattern strainers for water on supply side of each control valve, water pressure-reducing valve, solenoid valve, and pump.

G. Install water hammer arresters in water piping according to PDI-WH 201 and New York City Plumbing Code.

H. Install air vents at high points of water piping.

3.3. CONNECTIONS

A. Piping installation requirements are specified in other plumbing specification sections. Drawings indicate general arrangement of piping and specialties.

3.4. LABELING AND IDENTIFYING

A. Equipment Nameplates and Signs: Install engraved plastic-laminate equipment nameplate or sign on or near each of the following:

1. Double-check backflow-prevention assemblies.
2. Double-check, detector-assembly backflow preventers.
3. Calibrated balancing valves.
4. Primary, thermostatic, water mixing valves.
5. Primary water tempering valves.

3.5. FIELD QUALITY CONTROL

A. Perform the following tests and prepare test reports:

1. Test each pressure vacuum breaker double-check backflow-prevention assembly and double-check, detector-assembly backflow preventer according to NYC Department of Buildings and the device's reference standard.

B. Remove and replace malfunctioning domestic water piping specialties and retest as specified above.

3.6. ADJUSTING

A. Set field-adjustable pressure set points of water pressure-reducing valves.

B. Set field-adjustable flow set points of balancing valves.

C. Set field-adjustable temperature set points of temperature-actuated water mixing valves.

END OF SECTION 221119

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SECTION 221316
Sanitary Waste and Vent Piping

PART 1 - GENERAL

1.1. RELATED DOCUMENTS

A. The following documents apply to all required work for the Project: (1) the Contract Drawings, (2) the Specifications, (3) the General Conditions, (4) the Addendum and (5) the Contract (City of New York Standard Construction Contract).

B. LEED General Requirements.

1. Refer to DDC General Conditions.

a. Section 01 81 13.04 "Sustainable Design Requirements for LEED v4 Buildings."

1.2. SUMMARY

A. This Section includes the following for soil, waste, and vent piping inside the building:

1. Pipe, tube, and fittings.

1.3. DEFINITIONS

A. EPDM: Ethylene-propylene-diene terpolymer rubber.

B. NBR: Acrylonitrile-butadiene rubber.

1.4. PERFORMANCE REQUIREMENTS

A. Components and installation shall be capable of withstanding the following minimum working pressure, unless otherwise indicated:

1. Soil, Waste, and Vent Piping: 25-foot head of water.

B. Seismic Performance: Soil, waste, and vent piping and support and installation shall be capable of withstanding the effects of seismic events determined according New York City Building Code

1.5. SUBMITTALS

A. Refer to DDC General Conditions Section 01 33 00 "Submittal Procedures."

B. Product Data: For pipe, tube, fittings, and couplings.

B. Product Data: For pipe, tube, fittings, and couplings.

C. Field quality-control inspection and test reports.

1.6. QUALITY ASSURANCE

A. Refer to DDC General Conditions Section 01 40 00 "Quality Requirements."

B. Piping materials shall bear label, stamp, or other markings of specified testing agency.

C. Materials and work shall conform to the latest edition of reference specifications specified herein and to applicable codes and requirements of NYC Department of Buildings.

PART 2 - PRODUCTS

2.1. PIPING MATERIALS

A. Refer to Part 3 "Piping Applications" Article for applications of pipe, tube, fitting, and joining materials.

2.2. HUB-AND-SPIGOT, CAST-IRON SOIL PIPE AND FITTINGS

A. Pipe and Fittings: ASTM A 74, Service and Extra-Heavy class(es).

B. Gaskets: ASTM C 564, rubber.

C. Calking Materials: ASTM B 29, pure lead and oakum or hemp fiber.

2.3. HUBLESS CAST-IRON SOIL PIPE AND FITTINGS

A. Pipe and Fittings: ASTM A 888 or CISPI 301.

B. Shielded Couplings: ASTM C 1277 assembly of metal shield or housing, corrosion-resistant fasteners, and rubber sleeve with integral, center pipe stop.

1. Standard, Shielded, Stainless-Steel Couplings: CISPI 310, with stainless-steel corrugated shield; stainless-steel bands and tightening devices; and ASTM C 564, rubber sleeve.

a. Manufacturers:

1) ANACO.
2) Fernco, Inc.
3) Ideal Div.; Stant Corp.
4) Mission Rubber Co.
5) Tyler Pipe; Soil Pipe Div.
6) Or Approved Equal

2. Heavy-Duty, Shielded, Stainless-Steel Couplings: With stainless-steel shield, stainless-steel bands and tightening devices, and ASTM C 564, rubber sleeve.

   a. Manufacturers:

      1) ANACO.
      2) Clamp-All Corp.
      3) Ideal Div.; Stant Corp.
      4) Mission Rubber Co.
      5) Tyler Pipe; Soil Pipe Div.
      6) Or Approved Equal

3. Heavy-Duty, Shielded, Cast-Iron Couplings: ASTM A 48/A 48M, two-piece, cast-iron housing; stainless-steel bolts and nuts; and ASTM C 564, rubber sleeve.

C. Rigid, Unshielded Couplings: ASTM C 1461, sleeve-type, reducing- or transition-type mechanical coupling molded from ASTM C 1440, TPE material with corrosion-resistant-metal tension band and tightening mechanism on each end.

PART 3 - EXECUTION

3.1. EXECUTION REQUIREMENTS

A. Refer to DDC General Conditions for execution requirements.

3.2. EXCAVATION

A. Refer to Section 310000 "Earthwork" for excavating, trenching, and backfilling.

3.3. PIPING APPLICATIONS

A. Flanges and unions may be used on aboveground pressure piping, unless otherwise indicated.

B. Aboveground, soil and waste piping 10 inches and smaller shall be the following:

1. Hubless cast-iron soil pipe and fittings; standard, shielded, stainless-steel couplings; and hubless-coupling joints.

C. Aboveground, vent piping 10 inches and smaller shall be the following:

1. Hubless cast-iron soil pipe and fittings; standard, shielded, stainless-steel couplings; and hubless-coupling joints.

D. Underground, soil, waste, and vent piping shall be the following:

1. Service class, cast-iron soil piping; gaskets; and gasketed joints.

3.4. PIPING INSTALLATION

A. Basic piping installation requirements are specified in Section 220500 "Common Work Results for Plumbing."

B. Install cleanouts at grade and extend to where building sanitary drains connect to building sanitary sewers.

C. Install cleanout fitting with closure plug inside the building in sanitary force-main piping.

D. Install underground, ductile-iron, special pipe fittings according to AWWA C600.

1. Install encasement on piping according to ASTM A 674 or AWWA C105.

E. Install cast-iron sleeve with water stop and mechanical sleeve seal at each service pipe penetration through foundation wall. Select number of interlocking rubber links required to make installation watertight. Sleeves and mechanical sleeve seals are specified in Section 220500 "Common Work Results for Plumbing."

F. Install cast-iron soil piping according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook," Chapter IV, "Installation of Cast Iron Soil Pipe and Fittings."

1. Install encasement on underground piping according to ASTM A 674 or AWWA C105.

G. Make changes in direction for soil and waste drainage and vent piping using appropriate branches, bends, and long-sweep bends. Sanitary tees and short-sweep 1/4 bends may be used on vertical stacks if change in direction of flow is from horizontal to vertical. Use long-turn, double Y-branch and 1/8-bend fittings if 2 fixtures are installed back to back or side by side with common drain pipe. Straight tees, elbows, and crosses may be used on vent lines. Do not change direction of flow more than 90 degrees. Use proper size of standard increasers and reducers if pipes of different sizes are connected. Reducing size of drainage piping in direction of flow is prohibited.

H. Lay buried building drainage piping beginning at low point of each system. Install true to grades and alignment indicated, with unbroken continuity of invert. Place hub ends of piping upstream. Install required gaskets according to manufacturer's written instructions for use of lubricants, cements, and other installation requirements. Maintain swab in piping and pull past each joint as completed.

I. Install soil and waste drainage and vent piping at the following minimum slopes, unless otherwise indicated:

1. Building Sanitary Drain: 1/8 inch per 100ft downward in direction of flow for piping.
2. Horizontal Sanitary Drainage Piping: 1/8 inch per 100ft downward in direction of flow.
3. Vent Piping: 1 percent down toward vertical fixture vent or toward vent stack.

J. Sleeves are not required for cast-iron soil piping passing through concrete slabs-on-grade if slab is without membrane waterproofing.

K. Install ABS soil and waste drainage and vent piping according to ASTM D 2661.

L. Install PVC soil and waste drainage and vent piping according to ASTM D 2665.

M. Do not enclose, cover, or put piping into operation until it is inspected and approved by NYC Department of Buildings.

3.5. JOINT CONSTRUCTION

A. Basic piping joint construction requirements are specified in Section 220500 "Common Work Results for Plumbing."

B. Join hub-and-spigot, cast-iron soil piping with gasket joints according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for compression joints.

C. Join hub-and-spigot, cast-iron soil piping with calked joints according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for lead and oakum calked joints.

D. Join hubless cast-iron soil piping according to CISPI 310 and CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for hubless-coupling joints.

3.6. HANGER AND SUPPORT INSTALLATION

A. Pipe hangers and supports are specified in Section 220529 "Hangers and Supports for Plumbing Piping and Equipment." Install the following:

1. Vertical Piping: MSS Type 8 or Type 42, clamps.
2. Install individual, straight, horizontal piping runs according to the following:
    a. 100 Feet and Less: MSS Type 1, adjustable, steel clevis hangers.
    b. Longer Than 100 Feet: MSS Type 43, adjustable roller hangers.
    c. Longer Than 100 Feet, if Indicated: MSS Type 49, spring cushion rolls.
3. Multiple, Straight, Horizontal Piping Runs 100 Feet or Longer: MSS Type 44, pipe rolls. Support pipe rolls on trapeze.
4. Base of Vertical Piping: MSS Type 52, spring hangers.

B. Install supports according to Section 220529 "Hangers and Supports for Plumbing Piping and Equipment."

C. Support vertical piping and tubing at base and at each floor.

D. Rod diameter may be reduced 1 size for double-rod hangers, with 3/8-inch minimum rods.

E. Install hangers for cast-iron soil piping with the following maximum horizontal spacing and minimum rod diameters:

1. 1-1/2 and 2 inches: 60 inches with 3/8-inch rod.
2. 3 inches: 60 inches with 1/2-inch rod.
3. 4 and 5 inches: 60 inches with 5/8-inch rod.

4. 6 inches: 60 inches with 3/4-inch rod.
5. 8 to 12 inches: 60 inches with 7/8-inch rod.

F. Install supports for vertical cast-iron soil piping at base and every 15 feet.

G. Install hangers for steel piping with the following maximum horizontal spacing and minimum rod diameters:

1. 1-1/4 inches: 84 inches with 3/8-inch rod.
2. 1-1/2 inches: 108 inches with 3/8-inch rod.
3. 2 inches: 10 feet with 3/8-inch rod.
4. 2-1/2 inches: 11 feet with 1/2-inch rod.
5. 3 inches: 12 feet with 1/2-inch rod.
6. 4 and 5 inches: 12 feet with 5/8-inch rod.
7. 6 inches: 12 feet with 3/4-inch rod.
8. 8 to 12 inches: 12 feet with 7/8-inch rod.

H. Install supports for vertical steel piping every story .height

I. Support piping and tubing not listed above according to MSS SP-69 and manufacturer's written instructions.

3.7. CONNECTIONS

A. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Connect soil and waste piping to exterior sanitary sewerage piping. Use transition fitting to join dissimilar piping materials.

C. Connect drainage and vent piping to the following:

1. Plumbing Fixtures: Connect drainage piping in sizes indicated, but not smaller than required by plumbing code.
2. Plumbing Fixtures and Equipment: Connect atmospheric vent piping in sizes indicated, but not smaller than required by Commissioner.
3. Plumbing Specialties: Connect drainage and vent piping in sizes indicated, but not smaller than required by plumbing code.
4. Equipment: Connect drainage piping as indicated. Provide shutoff valve, if indicated, and union for each connection. Use flanges instead of unions for connections 2-1/2 inches and larger.

3.8. FIELD QUALITY CONTROL

A. During installation, Commissioner at least 24 hours before inspection must be made. Perform tests specified below in presence of Commissioner.

1. Roughing-in Inspection: Arrange for inspection of piping before concealing or closing-in after roughing-in and before setting fixtures.

2. Final Inspection: Arrange for final inspection by Commissioner to observe tests specified below and to ensure compliance with requirements.

B. Reinspection: If Commissioner find that piping will not pass test or inspection, make required corrections and arrange for reinspection.

C. Test sanitary drainage and vent piping according to procedures of Commissioner.

3.9. CLEANING

A. Clean interior of piping. Remove dirt and debris as work progresses.

B. Protect drains during remainder of construction period to avoid clogging with dirt and debris and to prevent damage from traffic and construction work.

C. Place plugs in ends of uncompleted piping at end of day and when work stops.

END OF SECTION 221316

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SECTION 221413
Facility Storm Drainage Piping

PART 1 - GENERAL

1.1. RELATED DOCUMENTS

A. The following documents apply to all required work for the Project: (1) the Contract Drawings, (2) the Specifications, (3) the General Conditions, (4) the Addendum and (5) the Contract (City of New York Standard Construction Contract).

B. LEED General Requirements:

1. Refer to DDC General Conditions.

a. Section 01 81 13.04 "Sustainable Design Requirements for LEED v4 Buildings."

1.2. SUMMARY

A. This Section includes the following storm drainage piping inside the building:

1. Pipe, tube, and fittings.
2. Special pipe fittings.
3. Encasement for underground metal piping.

1.3. PERFORMANCE REQUIREMENTS

A. Components and installation shall be capable of withstanding the following minimum working-pressure, unless otherwise indicated:

1. Storm Drainage Piping: 25-foot head of water.

B. Seismic Performance: Soil, waste, and vent piping and support and installation shall be capable of withstanding the effects of seismic events determined according to New York City Building Code.

1.4. SUBMITTALS

A. Refer to DDC General Conditions Section 01 33 00 "Submittal Procedures."

B. Product Data: For pipe, tube, fittings, and couplings.

C. Shop Drawings:

1. Piping layouts for all piping systems drawn at same scale as ductwork shop drawings; where such piping is completely shown on coordination drawings, separate piping shop drawings for the same area or areas are not required.

2. Piping shop drawings shall show all hangers and supports (type and location), fittings, valves, strainers and accessories. They shall show all sections necessary to establish pipe elevations, shall identify hanger types and loads, and show all tie-ins to HVAC piping, all equipment underground piping, support equipment, and all miscellaneous accessories

D. Field quality-control inspection and test reports.

1.5. QUALITY ASSURANCE

A. Refer to DDC General Conditions Section 01 40 00 "Quality Requirements."

B. Materials and work shall conform to applicable codes and requirements of NYC Department of Buildings.

C. Piping materials shall bear label, stamp, or other markings of specified testing agency.

PART 2 - PRODUCTS

2.1. PIPING MATERIALS

A. Refer to Part 3 "Piping Applications" Article for applications of pipe, tube, fitting, and joining materials.

2.2. HUB-AND-SPIGOT, CAST-IRON SOIL PIPE AND FITTINGS

A. Pipe and Fittings: ASTM A 74, Service and Extra-Heavy class(es).

B. Gaskets: ASTM C 564, rubber.

C. Calking Materials: ASTM B 29, pure lead and oakum or hemp fiber.

2.3. HUBLESS CAST-IRON SOIL PIPE AND FITTINGS

A. Pipe and Fittings: ASTM A 888 or CISPI 301.

B. Shielded Couplings: ASTM C 1277 assembly of metal shield or housing, corrosion-resistant fasteners, and rubber sleeve with integral, center pipe stop.

C. Rigid, Unshielded Couplings: ASTM C 1461, sleeve-type, reducing- or transition-type mechanical coupling molded from ASTM C 1440, TPE material with corrosion-resistant-metal tension band and tightening mechanism on each end.

PART 3 - EXECUTION

3.1. EXECUTION REQUIREMENTS

A. Refer to DDC General Conditions for execution requirements.

3.2. EXCAVATION

A. Refer to Section 310000 "Earthwork" for excavating, trenching, and backfilling.

3.3. PIPING APPLICATIONS

A. Flanges and unions may be used on aboveground pressure piping, unless otherwise indicated.

B. Aboveground, storm drainage piping 3 inches to 10 inches shall be the following:

1. Hubless cast-iron soil pipe and fittings; standard, and heavy-duty shielded, stainless-steel couplings; and coupled joints.

C. Underground storm drainage piping all sizes shall be the following:

1. Service class, cast-iron soil pipe and fittings; gaskets; and gasketed joints.

3.4. PIPING INSTALLATION

A. Storm sewer and drainage piping outside the building are specified in Section 334100 "Storm Utility Drainage Piping."

B. Basic piping installation requirements are specified in Section 220500 "Common Work Results for Plumbing."

C. Install seismic restraints on piping.

D. Install cleanouts at grade and extend to where building storm drains connect to building storm sewers. Cleanouts are specified in Section 221423 "Storm Drainage Piping Specialties."

E. Install cleanout fitting with closure plug inside the building in storm drainage force-main piping.

F. Install cast-iron sleeve with water stop and mechanical sleeve seal at each service pipe penetration through foundation wall. Select number of interlocking rubber links required to make installation watertight. Sleeves and mechanical sleeve seals are specified in Section 220500 "Common Work Results for Plumbing."

G. Install cast-iron soil piping according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook," Chapter IV, "Installation of Cast Iron Soil Pipe and Fittings."

1. Install encasement on underground piping according to ASTM A 674 or AWWA C105.

H. Make changes in direction for storm drainage piping using appropriate branches, bends, and long-sweep bends. Do not change direction of flow more than 90 degrees. Use proper size of standard increasers and reducers if pipes of different sizes are connected. Reducing size of drainage piping in direction of flow is prohibited.

I. Lay buried building storm drainage piping beginning at low point of each system. Install true to grades and alignment indicated, with unbroken continuity of invert. Place hub ends of piping upstream. Install required gaskets according to manufacturer's written instructions for use of lubricants, cements, and other installation requirements. Maintain swab in piping and pull past each joint as completed.

J. Install storm drainage piping at the following minimum slopes, unless otherwise indicated:

1. Building Storm Drain: 1 percent downward in direction of flow
2. Horizontal Storm-Drainage Piping: 1 percent downward in direction of flow.

K. Install engineered controlled-flow storm drainage piping in locations indicated.

L. Sleeves are not required for cast-iron soil piping passing through concrete slabs-on-grade if slab is without membrane waterproofing.

M. Do not enclose, cover, or put piping into operation until it is inspected and approved by NYC Department of Buildings.

3.5. JOINT CONSTRUCTION

A. Basic piping joint construction requirements are specified in Section 220500 "Common Work Results for Plumbing."

B. Hub-and-Spigot, Cast-Iron Soil Piping Gasketed Joints: Join according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for compression joints.

C. Hub-and-Spigot, Cast-Iron Soil Piping Calked Joints: Join according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for lead and oakum calked joints.

D. Hubless Cast-Iron Soil Piping Coupled Joints: Join according to CISPI 310 and CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for hubless-coupling joints.

3.6. VALVE INSTALLATION

A. General valve installation requirements are specified in Section 220523 "General-Duty Valves for Plumbing Piping."

B. Shutoff Valves: Install shutoff valve on each sump pump discharge.

1. Install gate valve for piping.

3.7. HANGER AND SUPPORT INSTALLATION

A. Pipe hangers and supports are specified in Section 220529 "Hangers and Supports for Plumbing Piping and Equipment." Install the following:

1. Vertical Piping: MSS Type 8 or Type 42, clamps.

2. Individual, Straight, Horizontal Piping Runs: According to the following:

   a. 100 Feet and Less: MSS Type 1, adjustable, steel clevis hangers.
   b. Longer Than 100 Feet: MSS Type 43, adjustable roller hangers.
   c. Longer Than 100 Feet, if Indicated: MSS Type 49, spring cushion rolls.

3. Multiple, Straight, Horizontal Piping Runs 100 Feet or Longer: MSS Type 44, pipe rolls. Support pipe rolls on trapeze.
4. Base of Vertical Piping: MSS Type 52, spring hangers.

B. Install supports according to Section 220529 "Hangers and Supports for Plumbing Piping and Equipment."

C. Support vertical piping and tubing at base and at each floor.

D. Rod diameter may be reduced 1 size for double-rod hangers, with 3/8-inch minimum rods.

E. Install hangers for cast-iron soil piping with the following maximum horizontal spacing and minimum rod diameters:

1. 6 inches and smaller: 12 inches within each fitting and coupling with 5/8-inch rod.
2. 8 inches and larger: 12 inches within each fitting and coupling with 7/8-inch rod.

F. Install supports for vertical cast-iron soil piping every 30 feet.

G. Support piping and tubing not listed above according to MSS SP-69 and manufacturer's written instructions.

3.8. CONNECTIONS

A. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Connect interior storm drainage piping to exterior storm drainage piping. Use transition fitting to join dissimilar piping materials.

C. Connect storm drainage piping to roof drains and storm drainage specialties.

3.9. FIELD QUALITY CONTROL

A. During installation, notify Commissioner.at least 24 hours before inspection must be made. Perform tests specified below in presence of Commissioner.

1. Roughing-in Inspection: Arrange for inspection of piping before concealing or closing-in after roughing-in.
2. Final Inspection: Arrange for final inspection by Commissioner.to observe tests specified below and to ensure compliance with requirements.

B. Reinspection: If Commissioner find that piping will not pass test or inspection, make required corrections and arrange for reinspection.

C. Test storm drainage piping according to procedures of NYC Department of Buildings or, in absence of published procedures, as follows:

1. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or restoreed. If testing is performed in segments, submit separate report for each test, complete with diagram of portion of piping tested.
2. Leave uncovered and unconcealed new, altered, extended, or replaced storm drainage piping until it has been tested and approved. Expose work that was covered or concealed before it was tested.
3. Test Procedure: Test storm drainage piping, except outside leaders, on completion of roughing-in. Close openings in piping system and fill with water to point of overflow, but not less than 10-foot head of water. From 15 minutes before inspection starts to completion of inspection, water level must not drop. Inspect joints for leaks.
4. Restore leaks and defects with new materials and retest piping, or portion thereof, until satisfactory results are obtained.
5. Prepare reports for tests and required corrective action.

D. Test force-main piping according to procedures of NYC Department of Buildings or, in absence of published procedures, as follows:

1. Leave uncovered and unconcealed new, altered, extended, or replaced force-main piping until it has been tested and approved. Expose work that was covered or concealed before it was tested.
2. Cap and subject piping to static-water pressure of 50 psig (345 kPa) above operating pressure, without exceeding pressure rating of piping system materials. Isolate test source and allow to stand for four hours. Leaks and loss in test pressure constitute defects that must be restoreed.
3. Restore leaks and defects with new materials and retest piping, or portion thereof, until satisfactory results are obtained.
4. Prepare reports for tests and required corrective action.

3.10. CLEANING

A. Clean interior of piping. Remove dirt and debris as work progresses.

B. Protect drains during remainder of construction period to avoid clogging with dirt and debris and to prevent damage from traffic and construction work.

C. Place plugs in ends of uncompleted piping at end of day and when work stops.

END OF SECTION 221413

SECTION 221423
Storm Drainage Piping Specialties

PART 1 - GENERAL

1.1. RELATED DOCUMENTS

A. The following documents apply to all required work for the Project: (1) the Contract Drawings, (2) the Specifications, (3) the General Conditions, (4) the Addendum and (5) the Contract (City of New York Standard Construction Contract).

1.2. SUMMARY

A. This Section includes the following storm drainage piping specialties:

1. Cleanouts.
2. Roof drains.
3. Miscellaneous storm drainage piping specialties.
4. Flashing materials.

B. Related Sections include the following:

1. Section 221316 "Sanitary Waste Piping" for floor drains, connected to sanitary sewer, grease interceptors and removal devices, oil interceptors, and solid interceptors.

1.3. DEFINITIONS

A. ABS: Acrylonitrile-butadiene-styrene plastic.

B. FOG: Fats, oils, and greases.

C. FRP: Fiberglass-reinforced plastic.

D. HDPE: High-density polyethylene plastic.

E. PE: Polyethylene plastic.

F. PP: Polypropylene plastic.

G. PUR: Polyurethane plastic.

H. PVC: Polyvinyl chloride plastic.

1.4. SUBMITTALS

A. Refer to DDC General Conditions Section 01 33 00 "Submittal Procedures."

B. Product Data: For each type of product indicated.

1.5. QUALITY ASSURANCE

A. Refer to DDC General Conditions Section 01 40 00 "Quality Requirements."

B. Drainage piping specialties shall bear label, stamp, or other markings of specified testing agency.

1.6. COORDINATION

A. Coordinate size and location of roof penetrations.

PART 2 - PRODUCTS

2.1. CLEANOUTS

A. Exposed Metal Cleanouts

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. Josam Company; Josam Div.
   b. MIFAB, Inc.
   c. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
   d. Tyler Pipe; Wade Div.
   e. Watts Drainage Products Inc.
   f. Zurn Plumbing Products Group; Specification Drainage Operation.
   g. Or Approved Equal

2. Standard: ASME A112.36.2M for cast iron for cleanout test tee.
3. Size: Same as connected drainage piping
4. Body Material: Hubless, cast-iron soil pipe test tee as required to match connected piping.
5. Closure: Bronze plug.
6. Closure Plug Size: Same as or not more than one size smaller than cleanout size.

B. Metal Floor Cleanouts:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. Josam Company; Josam Div.
   b. Sioux Chief Manufacturing Company, Inc.
   c. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
   d. Tyler Pipe; Wade Div.
   e. Watts Drainage Products Inc.
   f. Zurn Plumbing Products Group; Light Commercial Operation.
   g. Zurn Plumbing Products Group; Specification Drainage Operation.
   h. Or Approved Equal

2. Standard: ASME A112.36.2M for adjustable housing cleanout.
3. Size: Same as connected branch.
4. Type: Adjustable housing.
5. Body or Ferrule: Cast iron.
6. Clamping Device: Required.
7. Outlet Connection: Inside calk.
8. Closure: Bronze Plug.
9. Adjustable Housing Material: Cast iron with set-screws or other device.
10. Frame and Cover Material and Finish: Galvanized Cast Iron.
11. Frame and Cover Shape: Round.
12. Top Loading Classification: Medium Duty.
13. Riser: ASTM A 74, Service class, cast-iron drainage pipe fitting and riser to cleanout.

2.2. ROOF DRAINS

A. Metal Roof Drains:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. Froet.
   b. Josam Company; Josam Div.
   c. MIFAB, Inc.
   d. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
   e. Tyler Pipe; Wade Div.
   f. Watts Drainage Products Inc.
   g. Zurn Plumbing Products Group; Light Commercial Operation.
   h. Zurn Plumbing Products Group; Specification Drainage Operation.
   i. Or Approved Equal

2. Standard: ASME A112.21.2M.
3. Pattern: Roof drain.
4. Body Material: Cast iron.
5. Combination Flashing Ring and Gravel Stop: Required.
6. Flow-Control Weirs: Not required.
7. Outlet: Bottom.
8. Dome Material: Galvanized Cast iron.
9. Extension Collars: Required.
10. Underdeck Clamp: Required.
11. Sump Receiver: Not required
12. Options:

B. Metal Deck Drains:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. Josam Company; Josam Div.
   b. MIFAB, Inc.
   c. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.

d. Tyler Pipe; Wade Div.
e. Watts Drainage Products Inc.
f. Zurn Plumbing Products Group; Light Commercial Operation.
g. Zurn Plumbing Products Group; Specification Drainage Operation.
h. Or Approved Equal

2. Standard: ASME A112.21.2M.
3. Pattern: Promenade-deck drain.
4. Body Material: Cast iron.
5. Dimensions of Body: 14" square diameter
6. Combination Flashing Ring and Gravel Stop: Required.
7. Flow-Control Weirs: Not required.
8. Outlet: Bottom.
9. Dome Material: Cast iron.
10. Extension Collars: Required.
11. Underdeck Clamp: Required.
12. Sump Receiver: Not required.
13. Options: Vandal proof, Nickel Bronze finish.

C. Metal Area Drains:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Josam Company; Josam Div.
b. MIFAB, Inc.
c. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
d. Tyler Pipe; Wade Div.
e. Watts Drainage Products Inc.
f. Zurn Plumbing Products Group; Light Commercial Operation.
g. Zurn Plumbing Products Group; Specification Drainage Operation.
h. Or Approved Equal

2. Standard: ASME A112.21.2M.
3. Pattern: Promenade-deck drain.
4. Body Material: Cast iron.
5. Dimensions of Body: 14" square diameter.
6. Combination Flashing Ring and Gravel Stop: Required.
7. Flow-Control Weirs: Not required.
8. Outlet: Side.
9. Dome Material: Cast iron.
10. Extension Collars: Not required.
11. Underdeck Clamp: Required.
12. Sump Receiver: Not required.
13. Options: Vandal proof, Nickel Bronze finish.

D. Metal Control Flow Drains:

1. Standard: ASME A112.21.2M.

2. Pattern: Roof drain.
3. Body Material: Galvanized Cast iron.
4. Combination Flashing Ring and Gravel Stop: Required.
5. Flow-Control Weirs: Required.
6. Outlet: Bottom.
7. Dome Material: Cast iron.
8. Extension Collars: Required.
9. Underdeck Clamp: Required.
10. Sump Receiver: Not required.
11. Options: Vandal Proof

2.3. MISCELLANEOUS STORM DRAINAGE PIPING SPECIALTIES

A. Expansion Joints:

1. Standard: ASME A112.21.2M.
2. Body: Cast iron with bronze sleeve, packing, and gland.
3. End Connections: Matching connected piping.
4. Size: Same as connected piping.

B. Downspout Boots:

1. Description: ASTM A 74, Service class, hub-and-spigot, cast-iron soil pipe.
2. Size: Same as or larger than connected downspout.

2.4. FLASHING MATERIALS

A. Copper Sheet: ASTM B 152/B 152M, 12 oz./sq. ft. thickness.

B. Zinc-Coated Steel Sheet: ASTM A 653/A 653M, with 0.20 percent copper content and 0.04-inch minimum thickness, unless otherwise indicated. Include G90 hot-dip galvanized, mill-phosphatized finish for painting if indicated.

C. Elastic Membrane Sheet: ASTM D 4068, flexible, chlorinated polyethylene, 40-mil minimum thickness.

D. Fasteners: Metal compatible with material and substrate being fastened.

E. Metal Accessories: Sheet metal strips, clamps, anchoring devices, and similar accessory units required for installation; matching or compatible with material being installed.

F. Solder: ASTM B 32, lead-free alloy.

G. Bituminous Coating: SSPC-Paint 12, solvent-type, bituminous mastic.

PART 3 - EXECUTION

3.1. EXECUTION REQUIREMENTS

A. Refer to DDC General Conditions for execution requirements.

3.2. INSTALLATION

A. Refer to Section 220500 "Common Work Results for Plumbing" for piping joining materials, joint construction, and basic installation requirements.

B. Install cleanouts in aboveground piping and building drain piping according to the following, unless otherwise indicated:

1. Size same as drainage piping up to 4 inch Use 4 inch for larger drainage piping unless larger cleanout is indicated.
2. Locate at each change in direction of piping greater than 45 degrees.
3. Locate at minimum intervals of 50 feet.
4. Locate at base of each vertical soil and waste stack.

C. For floor cleanouts for piping below floors, install cleanout deck plates with top flush with finished floor.

D. For cleanouts located in concealed piping, install cleanout wall access covers, of types indicated, with frame and cover flush with finished wall.

E. Install roof drains at low points of roof areas according to roof membrane manufacturer's written installation instructions. Roofing materials are specified in Section 077100 "Roof Specialties and Accessories."

1. Install roof-drain flashing collar or flange so that there will be no leakage between drain and adjoining roofing. Maintain integrity of waterproof membranes where penetrated.
2. Position roof drains for easy access and maintenance.

F. Install sleeve flashing device with each riser and stack passing through floors with waterproof membrane.

G. Install expansion joints on vertical stacks and conductors. Position expansion joints for easy access and maintenance.

H. Install cast-iron soil pipe downspout boots at grade with top of hub 18 inches above grade.

I. Install conductor nozzles at exposed bottom of conductors where they spill onto grade.

J. Install escutcheons at wall, floor, and ceiling penetrations in exposed finished locations and within cabinets and millwork. Use deep-pattern escutcheons if required to conceal protruding pipe fittings.

3.3. CONNECTIONS

A. Piping installation requirements are specified in other plumbing specification sections. Drawings indicate general arrangement of piping, fittings, and specialties.

3.4. FLASHING INSTALLATION

A. Fabricate flashing from single piece unless large pans, sumps, or other drainage shapes are required. Join flashing according to the following if required:

B. Copper Sheets: Solder joints of copper sheets.

C. Install sheet flashing on pipes, sleeves, and specialties passing through or embedded in floors and roofs with waterproof membrane.

1. Pipe Flashing: Sleeve type, matching pipe size, with minimum length of 10 inches, and skirt or flange extending at least 8 inches around pipe.
2. Sleeve Flashing: Flat sheet, with skirt or flange extending at least 8 inches around sleeve.
3. Embedded Specialty Flashing: Flat sheet, with skirt or flange extending at least 8 inches around specialty.

D. Set flashing on floors and roofs in solid coating of bituminous cement.

E. Secure flashing into sleeve and specialty clamping ring or device.

F. Fabricate and install flashing and pans, sumps, and other drainage shapes.

3.5. PROTECTION

A. Protect drains during remainder of construction period to avoid clogging with dirt or debris and to prevent damage from traffic or construction work.

B. Place plugs in ends of uncompleted piping at end of each day or when work stops.

END OF SECTION 221423

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SECTION 221513

Compressed Air Equipment

PART 1 – GENERAL

1.1. RELATED DOCUMENTS

A. The following documents apply to all required work for the Project: (1) the Contract Drawings, (2) the Specifications, (3) the General Conditions, (4) the Addendum and (5) the Contract (City of New York Standard Construction Contract).

1.2. SUMMARY

A. Work Included: Furnish and install a compressed air system with all piping, accessories and appurtenances necessary for a complete installation. Locate the equipment on the 2nd floor and include two (2) air compressor units, two (2) refrigerated air dryers, two (2) vertical air receivers, and four (4) portable compressors. Provide air tool stations and hose reels each with air hose and filter, regulator, lubricator assembly wall mounted as shown on Contract Drawings. Compressed air system shall also supply air to the Fluid Dispensing System as shown.

B. Related Sections:

1.	Division 3 Section 03 30 00	"Cast-in-Place Concrete."
2.	Division 9 Section 09 90 00	"Painting and Finishing."
3.	Division 22 Section 22 05 00	"Common Results for Plumbing."
4.	Division 22 Section 22 05 53	"Identification for Plumbing Piping and Equipment"
5.	Division 22 Section 22 05 29	"Hangers and Supports for Plumbing Piping & Equipment."
6.	Division 22 Section 22 15 13.10	"Fluid Dispensing System."
7.	Division 23 Section 23 05 13	"Common Motor Requirements for HVAC Equipment."
8.	Division 23 Section 23 09 00	"Instrumentation and Control for HVAC."
9.	Division 26 Section 26 05 00	"Common Work Results for Electrical."
10.	Division 26 Section 26 29 23	"Variable Frequency Motor Controllers."

C. References:

1. ASME Boiler and Pressure Vessel Code, Sec. VIII, Div 1 – Pressure Vessels.
2. ANSI B93.45 (NFPA T3.27.3) – Pneumatic Fluid Power Compressed Air Dryers – Methods for Rating and Testing.
3. AFBMA 9 – Load Ratings and Fatigue Life for Roller Bearings.
4. AFBMA 11 – Load Ratings and Fatigue Life for Ball Bearings.
5. ANSI B 31.1 – Power Piping
6. CAGI ADF-100 - Refrigerated Compressed. Air Dryers - Methods for Testing and Rating.
7. American Welding Society B 3.0 – Standard Qualification Procedure.

8. New York City Construction Codes.

1.2 SYSTEM DESCRIPTION

A. Air Compressor Units: Design each air compressor unit for intermittent operation under the following conditions with the specified characteristics:

1. Inlet air Conditions:

a.	Temperature range	50 to 100
b.	Relative humidity, percent	1 to 100
c.	Pressure, psia	14.7

2.	Stages	Two
3.	Mounting on intermediate receiver tank	Horizontal
4.	Rated discharge pressure, psig	175
5.	Minimum capacity at rated discharge pressure, scfm	200
6.	Relief valve setting	250
7.	Maximum motor speed, rpm	1000
8.	Maximum compressor speed, rpm	785
9.	Motor horsepower, minimum	30
10.	Motor enclosure	TEFC
11.	Power supply	460V/3 pH/60 Hz

B. Refrigerated Air Dryers: Rate air dryers in accordance with the standard rating conditions of the National Fluid Power Association for Class H Dryers, i.e. 33 to 39 degrees F pressure dew point range at 230 psig and 100 degrees F inlet air, and 100 degrees F ambient air with a maximum pressure drop of 5 psi. Under this rating, provide the dryers with capacities not less than 400 scfm.

C. Vertical Air Receivers: Supply receivers under the following conditions with the specified characteristics:

1.	Minimum capacity, gallons	240
2.	Diameter, inches	24
3.	Position	Vertical
4.	Working pressure, psig	200

1.3 SUBMITTALS

A. Refer to DDC General Conditions Section 01 33 00 "Submittal Procedures."

B. Contractor's Drawings: Submit shop drawings, including arrangement and erection drawings of the compressed air equipment and control equipment; installation templates; schematic control diagrams, electrical connection diagrams, and complete description of the control system.

C. Quality Control Submittals: Submit the following:

1. Manufacturer's certified performance and material records as specified.

2. Manufacturer's certified copies of Field Test Reports.

D. Operation and Maintenance Manuals: Submit Operation and Maintenance (O&M) instructions for the compressed air equipment.

1.4 DELIVERY, STORAGE AND HANDLING

A. Protect all electrical equipment from the weather during transit and storage by suitable means, including shrink wrapping or hand wrapping and taping.

1.5 QUALITY ASSURANCE

A. Refer to DDC General Conditions Section 01 40 00 "Quality Requirements."

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. The compressor, dryer and ancillary equipment shall be provided by the Contractor through one vendor. The Contractor, through the vendor, shall have the responsibility of matching all components and providing equipment which function together as a system.

B. Manufacturers are listed below. Other manufacturers of equivalent products may be submitted for approval.

1. Compressor Units:

   a. Ingersoll-Rand Company.
   b. FSCurtis Air Compressors.
   c. Chicago Pneumatic.
   d. Or approved equal.

2. Flexible Connectors for Compressor:

   a. Anaconda.
   b. Metraflex.
   c. Dayton.
   d. Or approved equal.

3. Air-Cooled Aftercooler:

   a. Ingersoll-Rand Company.
   b. Kaeser Compressors.
   c. AKG
   d. Or approved equal.

4. Refrigerated Air Dryer:

a. Ingersoll-Rand Company.
b. Speedaire
c. Hankinson
d. Or approved equal.

5. Pressure Regulators for Pressure Reducing Stations:

a. A.W. Cash.
b. Fisher Controls.
c. Gast
d. Or approved equal.

6. Equipment for Air Tool Stations:

a. Chicago Pneumatic.
b. Parker-Hannifin Corporation.
c. Gast
d. Or approved equal.

2.2 AIR COMPRESSOR UNITS

A. General: Assemble each air compressor unit to include two simplex compressors and electric motors with V-belt drives and belt take-up as well as suitable belt guard and inlet air filters and silencers mounted on a horizontal air receiver. Unit shall include a pressure gauge, service valve, relief valve, adjustable pressure switch for stop-start control, alternating control panel, anti-vibration pads, flexible pipe connections, and an aftercooler.

B. Design: Provide air compressors of the oil lubricated, reciprocating, air cooled, two-stage, air receiver mounted type, equipped with an automatic pressure regulator, automatic pressure unloader providing no load starting, and oil level or oil pressure protection. Provide two stage units with an intercooler and interstage safety valve.

C. Air Receiver Mounted: Mount each compressor with its motor on a common structural steel base plate which is mounted on an intermediate horizontal receiver tank.

D. Relief Valve: Install an ASME safety relief valve as an integral part of the compressor or between the compressor and discharge check valve.

E. Inlet Filter and Silencer: Provide compressor inlet with an air filter and silencer of the dry filter, radially pleated type enclosed in a steel housing, adequately sized for the capacity of the compressor.

F. Anti-Vibration Pads: Use cork and neoprene vibration pads with flexible connections as recommended by manufacturer. Design the pads to control oscillation and to withstand all lateral forces.

G. Pipe Connections: Provide piping connections to each compressor through corrugated type flexible connectors with a braided protective covering to prevent vibration transmission. Provide piping

from the air compressor to air tool stations and fluid dispensing pumps (See Division 22 Section "Fluid Dispensing System"), and as indicated on the Contract Drawings. Each air tool station shall include a combination filter/regulator/lubricator unit and hose reel with hose and outlet. Compressed air piping shall be stainless steel.

H. Portable Compressor Units: Provide portable 25 horsepower, diesel engine-driven air compressors to serve as an emergency air source. Where specifically required, provide an air dryer.

2.3 AFTERCOOLERS

A. General: Equip each air compressor unit with an air-cooled aftercooler.

B. Air-Cooled Type: Provide each air-cooled aftercooler to cool the compressed air to a maximum of 25 degrees F over ambient air temperature. Pressure relief valves shall be provided for each aftercooler to protect against overpressurization.

2.4 REFRIGERATED AIR DRYERS

A. General: Equip each refrigerated air dryer with a condensing unit, refrigerant evaporator, mechanical separator automatic condensate discharge valve, high discharge air temperature alarm light and switch for actuating a remote alarm, prefilter and afterfilter.

B. Filter: Equip dryers with filters to remove oil carryover, oil aerosols and other foreign matter. Install a prefilter near the dryer inlet and install an afterfilter near the dryer discharge. Design the prefilter for mechanical removal of solid and liquid particles. Prefilter shall be a coalescing- type filter separator that removes oil and water liquid/mist down to 0.5 PPM by weight. Provide and afterfilter of the coalescing type with a 0.5 micron rating or lower.

C. Power: Design dryers for a 460-volt, 3-phase, 60-hertz power supply. Provide refrigerated air dryers which are base mounted.

D. Automatic Drain Valve: Provide automatic drain valves that effectively remove condensate from the air compressor. The drain valves shall be electric condensate drain valves. The drain valve shall be incorporated with a solenoid valve and electric controls, and be 3/8" NPT. The drain valve shall include a manual by pass and a strain/ball valve assembly.

2.5 VERTICAL AIR RECEIVERS

A. General: Construct air receiver tanks of welded steel meeting the requirements of the ASME Boiler and Pressure Vessel Code, Section VIII, for unfired pressure vessels and bearing an ASME stamp. Provide the tanks with dished ends and with feet or a base for mounting in a horizontal or vertical position as specified.

B. Appurtenances: Equip each air receiver with a pressure gauge, plugged inspection openings, a drain valve, an ASME pressure relief valve, and all necessary pipe connections.

1. Fit air receiver with an automatic drain valve to remove condensate at each starting of the compressor.

2.6 PRESSURE CONTROL VALVES

A. General: Provide regulator control valves of the designed for compressed air service. Design the valves to be capable of relieving the specified or scheduled air flow at 10 percent overpressure. Mount the pressure control valve on the air receiver to relieve the full capacity of the compressors at 10 percent overpressure above the set pressure. Furnish valves meeting the requirements of the ASME Code for unfired pressure vessels and bearing the Code stamp.

2.7 GAUGES

A. Provide pressure gauges of the Bourdon tube type with minimum 6 inch diameter dials, plainly marked. Connect each gauge with red brass pipe, fittings and isolating stopcocks. Equip each gauge with a snubber and threaded protective diaphragm seal. Furnish gauges with a range of 0 to 300 psig.

2.8 BEARINGS

A. General: Manufacture each compressor with bearings of the antifriction ball or roller type of ample size to carry the loads imposed under continuous service without overheating.

B. Radial and Thrust: Equip compressors with radial and thrust bearings. One of the bearings in each case may be combined with the thrust bearing.

C. Life: Design all bearings to be accessible and located for convenient repair or replacement with an average B 10 operating life of not less than 100,000 hours according to AFBMA 9 and AFBMA 11.

2.9 LUBRICATION

A. General: Provide oil lubricated compressor bearings.

B. Reservoir: Use a reservoir system or other approved method. Provide all bearings with oil reservoirs to insure a constant supply of clean oil and with suitable gauges to give visual indication that an adequate supply of lubricant is available and is being supplied to the bearings.

C. Drip and Drain: Make provisions to prevent throwing or dripping of lubricant from the bearings and properly drain all oil sumps and pockets.

D. Oil Supply: Supply such oil of the kind and quality specified by the compressor manufacturer, as is necessary to place each compressor unit in regular operation for a period of one year.

2.10 PRESSURE REDUCING STATIONS

A. General: Provide each air tool station with a pressure reducing station consisting of a line filter, pressure regulating valve, bypass, pressure gauge and pressure relief valve. Arrange the pressure reducing station to reduce the supply air pressure to the downstream pressure specified. Provide pressure reducing valve outlet pressures and capacities, and pressure relief valve setting as shown on Contract Drawings.

B. Pressure Regulating Valves: Provide direct acting, spring loaded, diaphragm operated, single seated pressure regulating valves designed for compressed air service. Design the valves to maintain the selected downstream pressures with inlet pressures up to 200 psig. Provide downstream pressure settings to be field adjustable.

C. Other Requirements: Provide pressure gauges as specified in Article 2.7. Provide pressure relief valves as specified in Article 2.6. Equip line filters with a filter element with a 5-micron rating and a manual drain valve.

2.11 AIR TOOL STATIONS

A. General: Construct each air tool station to include a filter and moisture separator, pressure regulator, lubricator, and an air hose assembly. Equip the filter and moisture separator with a manual drain valve designed for a maximum pressure of 300 psi. Equip the pressure regulator with a pressure gauge and provide a pressure regulator of the self-relieving type designed for a maximum pressure of 400 psi. Design the lubricator for a maximum pressure of 300 psi.

B. Air Hose Valve Assembly: At each air tool station, provide one air hose valve assembly consisting of a 1/2-inch globe valve designed to operate satisfactorily at a pressure of 175 psig, adapted to a 1/2 inch safety quick detachable steel hose coupling to prevent airflow until the coupling is fully engaged and locked, and a steel threaded 1/2 inch quick detachable male hose coupling attached to the safety coupling.

1. Furnish 50-foot lengths of 1/2-inch air hose with quick pressure couplings at each end. In addition, furnish an air gun with nozzles and self closing valves for each air tool station.
2. Furnish stainless steel hose reels capable of holding 50-foot length of ½-inch air hose at each air tool station.

2.12 TIRE FILLING STATIONS

A. General: Construct each tire filling station as shown in the Contract Drawings. Tire filling stations shall be located with all air tool stations within the main garage area and BME shop area. Air lines for tools and tire filling shall be independent of each other, but may be from the same branch line.

B. Air Hose Valve Assembly: Provide air hose valve assemblies consisting of a 1/2-inch globe valve designed to operate satisfactorily at a pressure of 175 psig, adapted to a 1/2 inch safety quick detachable steel hose coupling to prevent airflow until the coupling is fully engaged and locked, and a steel threaded 1/2 inch quick detachable male hose coupling attached to the safety coupling.

1. Furnish 50-foot lengths of 1/2-inch air hose with quick pressure couplings at each end. In addition, furnish an air gun with nozzles and self closing valves for each tire filling station.
2. Furnish stainless steel hose reels capable of holding 50-foot length of ½-inch air hose at each tire filling station.

2.13 FLUID DISPENSING SYSTEM

A. Provide compressed air service to pneumatic pumps for the fluid dispensing system as shown in the Contract Drawings and detailed in Division 22 Section "Fluid Dispensing System."

2.14 ACCESSORIES

A. Control Panel: Provide a local control panel from the compressor manufacturer located in the compressor room. Manufacture the control panel to include, but not be limited to, the following equipment:

1. ON OFF/LOCKOUT switch for each compressor.
2. Low oil level or pressure indicating light for each compressor.
3. Low system pressure indicating light.
4. Discharge pressure gauge.
5. Aftercooler discharge temperature gauge.

B. Safety Requirements for Control Panel: Provide all accessories and appurtenances required for the safe, proper operation of the air compressor equipment as described herein whether or not such components have been specifically shown or specified. Provide compressor controls, control panel and wiring.

C. Motors: Design air compressor drive motors for operation at 460 volts, 3 phase, 60 hertz.

2.15 SYSTEM CONTROL

A. Adjustable Pressure Switch: Provide adjustable, heavy duty pressure switches for starting and stopping the compressors and a low pressure alarm switch on the air receiver. Equip the switched with double pole, double throw contacts rated at 10 amperes for 120-volt ac power.

B. Duty Sequence: Arrange the compressor duty sequence to be automatically selected by an automatic alternator to balance compressor operating times.

C. Oil Switches: Equip each compressor with a low level or low oil pressure switch. Design the switch to shut off the compressor and actuate a compressed air system control panel mounted indicating light and a remote alarm. Provide a lubricating oil system switch as recommended by the compressor manufacturer.

D. Temperature Switch: Equip each refrigerated air dryer with a high temperature switch located in the compressed air line near the dryer discharge. Set the switch to actuate a remote refrigerated air dryer failure alarm.

2.16 BUILDING MANAGEMENT SYSTEM INTERFACE

A. Provide the following dry contact alarm points and associated devices for each compressor for wiring to corresponding Building Management System Alarm inputs:

1. Compressor Failure.
2. Low Oil Level Shutdown.

B. Provide the following dry contacts alarm points and associated devices for each air dryer for wiring to corresponding Building Management System Alarms inputs:

1. High Discharge Air Temperature.

C. Provide a system air pressure sensor with 4 to 20 ma output calibrated for the compressed air operating pressure range for wiring to the Building Management System (BMS).

D. Provide commissioning and coordination of the Building Management System (BMS) interface points needed for proper operation of these points.

PART 3 – EXECUTION

3.1 EXECUTION REQUIREMENTS

A. Refer to DDC General Conditions for execution requirements

3.2 INSTALLATION

A. Install all compressed air equipment in accordance with manufacturer's recommendations and approved shop drawings.

3.3 FIELD QUALITY CONTROL

A. Mounting System: Each unit shall be mounted on a monolithic concrete base. Install reinforced concrete anchor pad with embedded anchor bolts as shown on the Contract Drawings and in accordance with Division 3 Section "Cast-in-Place Concrete."

B. Piping and Accessories: Install all piping connections and accessories, as specified or shown on Contract Drawings, in accordance with respective manufacturer's recommendations.

1. On each unit discharge, furnish a pressure gauge and a drain cock at the lowest point.
2. All piping shall be run free of traps and shall be pitched to drip pockets provided at all low points.
3. Every branch supply section shall be controlled by a valve.

C. Welding: Joints between sections of pipe and fittings 2 inches and larger shall be electric welded.

1. Welding shall conform to applicable portions of ANSI Standard B 31.1, American Welding Society Standard B 3.0 and the New York City Building Code.
2. Welded angular branch connections shall be made with seamless shaped 45 degree nipples provided the branch welds are reinforced with rings or saddles.
3. Directional changes and branch connections shall be made with factory-fabricated, long pattern, long radius welded fittings. Elbows, reducers, welding tees, and caps shall be manufactured by Crane, Grinnell, Ladish, Taylor, Tube Turns, or approved equal. Field- fabricated and "compact" or short pattern fittings will not be accepted.

3.4 FIELD TESTS

A. Testing: After the installation of the air compressor and all appurtenances, subject the compressor to a field running test under actual operating conditions. Perform field tests as directed and in the presence of the Commissioner. Perform the field tests to demonstrate that under all conditions of operation the unit:

1. Has not been damaged by transportation or installation.
2. Has been properly installed.
3. Has no mechanical defects.
4. Has been properly connected.
5. Is in proper alignment.
6. Is free of overheating of any parts.
7. Is free of all objectionable vibration.
8. Is free of excessive noise.
9. Is free of overloading of any parts.
10. Operates as specified with the control system.

B. Defects: Promptly correct any defects in the equipment or failure to meet the requirements of the Specifications.

C. Manufacturer's Field Services: Furnish the services of a qualified representative of the compressed air equipment manufacturer to inspect the installation of the compressed air equipment, place it in operation, make any necessary adjustments, and instruct the operating personnel in its operation and maintenance.

3.5 PAINTING

A. Paint the compressed air equipment as specified in Division 9 Section "Painting and Finishing."

END OF SECTION 221513

SECTION 221513.10

Motor Fuel Dispensing System

PART 1 – GENERAL

1.1. RELATED DOCUMENTS

A. The following documents apply to all required work for the Project: (1) the Contract Drawings, (2) the Specifications, (3) the General Conditions, (4) the Addendum and (5) the Contract (City of New York Standard Construction Contract).

B. LEED General Requirements:

1. Refer to DDC General Conditions.

a. Section 01 81 13.04 "Sustainable Design Requirements for LEED v4 Buildings."

1.2. SUMMARY

A. Work Included:

1. A fuel dispensing system shall be provided to supply department vehicles with diesel fuel, unleaded gasoline, or E85 as needed.
2. Contractor shall furnish and install containment fill boxes, all single and double wall piping systems, dispensers, vapor recovery equipment, automatic nozzles, hoses, pumps, meters, vertical check and back pressure valves, filters, breakaway valves, hoses, swivels, fuel management system, fuel monitoring system, leak detection equipment, transfer pumps, and all other required trim for a complete and operational system.

B. Related Sections:

1.	Division 22 Section 22 15 13.20	"Fluid Dispensing Systems."
2.	Division 33 Section 33 52 13.13	"Fiberglass Double Containment Piping"
3.	Division 33 Section 33 52 13.16	"Stainless Steel Double Containment Piping"
4.	Division 33 Section 33 56 14	"Underground Storage Tanks."

C. Governing Standards:

1. FDNY Rules.
2. NFPA 30 – Flammable and Combustible Liquids Code.
3. NFPA 30A – Code for Motor Fuel Dispensing Facilities and Repair Garages.
4. NFPA 31 – Installation of Oil-Burning Equipment.
5. NYC Fire Code.
6. NYC Mechanical Code.
7. UFC – Uniform Fire Code.
8. UL 87 – Underwriters Laboratories (UL) Power Operated Dispensing Devices for Petroleum Products.
9. UL 330 – Underwriters Laboratories (UL) Hose and Hose Assemblies for Dispensing

Flammable and Combustible Liquids.
10. UL 842 – Underwriters Laboratories (UL) Standard for Valves for Flammable Fluids.

1.3 SUBMITTALS

A. Refer to DDC General Conditions Section 01 33 00 "Submittal Procedures."

B. Submit shop drawings and accessory cut sheets for approval. The design drawings shall show principal dimensions, size, type and locations of all connections and fittings and locations of all options/ accessories. Design drawings shall also include catalog cut sheets for associated accessory items and subassemblies.

C. Submit copies of the system installation, operation and maintenance manual prior to delivery.

D. Submit copies of all quality control testing documentation, installation inspection documentation, and written warranty at time of documentation completion.

1.4 QUALITY ASSURANCE

A. Refer to DDC General Conditions, section 01 40 00 "Quality Requirements."

B. Manufacturer shall have a minimum of 3 years experience in producing similar equipment.

C. Contractor shall be a licensed NYC installer having a minimum of 3 years experience in installing similar equipment.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Use every precaution to prevent damage to the equipment during transportation and delivery to the site.

1. Do not allow equipment to be dropped, bumped, dragged, pushed, rolled or moved in any way which will cause damage.
2. If, in the process of transportation or handling, any equipment is damaged, replace or repair such equipment or accessories. Make all required repairs.
3. Materials and equipment shall be delivered in original, undamaged packaging with manufacturer's labels and seals intact.

B. Storage of Materials and Equipment:

1. All materials shall be stored in a dry, enclosed area, off the ground and away from all possible contact with water, ice or snow. Materials shall be protected from extreme heat and direct sunlight.
2. Damage to materials during storage shall be prevented primarily by minimizing the amount of time they are stored at the job-site before being incorporated into the work.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers are listed below. Equipment products of other manufacturers may be submitted for approval.

1. Dispensers:

   a. Dresser Wayne.
   b. Gasboy.
   c. OPW.
   d. Or approved equal.

2. Containment Sumps:

   a. Bravo.
   b. Fibrelite.
   c. OPW.
   d. Or approved equal.

3. Pumps:

   a. FE Petro.
   b. Red Jacket.
   c. National Pump Company
   d. Or approved equal.

4. System Management:

   a. OPW.
   b. Gasboy.
   c. Snyder
   d. Or approved equal.

5. Vapor Recovery:

   a. OPW.
   b. EBW.
   c. Morrison.
   d. Goodyear.
   e. Or approved equal.

6. Accessories:

   a. EBW.
   b. Morrison.
   c. OPW.
   d. Goodyear.

e. Or approved equal.

7. Transfer Pump:

a. Simplex.
b. Graco, Inc.
c. Blackmer
d. Or approved equal.

2.2 UNLEADED GASOLINE AND E85 DISPENSERS

A. General:

1. The dispenser shall be a single product, twin hose type with a breakaway connection valve and swivel on each dispensing hose and shall incorporate provisions for a bolted, sealed, flanged connection to the containment sump.
2. Dispenser shall be rated up to 22 gpm at discharges and be designed to dispense gasoline including ethanol blends up to 85 percent (E85), diesel including biodiesel blends up to 20 percent (B20), and kerosene.
3. Aluminum, zinc, or red metals shall not be allowed in flow path.

B. Features:

1. Two volume only and lighted registers with power resets/interlocks.
2. 10:1 pulsers
3. DC junction box in hydraulic cabinet for wire terminations.
4. Explosion-proof AC junction box in hydraulic cabinet for AC wire terminations. A wire from each reset shall be provided to the junction box to facilitate a reset complete signal to an external control system.
5. Stainless steel construction including exterior panels, bezel, top, doors, base, structural columns and frame.
6. Lockable hinged door.
7. Product identification panels at top of cabinet.
8. Two (2) nickel-plated positive displacement two-piston meters with stainless steel sleeves and Teflon piston cups.
9. Minimum 1-inch ID black iron internal piping.
10. Two (2) 1-inch discharge outlets.
11. One (1) high flow ethanol-compatible 1-micron internal filter for each hose outlet.
12. 1-inch nickel-plated brass solenoid valve for each hose outlet.
13. 1-1/2-inch minimum supply inlet with stainless steel inlet strainer.
14. Dispenser shall be compatible with Stage II Vapor Recovery hoses, nozzles, balance adaptors, and other related equipment.

2.3 DIESEL FUEL DISPENSERS

A. General:

1. The dispenser shall be a single product, twin hose type with a breakaway connection valve and swivel on each dispensing hose and shall incorporate provisions for a bolted, sealed, flanged connection to the containment sump.
2. Product hoses shall be lane-oriented.
3. Dispenser shall be rated up to 36 gpm at discharges and be designed to dispense diesel including biodiesel blends up to 20 percent (B20), gasoline including standard oxygenated blends, and kerosene.

B. Features:

1. Two volume only and lighted electronic displays: 6-digit, 1 inch liquid crystal displays (LCD). Minimum display backup of 15 minutes in the event of power loss.
2. Four character ½ inch LCD operator message display for each hose. Message display shall denote authorization status, limits, etc.
3. Electromechanical totalizer: 7-digit non-resettable.
4. Electronic 6-digit non-resettable and resettable totalizers per hose.
5. Dual pulse output interface for each hose for connection to fuel control and tank monitoring system.
6. For each hose, two (2) positive displacements, two-piston meters connected to the same discharge for maximum flow.
7. Integral Hall Effect pulsers.
8. Electronic calibration without the need to set mechanical adjusters.
9. Proportional solenoid valve on discharge of each meter, programmable thru electronic register to set maximum flow rate.
10. Two (2) internal filter with 30-micron elements
11. Two (2) 1 inch discharge outlets.
12. One (1) 2 inch NPT inlet for one product.
13. Explosion-proof junction box in hydraulic cabinet to make all dispenser power and control wiring terminations.
14. Stainless steel construction including exterior panels, bezel, top, doors, base, structural columns and frame.
15. Lockable hinged door.
16. Lighted brand panels labeled "Diesel".
17. Lane-oriented nozzle boot on each dispenser side with lift-to-start nozzle hooks to turn on/off dispenser.

2.4 CONTAINMENT SUMPS

A. General:

1. Containment sumps shall be furnished and installed at locations shown in Contract Drawings. Each sump shall be factory assembled pre-piped, liquid tight and constructed of fiberglass reinforced polymer.
2. Containment sumps shall have provisions to seal and terminate secondary containment pipe within. Piping annular space shall drain into the confines of the sump.
3. Fuel Oil Extraction: In the event of a leak, the fuel oil shall be emptied from the sump by means of a vacuum truck and disposed of according to New York City Fueling and NFPA code.

B. Dispenser Sump:

1. Dispenser sump shall provide access to and secondary containment of dispenser plumbing and breakaway and shear valves.
2. Dispenser sump shall be monitored with leak detection equipment.
3. Dispenser sump shall incorporate provisions for a flanged, sealed and bolted connection with the dispenser.

C. Transition Sump:

1. Contractor shall provide transition sumps at locations shown to allow piping to transition from below ground to above. And shall provide access to and secondary containment of fuel lines as shown. Transition sumps shall be monitored with leak detection equipment.
2. Transition sumps shall have a water tight diamond plate access cover capable of withstanding H20 axle loads.
3. Transition sumps shall incorporate provisions to support a pipe rack system. Pipe rack systems shall be provided where shown, specified or as needed to support above ground piping exiting transition sumps.
4. Positive concrete anchoring shall be incorporated as an integral part of the sump design.
5. Transition sumps shall include 2-inch rigid pipe fittings where pipes exit sump above the ground.
6. Transition sumps shall include above ground factory-sealed electrical connections.

2.5 PUMPS

A. Provide two (2) submersible turbine pumps per fuel tank, manifolded together for a single discharge outlet.

B. Pumps shall be compatible with Diesel including biodiesel up to 20 percent (B20) and Gasoline including ethanol blends up to 85 percent (E85).

C. Pumps shall be designed for class 1, group D hazardous locations.

D. Pumps shall be 1-1/2 hp, 208-230 VAC, 60 Hz, 1-phase.

2.6 SYSTEM MONITORING AND MANAGEMENT

A. System Monitoring: Fuel tanks shall be monitored for leakage and level as described in Division 33 Section "Underground Storage Tanks."

B. Fuel Management:

1. Provide a complete fuel management system for each dispenser to maintain 24 hour controlled access to fuel dispensing, activated by valid operator access card.
2. Fuel management system shall be of a modular design consisting of fuel island terminals, fuel site controller and printer and universal pump controllers as required.
3. Access to product shall be restricted to personnel holding valid magnetic strip cards and who perform a predetermined series of data entry operations including a personal identification number (PIN), equipment identification, and odometer reading.
4. An internal electronic file shall hold data for each local card authorized to use the system.

This file shall contain personnel information on the user issued the card. It shall have the capability to limit the amount of fuel dispensed to predetermined operator allocated amounts. Allocation shall be determined by DSNY. This file shall have the capability to restrict the type of product the user may obtain to only the type used by the equipment entered.

5. System shall be configured using a Windows based configuration utility with on-screen "help" support for explanation of all functions.
6. Fuel Island Terminals (FIT) shall be provided for each fueling island. Terminals shall include a weatherproof cabinet with mounting pedestal, easy-to-read, back-lit, graphics liquid crystal display (LCD), and 12-key keyboard with audible (tone) and tactile feedback (keys move when pressed). Each FIT shall be capable of controlling up to 8 dispensers and be able to selectively access up to 32 hoses. Each FIT shall include a magnetic strip card reader as well as an extra reader bay to allow for updating to other types of cards in the future.
7. Fuel Site Controller (FSC) shall be located within the fueling office and shall have the ability to communicate with up to eight (8) FITs and shall be capable of controlling up to 32 hoses simultaneously. Both mechanical and electronic pumps shall be controllable by the system. The FSC shall include an internal 38.4kbps modem for direct data transmission over phone lines and shall also include an internal 10Base-T Ethernet port for communications via TCP/IP over an intranet.
8. System shall include a 5 x 9 pin dot-matrix bi-directional journal printer located in the fueling office near the FSC to make hard copies of transaction data and reports. The printer shall be capable of operation at 180 characters per second (cps). The printer shall use standard 8 ½ inch x 11 inch pin-feed paper and shall be capable of printing on 1, 2, or 3 part paper.
9. Management system shall be equipped to communicate with system monitoring equipment.
10. The system's card memory shall have a standard capacity of 500 cards and be expandable up to 16,000 cards.
11. The system shall have the capability of being placed in either an "Open" or "Closed" mode by authorized personnel. Fueling is not allowed in the "Closed" mode.

2.7 PIPING

A. Piping located in areas designated as exterior and underground shall be fiberglass double containment piping. Piping located in areas designated as interior and above ground shall be metallic double containment pipe. Piping shall conform to Division 33 Sections "Fiberglass Double Containment Piping" and "Stainless Steel Double Containment Piping."

B. Piping shall slope toward tank to allow any leakage captured by secondary containment pipe to drain back to tank leak detection equipment.

C. Piping between sumps, or equipment shall be double containment pipe.

D. Single wall piping shall be used within sumps and equipment where confines act as secondary containment and have provisions for leak detection.

2.8 TANKS

A. Fuel tanks shall conform to Division 33 Section "Underground Storage Tanks."

B. Fuel tanks shall be located and sized as shown in Contract Drawings.

2.9 VAPOR RECOVERY EQUIPMENT

A. Contractor shall provide Stage II Vapor Recovery equipment compatible with the unleaded gasoline and E85 dispensers including but not limited to automatic shutoff nozzles, hoses, swivels, breakaways, balance adaptors, vapor shear valves and piping.

B. Contractor shall provide vapor recovery equipment compatible with the gasoline and E85 fuel tanks including but not limited to extractor assemblies, ball float vent valves and piping.

C. Contractor shall provide Stage I Vapor Recovery manholes and piping as indicated on contract drawings.

D. Vapor recovery equipment shall be compatible with gasoline including ethanol blends up to 85 percent (E85).

2.10 ACCESSORIES

A. Non-Vapor Recovery Nozzles (NVRN):

1. NVRNs shall be provided for each diesel fuel dispensing hose.
2. NVRNs shall be of a high-flow design and include the following features:

    a. Spout retaining ring.
    b. Two-stage lever.
    c. 50 psi maximum pressure.
    d. Replaceable spout.
    e. 1 inch NPT inlet.
    f. Green hand insulator.

3. NVRNs shall be compatible with card-locked refueling equipment.

B. Hoses:

1. Unleaded gasoline and E85 dispensers shall be equipped with Stage II Vapor Recovery hose compatible with gasoline including ethanol blends up to 85 percent (E85). Hoses shall be 15 feet long.
2. Diesel dispensers shall be equipped with hose compatible with diesel fuel including biodiesel blends up to 20 percent (B20). Hoses shall be 15 feet long.

C. High Hose Retrievers: High hose retrievers shall be provided as shown. High hose retrievers for unleaded gasoline and E85 dispensers shall be compatible with Stage II Vapor Recovery hose. High hose retrievers shall be mounted on schedule 160 pipe, 10 feet above grade. Contractor shall provide all breakaways, swivels and other accessories as shown and required by code.

D. Spill Containment Fill Box Assemblies: Spill containment fill box assemblies shall be provided as shown on contract drawings. See Division 33 Section "Underground Storage Tanks" for details.

E. Emergency Shut-off Push Buttons: Emergency shut-off push buttons shall be located as shown and as required. Push buttons shall disconnect power to all dispensing devices, pumps, and all other electrical equipment in the fueling area. All push buttons shall be interconnected and require manual intervention to reset.

F. Signage: Identification signs shall be provided and installed as shown, specified and as required by New York City Fueling, NFPA code and New York City regulations.

2.11 TRANSFER PUMP

A. Contractor shall supply a packaged, fully enclosed fuel oil pump set and pump controller compatible with and to supply fuel from a main storage tank to the emergency generator day tank.

B. Transfer pumps shall consist of a free standing stainless steel enclosure, duplex pumps, pump controller, and leak containment and sensors.

C. Enclosure shall have separate mechanical and electrical compartments with separate hinged and lockable access doors for each.

D. Enclosure shall incorporate a containment basin for capture of any leaks from the fuel valves, fittings, pumps or piping. The containment basin shall be equipped with a leak sensor to detect any leakage. The sensor shall activate an alarm on the pump set control panel and have dry contacts for remote annunciation.

E. The pump set shall include a 1-inch fuel supply manifold, 1-inch fuel outlet manifold, and a 1- inch fuel return manifold located on the top of the enclosure.

F. The pumps set shall include duplex direct-drive, positive-displacement, motor driven pumps coupled via flexible coupling. Pumps shall be 7 GPM @ 50 PSI high lift pumps. Pumps shall be high pressure, hydraulic type consisting of two intermeshing, hardened steel, precision ground gear assemblies enclosed by a high strength, die cast aluminum housing, hardened drive shaft, pressure loaded mechanical shaft seal. Each pump shall have stainless steel braided flex hoses on the inlets and outlet of each connection.

G. Each pump shall include a pressure relief valve, adjustable type, 30-200 PSI, bronze construction with stainless steel spring. Pressure relief valve shall be connected to pressure- relief return manifold for return to main tank.

H. Shutoff ball valves with bronze construction, stainless steel ball and Teflon seal rated to 600 PSI shall be installed at pump inlets, pump outlets.

I. Each pump shall include a bronze construction spring-type check valve rated to 600 PSI.

J. Canister or y-type strainers shall be installed at each pump and shall have 60-mesh washable elements and differential pressure indicators with panel alarm indicators and remote dry contacts to indicate that the strainers need service.

K. Flow switches shall be installed on each pump outlet. Switches shall sense proper pump operation as required by the control system. Switches shall be bronze construction, shuttle/reed switch type, 400 PSI rated.

L. Motors shall be open drip proof construction, 3/4HP, NEMA type B, continuous duty at 40C, 1725 RPM, 460 VAC, 3-phase, 60 hertz, 1.15 service factor.

M. Pump set shall include an automatic duplex pump controller to provide lead-lag operation with automatic alternation of pumps on successive starts and automatic lag pump starts and runs. Upon time-out of flow switch delay, pump failure circuit is armed and monitors for proper pump flow. Upon sensing of loss of flow, lag pump is started and runs continuously until manually reset, alarm is activated to manual reset. In normal operation, upon subsequent closure of remote control contacts, pump alternate operation. In either normal or alarm operation, pumps do not run simultaneously.

N. Pump set shall include pumps motor starter of full voltage type, non-reversing, with overload relay, circuit breaker and disconnect switch with lockable, externally operable, weatherproof handle mechanism.

O. Pump controller shall include a mode control switch with "Alternate—Both" positions, Pump running indicators, pump set leak indicator, pump failure indicator and control power transformer.

P. Pump Set shall include the following options:

1. Weatherproof stainless steel enclosure.
2. Upgrade for low sulfur diesel fuel use.
3. Pressure gauge with isolation valve, 2 inch.
4. Vacuum gauge with isolation valve, 2 inch.
5. Loss of flow alarm.
6. Strainer differential pressure switch.
7. Digital level indication 115AC-4-20mA level transducer.

PART 3 – EXECUTION

3.1 EXECUTION REQUIREMENTS

A. Refer to DDC General Conditions for execution requirements.

3.2 INSTALLATION

A. All equipment and system components shall be installed in strict accordance with the most recent installation instructions provided by the manufacturer, NFPA, DEC Standards, local ordinance, recognized engineering procedure, and other New York City Fueling codes.

B. Contractor shall be properly trained by manufacturer, the state, or other approved agency.

3.3 TESTING

A. System tests shall be according to manufacturer's guidelines at time of installation.

B. Manufacturer's Services: The contractor shall engage the supplier to supervise and/or perform checkout and start-up of all system components. As part of these services, the supplier shall include for those equipment items not manufactured by them, the services of an authorized manufacturer's representative

to check the equipment installation and place the equipment in operation. The manufacturer's representative shall be thoroughly knowledgeable about the installation, operation and maintenance of the equipment.

C. A factory instructed representative shall be present at the first tank filling and dispensing operation at the facility.

3.4 INSTRUCTION

A. The manufacturer of the fuel dispensing system shall include one day of on-site classroom and hands-on instruction at the facility. The day is one session of 8 hours.

1. Maintenance: Instruction shall include operation of the system and regular maintenance (electrical, and mechanical). Additionally the City of New York key maintenance personnel shall be allowed to "shadow" the installation process whenever possible.
2. Supervisors: Instruction shall include operation of the system and basic troubleshooting as a minimum.
3. Operators Instruction: Operator instruction shall provide use skills along with safety instruction.

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SECTION 221513.20

Fluid Dispensing System

PART 1 - GENERAL

1.1. RELATED DOCUMENTS

A. The following documents apply to all required work for the Project: (1) the Contract Drawings, (2) the Specifications, (3) the General Conditions, (4) the Addendum and (5) the Contract (City of New York Standard Construction Contract).

B. LEED General Requirements.

1. Refer to DDC General Conditions.

a. Section 01 81 13.04 "Sustainable Design Requirements for LEED v4 Buildings."

1.2 SUMMARY

A. Work Included:

1. A fluid dispensing system shall be provided to supply bulk motor oil, hydraulic oil, chassis grease, gear oil, and transmission fluid for use in the maintenance bay for servicing department vehicles. Waste oil and antifreeze collections systems shall be provided for the collection of used fluids.
2. Contractor shall furnish and install pumps, dispensing hose reels, dispensing nozzles, leak and level monitoring equipment, moisture separators, pressure regulators, pneumatic hoses, piping, waste oil drain receiver, valves, fittings, and accessories as shown, specified and required for a complete and fully operational system.

B. Related Sections:

1.	Division 22 Section 22 05 53	"Identification for Plumbing Piping and Equipment."
2.	Division 22 Section 22 15 13	"Compressed Air Equipment"
3.	Division 22 Section 22 15 13.10	"Motor Fuel Dispensing Systems."
4.	Division 33 Section 33 52 13.13	"Fiberglass Double Containment Piping."
5.	Division 33 Section 33 56 14	"Underground Storage Tanks."

1.3 REFERENCES

A. FDNY Rules.

B. NFPA 30 – Flammable and Combustible Liquids Code.

C. NFPA 30A - Code for Motor Fuel Dispensing Facilities and Repair Garages.

D. NFPA 31 – Installation of Oil-Burning Equipment.

E. NYC Fire Code.

F. NYC Mechanical Code.

G. UFC – Uniform Fire Code.

H. UL – Power Operated Dispensing Devices for Petroleum Products.

I. UL 842 – Underwriters Laboratories (UL) Standard for Valves for Flammable Fluids.

1.4 SUBMITTALS

A. Refer to DDC General Conditions Section 01 33 00 "Submittal Procedures."

B. Submit shop drawings and accessory cut sheets for approval. The design drawings shall show principal dimensions, size, type and locations of all connections and fittings and locations of all options/ accessories. Design drawings shall also include catalog cut sheets for associated accessory items and subassemblies.

C. Submit copies of the system installation, operation and maintenance manual prior to delivery.

D. Submit copies of all quality control testing documentation, installation inspection documentation, and written warranty to the engineer at time of documentation completion.

1.5 QUALITY ASSURANCE

A. Refer to DDC General Conditions, section 01 40 00 "Quality Requirements."

B. Manufacturer shall have a minimum of 3 years experience in producing similar equipment.

C. Contractor shall be a licensed NYC installer having a minimum of 3 years experience in installing similar equipment.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Use every precaution to prevent damage to the equipment during transportation and delivery to the site.

1. Do not allow equipment to be dropped, bumped, dragged, pushed, rolled or moved in any way which will cause damage.
2. If, in the process of transportation or handling, any equipment is damaged, replace or repair such equipment or accessories. Make all required repairs.

B. Provide temporary storage on site prior to installation – storage location shall be free of rocks and debris.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers are listed below. Equipment products of other manufacturers may be submitted for approval.

1. Lubrication equipment:

   a. Graco, Inc
   b. Lincoln Industrial Corporation.
   c. OPW.
   d. Or approved equal.

2. Transition Sumps:

   a. Fibrelite.
   b. OPW.
   c. PEI
   d. Or approved equal

3. Pumps:

   a. Graco, Inc
   b. Lincoln Industrial Corporation.
   c. Blackmer.
   d. Or approved equal.

4. Accessories:

   a. Graco.
   b. OPW.
   c. Goodyear.
   d. Eagle.
   e. Hubbell-Wiegmann.
   f. Or approved equal.

2.2 MOTOR OIL AND HYDRAULIC OIL DISPENSING SYSTEMS

A. Contractor shall provide motor oil and hydraulic oil dispensing systems which will dispense product in the maintenance bay at the locations shown on Contract Drawings. Each system shall store product in an underground storage tank located under the fueling area floor. Systems shall be equipped with a wall mounted air powered oil pump, wall mounted pump enclosure, hose reels and nozzles as described below. Each pump shall include a dedicated regulator/dryer/lubricator and shall be connected to the building compressed air system. Each hose reel shall be outfitted with 50 ft of dispensing hose. Dispensing shall be controlled by a centrally located electronic dispensing control console as described below. Contractor shall supply all piping, hangers, placards, containment sumps, vents, monitoring equipment, and other accessories for a complete and operational system.

2.3 CHASSIS GREASE AND TRANSMISSION FLUID DISPENSING EQUIPMENT

A. Contractor shall provide two (2) portable chassis grease and two (2) portable transmission fluid dispensing systems which can be wheeled around the maintenance bay as needed. Systems shall be compatible with 120 lb pails and equipped with an air powered oil pump and nozzle as described below. Each system shall be equipped with a regulator/dryer/lubricator assembly and compatible quick disconnect to allow connection to the building compressed air system. Systems shall include a castor base, lid cover, and 15 ft of dispensing hose.

2.4 GEAR OIL DISPENSING EQUIPMENT

A. Gear oil shall be dispensed directly out of stationary drums using manual hand pumps and located as shown on contract drawings. Contractor shall supply hand pumps and spill containment pallets for drum storage as specified herein.

2.5 WASTE OIL COLLECTION SYSTEM

A. Contractor shall provide a waste oil collection system allowing storage of waste product. System shall include an underground storage tank located under the fueling area floor, two waste oil receivers located in the maintenance bay as shown on Contract Drawings, all single and double wall piping, tank monitoring equipment including a high level sensor and alarm, waste oil extraction port, stick ports, and all other accessories needed for a complete and operational system. Waste oil shall drain by gravity from the receivers in the maintenance bay to the underground storage tank. See Contract Drawings for receiver and extraction port details.

2.6 WASTE ANTIFREEZE COLLECTION SYSTEM

A. Contractor shall provide two (2) portable waste antifreeze collection systems. Systems shall include but not be limited to a green polyethylene 25 gallon tank, 10-inch semi-pneumatic wheels, 3-inch urethane castors, removable filter screen, 22-inch x 24-inch collection bowl, and a 3-inch inspection port. Collection bowl height shall be adjustable with 27-inch travel.

2.7 PUMPS

A. Motor Oil and Hydraulic Oil Pumps:

1. Contractor shall supply one (1) wall mounted positive displacement oil pump for each oil to be dispensed. Pump shall have a 4-inch pumping stroke and cycle on demand only.
2. Pumps shall include a pneumatically operated 4-1/4 inch diameter air motor. Air motor and lower pump section shall be of an in-line design.
3. Air Motor shall include a grounding lug and be equipped an external muffler operating below OSHA noise standards.
4. Air motor shall have a valve in piston design. Cylinder shall be hard coated aluminum and corrosion resistant steel.
5. Air Motor shall include a non-metallic poppet valve.
6. Pump assembly shall have the following characteristics:

a.	Pump Ratio:	10:1
b.	Continuous duty flow rate:	4.1 gpm
c.	Maximum fluid pressure:	1,800 psi

d.	Maximum air inlet pressure:	180 psi
e.	Fluid outlet size:	¾ inch NPT
f.	Air inlet size:	½ inch NPT
g.	Air consumption:	32 cfm per 4.1 gpm

7. Contractor shall supply any accessory components required for proper pump operation including but not limited to thermal relief kit, wall mount bracket, low level cut-off kit, bleed type air shut-off valve, air filter/regulator/lubricator, automatic drain valve for filter, fluid shut-off valve, suction kit, run-away valve, etc.

B. Chassis Grease Pump:

1. Contractor shall supply one (1) drum mounted positive displacement grease pump for each portable chassis grease dispensing system. Pump shall have a 4 inch pumping stroke and cycle on demand only.
2. Pumps shall include a pneumatically operated 4-1/4 inch diameter air motor. Air motor and lower pump section shall be of an in-line design.
3. Air Motor shall include a grounding lug and be equipped an external muffler operating below OSHA noise standards.
4. Air motor shall have a valve in piston design. Cylinder shall be hard coated aluminum and corrosion resistant steel.
5. The pump shall be of the "topper" type with down tube for a 400 pound drum, an integral indictor plate, hose and fitting kit and a pump elevator.
6. Pump assembly shall have the following characteristics:

a.	Pump Ratio:	50:1
b.	Continuous duty flow rate:	5 lbs per minute
c.	Maximum fluid pressure:	7,500 psi
d.	Maximum air inlet pressure:	180 psi
e.	Fluid outlet size:	3/8 inch NPT
f.	Air inlet size:	½ inch NPT
g.	Air consumption:	13 cfm per gallon

7. Contractor shall supply any accessory components required for proper pump operation including but not limited to filter/regulator/lubricator, automatic drain for air filter, air shut-off valve, fluid shut-off valve, runaway valve, etc.

C. Transmission Fluid Pump:

1. Contractor shall supply one (1) drum mounted positive displacement oil pump for each portable transmission fluid dispensing system. Pump shall have a 3 inch pumping stroke and cycle on demand only.
2. Pumps shall include a pneumatically operated 3 inch diameter air motor. Air motor and lower pump section shall be of an in-line design.
3. Air Motor shall include a grounding lug and be equipped an external muffler operating below OSHA noise standards.
4. Air motor shall have a valve in piston design. Cylinder shall be hard coated aluminum and corrosion resistant steel.
5. Air Motor shall include a non-metallic poppet valve.

6. Pump assembly shall have the following characteristics:

a.	Pump Ratio:	5:1
b.	Continuous duty flow rate:	2.8 gpm
c.	Maximum fluid pressure:	900 psi
d.	Maximum air inlet pressure:	180 psi
e.	Fluid outlet size:	½ inch NPT
f.	Air inlet size:	3/8 inch NPT
g.	Air consumption:	10 cfm per 2.8 gpm @ 100 psi

7. Contractor shall supply any accessory components required for proper pump operation including but not limited to filter/regulator/lubricator, automatic drain for air filter, air shut-off valve, fluid shut-off valve, runaway valve, etc.

D. Gear Oil Pumps: Contractor shall supply two (2) drum mounted rotary, dispensing type hand pumps. Pumps shall be self-priming, cast-iron construction and be designed for liquid dispensing of petroleum products from barrels or drums into smaller containers. Pumps shall include pump, grip, crank, 40" suction pipe, bung adaptor, and spout. Each pump shall also include a drip pan kit which includes a built-in bung adapter and drain return to barrel.

2.8 HOSE REEL ASSEMBLIES

A. Motor Oil and Hydraulic Oil Assemblies:

1. Contractor shall supply wall mounted hose reels as indicated on Contract Drawings for motor oil and hydraulic oil. Reels shall have a minimum capacity of 50 feet of ½ inch ID hose.
2. Reel construction: Reel base shall be a double pedestal design made of 10 gauge steel with welded joints and formed ribs. The reel shall incorporate a fully ported hub, guide- arms adjustable to 15 different mounting positions supporting hose guides on both sides, a ZA12 (zinc alloy) ratchet, and external brass swivel housing. The hose guide roller assembly shall be the full width of the spool with 1-1/8 inch diameter rollers, a one-piece roller support and delrin bearings and seals.
3. Hose reels shall have the following characteristics:

a.	Reel outlet:	½ inch NPSM
b.	Reel inlet:	½ inch NPSM
c.	Pressure rating (oil):	1,800 psi

4. Contractor shall supply any accessory components required for proper reel operation including but not limited to hose inlet kit and fluid shut-off valve.
5. Contractor shall supply a minimum of 50 feet of hose per reel so nozzle is reachable from the ground.

2.9 DISPENSING NOZZLES

A. Motor Oil and Hydraulic Oil Nozzles:

1. Motor oil and hydraulic oil dispensing systems shall be equipped with metered dispensing nozzles that can measure the amount of fluid actually dispensed.
2. Dispensing nozzles shall have a locking trigger for hands free operation.
3. Nozzles shall include: electronic lubricant meter, valve handle, rigid 75 degree nozzle wand, lockable trigger, inlet filter, and swivel.
4. Electronic lubricant meter shall have the following characteristics:

a.	Flow Range:	0.12 to 12.0 gpm
b.	Maximum working pressure:	1500 psi
c.	Weight:	1.9 lb
d.	Units of Measure:	gallons, quarts, pints
e.	Maximum Recorded Dispense:	199.99 units
f.	Maximum Totalizer:	19,999 units
g.	Inlet/Outlet:	½ npt, non-directional flow
h.	Battery Specifications:	
1)	Rated Discharge Current:	100 microamps
2)	Rated Capacity:	1.0 amp hour

5. Dispensing nozzles shall have the following characteristics:

a.	Maximum Flow Rate:	12 gpm
b.	Maximum Operating Pressure:	1500 psi
c.	Nozzle Inlet:	½ npt
d.	Outlet:	½ npt

B. Transmission Fluid Nozzles:

1. Transmission fluid dispensing systems shall be equipped with automatic dispensing nozzles that can be set to dispense specific volumes of fluids.
2. Dispensing nozzles shall have a cast aluminum body equipped with a liquid crystal display (LCD), inlet screen, and pressure balanced trigger with trigger lock, guard, and guard boot.
3. Dispensing nozzles shall have the following characteristics:

a.	Flow Range:	0.1 to 14 gpm
b.	Maximum Working Pressure:	1500 psi
c.	Units of Measure:	quarts, pints, gallons, liters
d.	Maximum Totalizer:	999,999 gallons or liters
e.	Maximum Recorded Dispense:	999.99 units
f.	Accuracy:	±0.5 percent
g.	Nozzle Inlet:	½ inch npt
h.	Battery:	4 AA alkaline or 4AA lithium
i.	Battery Duration:	6 to 12 months

C. Chassis Grease Nozzles:

1. Chassis grease dispensing systems shall be equipped with metered dispensing nozzles.

2. Dispensing nozzles shall have lightweight aluminum construction, oval gear metering system, and equipped with a re-settable liquid crystal display (LCD).
3. Dispensing nozzles shall have the following characteristics:

a.	Flow Range:	up to 35.3 oz/min
b.	Maximum Working Pressure:	5000 psi
c.	Units of Measure:	ounces or grams
d.	Maximum Totalizer:	999.9 lbs
e.	Accuracy:	±3 percent
f.	Nozzle Inlet:	¼ inch NPTF
g.	Battery:	2 AA alkaline
h.	Battery Duration:	18 to 24 months

2.10 ELECTRONIC DISPENSING CONTROL CONSOLE

A. Contractor shall provide an operator programmable dispensing control system as described on contract drawings and as specified herein. System shall have a two (2) fluid, seven (7) station capacity and shall control dispensing of motor oil and hydraulic oil. System shall include but not be limited to a programmable control console, pulse meter, fluid solenoid valve, air solenoid valve, ready light, fluid filters, check valves, pressure relief kit, control console shelf, and any signal and electrical wiring required for an operable system.

B. System Operation: The operator shall select the type of fluid, station, and quantity to be dispensed. The controller energizes respective air and fluid solenoid valves. A ready light adjacent to the dispensing station illuminates indicating the system is ready for dispensing. As fluid is dispensed, the pulse meter sends a signal to the controller corresponding to the amount of flow. When the designated amount of fluid has been dispensed, the controller de-energizes the solenoids preventing further dispensing.

C. System shall have the following characteristics:

1.	Fluid System Max Working Pressure:	1500 psi
2.	Power Input:	110/120 Vac
3.	Circuit Breaker:	0.40 amp
4.	Units of Measurement:	
	a. Totalizing:	Gallons/Liters to 19999
	b. Dispensing:	0.01 increments up to 199.99 units
5.	Control Power Output:	24 Vdc at 0.60 amp max to any one valve
6.	Backup Battery :	Lithium, 3.6 V 1.0 amp hour

D. Fluid solenoid valve shall have the following characteristics:

1.	Type:	2 way normally closed
2.	Electrical Rating:	28 Vdc, 0.46 amp
3.	Leads:	18 AWG x 18 inch long
4.	Max Working Pressure:	3000 psi
5.	Inlet/Outlet:	½ npt

6. Min Actuation Volts Required: 20 Vdc

E. Air solenoid valve shall have the following characteristics:

1.	Type:	3-way air valve, normally closed
2.	Electrical Rating:	24 Vdc, 0.25 amps
3.	Leads:	18 AWG x 12 inch long
4.	Inlet/Outlet:	Adapted to ½ npt

2.11 PIPING

A. Piping located below ground between sumps or equipment shall be double containment piping conforming to Division 33 Section "Fiberglass Double Containment Piping."

B. Piping located above ground shall be single wall steel.

C. Double containment piping shall slope toward tank to allow any leakage captured by secondary containment pipe to drain back to tank leak detection equipment.

D. Single wall piping shall be used within sumps and equipment where confines act as secondary containment and have provisions for leak detection.

2.12 TRANSITION SUMPS

A. Containment sumps shall be furnished and installed at locations shown in contract drawings. Each sump shall be factory assembled, pre-pipes, liquid tight and constructed of fiberglass reinforced polymer.

B. Oil Extraction: In the event of a leak, the fuel oil shall be emptied from the sump by means of a vacuum truck and disposed of according to New York City Fueling Code.

C. Contractor shall provide transition sumps at locations shown to allow piping to transition from below ground to above. And shall provide access to and secondary containment of fuel lines as shown. Transition sumps shall be monitored with leak detection equipment.

D. Transition sumps shall have a water tight diamond plate access cover capable of withstanding H20 axle loads.

E. Transition sumps shall incorporate provisions to support a pipe rack system. Pipe rack systems shall be provided where shown, specified or as needed to support above ground piping exiting transition sumps.

F. Positive concrete anchoring shall be incorporated as an integral part of the sump design.

G. Transition sumps shall include 2-inch rigid pipe fittings where pipes exit sump above the ground.

H. Containment sumps shall have provisions to seal and terminate secondary containment pipe within. Piping annular space shall drain into the confines of the sump.

I. Transition sumps shall include above ground factory-sealed electrical connections.

2.13 UNDERGROUND STORAGE TANKS (UST)

A. UST shall conform to Division 33 Section "Underground Storage Tanks."

B. UST shall be located and sized as shown in contract drawings.

2.14 SYSTEM MONITORING

A. UST shall be monitored for leakage and level as described in Division 33 Section "Underground Storage Tanks."

2.15 ACCESSORIES

A. Spill Containment Fill Box Assemblies: Spill containment fill box assemblies shall be provided as shown on contract drawings. See Division 33 Section "Underground Storage Tanks" for details.

B. Spill Containment Pallets: Contractor shall provide six (6) 2-drum spill containment pallets with a minimum sump capacity of 62 US gallons. Pallets shall have a yellow tub with black grating, be constructed of polyethylene, have a load capacity of 2000 pounds and be equipped with a ¾ inch drain plug. Pallets shall have approximate dimension of 51 inches long by 26 ¼ inches wide by 15 inches deep.

C. Wall Mounted Pump Enclosure: Contractor shall provide one (1) wall mounted enclosure to house both the motor oil pump and hydraulic oil pump. Enclosure shall be constructed of type-304 stainless-steel, have a single-door, and have a NEMA 4X rating. Enclosure shall have minimum dimensions of 36 inch long by 36 inch wide by 12 inch deep. Enclosure shall be located as shown on contract drawings.

D. Signage:

1. Identification signs shall be provided and installed as shown, specified and as required by code and New York City regulations.
2. All fueling equipment, dispensers, pipes, sumps, fill boxes, vapor recovery equipment, and related shall be placarded in accordance with all applicable codes and laws including but not limited to any safety labels and instructions.
3. Each fill pipe shall be labeled with a tank information tag securely attached to the inside of the fill box (spot tack welding of the tag is not acceptable).
4. Emergency stop switches shall be clearly identified "EMERGENCY FUEL SHUTOFF".
5. Each dispenser access door shall bear a thirty-six (36) inch agency logo.

PART 3 - EXECUTION

3.1 EXECUTION REQUIREMENTS

A. Refer to DDC General Conditions for execution requirements.

3.1 INSTALLATION

A. All equipment and system components shall be installed in strict accordance with the most recent installation instructions provided by the manufacturer, NFPA, local ordinance, recognized engineering procedure, and New York City applicable codes.

B. Contractor shall be properly trained by manufacturer, the state, or other approved agency.

3.2 TESTING

A. System tests shall be according to manufacturer's guidelines at time of installation.

B. Manufacturer's Services: The contractor shall engage the supplier to supervise and/or perform checkout and start-up of all system components. As part of these services, the supplier shall include for those equipment items not manufactured by them, the services of an authorized manufacturer's representative to check the equipment installation and place the equipment in operation. The manufacturer's representative shall be thoroughly knowledgeable about the installation, operation and maintenance of the equipment.

C. A factory instructed representative shall be present at the first tank filling and dispensing operation at the facility.

3.3 INSTRUCTION

A. The manufacturer of the fuel dispensing system shall include one day of on-site classroom and hands-on instruction at the facility. The day is one session of 8 hours.

1. Maintenance – Instruction shall include operation of the system and regular maintenance (electrical, and mechanical). Additionally the City of New York key maintenance personnel shall be allowed to "shadow" the installation process whenever possible. By "shadowing" the equipment installation, the highest level of practical knowledge can be obtained.
2. Supervisors – Instruction shall include operation of the system and basic trouble shooting as a minimum.
3. Operators - Instruction shall provide use skills along with safety instruction.

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SECTION 221513.30
General-Service Compressed-Air Piping

PART 1 - GENERAL

1.1. RELATED DOCUMENTS

A. The following documents apply to all required work for the Project: (1) the Contract Drawings, (2) the Specifications, (3) the General Conditions, (4) the Addendum and (5) the Contract (City of New York Standard Construction Contract).

B. LEED General Requirements:

1. Refer to DDC General Conditions.

a. Section 01 81 13.04 "Sustainable Design Requirements for LEED v4 Buildings."

1.2. SUMMARY

A. Section includes piping and related specialties for general-service compressed-air systems.

B. Related Requirements:

1. Section 22 15 13 "Compressed Air Equipment" for general-service air compressors and accessories.

1.3. DEFINITIONS

A. Compressed-Air Condensate Waste Piping: System of compressed-air piping for condensate and specialties operating at pressures of 220 psig (1517 kPa) or less.

B. High-Pressure Compressed-Air Piping: System of compressed-air piping and specialties operating at pressures between 150 and 220 psig (1035 and 1517 kPa).

C. Low-Pressure Compressed-Air Piping: System of compressed-air piping and specialties operating at pressures of 150 psig (1035 kPa) or less.

1.4. PERFORMANCE REQUIREMENTS

A. Seismic Performance: Compressed-air piping and support and installation shall withstand the effects of earthquake motions.

1.5. SUBMITTALS

A. Refer to DDC General Conditions Section 01 33 00 "Submittal Procedures."

B. Product Data: For the following:

1. Aluminum tube, fittings, and valves.
2. Safety valves.
3. Pressure regulators. Include rated capacities and operating characteristics.
4. Automatic drain valves.
5. Quick couplings.

1.6. INFORMATIONAL SUBMITTALS

A. Qualification Data:

1. For manufacturer.
2. For installers.

B. Field quality-control reports.

1.7. CLOSEOUT SUBMITTALS

A. Product Brochures and Installation Instructions: To include in maintenance manuals.

1.8. QUALITY ASSURANCE

A. Refer to DDC General Conditions, section 01 40 00 "Quality Requirements."

B. Manufacturer Qualifications: Manufacturer meets the requirements of ISO 9001.

C. ASME Compliance:

1. Comply with ANSI/ASME B31.1, "Power Piping," for high- and low-pressure compressed-air piping.
2. Comply with ANSI/ASME B31.3, "Process Piping," for high- and low-pressure compressed-air piping.

1.9. WARRANTY

A. Manufacturer's Warranty for Aluminum Piping System: Manufacturer warrants aluminum pipe and fitting components to be free of leaks due to manufacturing defects within specified warranty period.

1. Special Warranty for Aluminum Piping System: 10 years from date of substantial completion.

1.10. PROJECT CONDITIONS

A. Interruption of Existing Compressed-Air Service: Do not interrupt compressed-air service to facilities occupied by the City of New York or others unless permitted under the following conditions and then only after arranging to provide temporary compressed-air service according to requirements indicated:

1. Notify Commissioner no fewer than (7) days in advance of proposed interruption of compressed-air service.

1. Do not proceed with interruption of compressed-air service without the Commissioner's written permission.

PART 2 - PRODUCTS

2.1. PIPES, TUBES, AND FITTINGS

A. Aluminum Piping System: Nickel-plated push-connect bite ring couplings, and galvanized ductile-iron roll-groove couplings.

1. Basis-of-Design Product: Subject to compliance with requirements, provide Applied System Technologies; Infinity Piping System and Elevation Piping System or a comparable product by one of the following:

   a. Gardner Denver, Inc.; Quick-Lock.
   b. Ingersoll-Rand; SimplAir.
   c. Or approved equal.

2. Source Limitations: Obtain aluminum piping systems and components from single source from single manufacturer.
3. Pressure and Temperature Range: Aluminum piping and related specialties for general-service compressed-air systems operating at 220 psig (1517 kPa) or less, across a temperature range of minus 4 deg F to plus 176 deg F (minus 20 deg C to plus 80 deg C).
4. Tubing: Aluminum pipe, alloy grade AA 6063-T5.
5. Pipe Coating: Powder coated paint certified non-toxic to AAMA 603 and 605.
6. Tubing shall be quality controlled to meet the tolerances specified by the roll groove or push-to-connect coupling manufacturer. The tubing manufacturer shall follow ISO 9001:2000 quality standards.
7. Pipe Identification: Decal with maximum working pressure and temperature supplied with each length of pipe.
8. Push-Connect Bite Ring Couplings, 14 mm to 63 mm: Solid-brass and nickel-plated body, high nitrile rubber O-ring seal in excess of 36-percent, and AISI Type 304 stainless-steel clamping washer.
9. Fittings: Solid-brass and nickel-plated.
10. Available sizes of couplings in first subparagraph below are 73, 90, 115, 168, 220, and 273 mm, which correspond approximately to piping larger than NPS 2-1/2 (DN 65).
11. Roll-Groove Couplings, 73 mm to 273 mm: Solid ductile-iron, galvanized, ASTM A 536 grade 65-45-12, nitrile rubber standard seals, and fluoroelastomer seals for high temperature applications.
12. Ball Valves, 20 mm to 63 mm: NPT threaded ends, or push-connect bite ring ends.
13. Butterfly Valves, 73 mm to 273 mm: Tube-to-tube, with two roll-groove end couplings.
14. Flanges, 73 mm to 273 mm: ASME B16.5, Class 150.

B. Pipe Hangers and Supports:

1. Basis-of-Design Product: Subject to compliance with requirements, provide Applied System Technologies; hangers and supports or comparable products by one of the following:

   a. Gardner Denver, Inc.; Quick-Lock Hangers.
   b. Ingersoll-Rand; SimplAir Hangers.
   a. Or approved equal.

2. Description: Wire rope utilizing adjustable camlock system with standard threaded stud for connection to provided hangers.
3. Hangers: UV-stabilized nylon and galvanized clevis style.

2.2. JOINING MATERIALS

A. Pipe-Flange Gasket Materials: Suitable for compressed-air piping system contents.

1. ASME B16.21, nonmetallic, flat, asbestos free, 1/8-inch (3.2-mm) maximum thickness unless thickness or specific material is indicated.

a. Full-Face Type: For flat-face, Class 125, cast-iron and cast-bronze flanges.
b. Narrow-Face Type: For raised-face, Class 250, cast-iron and steel flanges.

B. Flange Bolts and Nuts: ASME B18.2.1, carbon steel, unless otherwise indicated.

2.3. VALVES

A. Metal Ball, Butterfly, Check, and Gate Valves: Comply with requirements in Section 22 05 23 "General Duty Valves for Plumbing Piping".

2.4. FLEXIBLE PIPE CONNECTORS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Flex-Hose Co., Inc.
2. Flexicraft Industries.
3. Hyspan Precision Products, Inc.
4. Mercer Rubber Co.
5. Metraflex Company (The).
6. Proco Products, Inc.
7. Unaflex.
8. Universal Metal Hose.
9. Or approved equal.

B. Bronze-Hose Flexible Pipe Connectors: Corrugated-bronze tubing with bronze wire-braid covering and ends brazed to inner tubing.

1. Working-Pressure Rating: 250 psig (1725 kPa) minimum.
2. End Connections, 63 mm and Smaller: Threaded copper pipe or plain-end copper tube.
3. End Connections, 73 mm and Larger: Flanged copper alloy.

C. Stainless-Steel-Hose Flexible Pipe Connectors: Corrugated-stainless-steel tubing with stainless-steel wire-braid covering and ends welded to inner tubing.

1. Working-Pressure Rating: 200 psig minimum.
2. End Connections, 63 mm and Smaller: Threaded steel pipe nipple.
3. End Connections, 73 mm and Larger: Flanged steel nipple.

2.5. SPECIALTIES

A. Safety Valves: ASME Boiler and Pressure Vessel Code: Section VIII, "Pressure Vessels," construction; National Board certified, labeled, and factory sealed; constructed of bronze body with poppet-type safety valve for compressed-air service.

1. Pressure Settings: Higher than discharge pressure and same or lower than receiver pressure rating.

B. Air-Main Pressure Regulators: Semi-precise pressure regulator.

1. Basis-of-Design Product: Subject to compliance with requirements, provide Applied System Technologies; Optiflo or a comparable product by one of the following:

    a. Gardner Denver, Inc.; XMX.
    b. Ingersoll-Rand; Pace.
    c. Or approved equal.

2. Type: Semi-precise poppet valve operated, aluminum body, direct acting, spring-loaded manual pressure-setting adjustment.
3. Pressure: Maximum inlet pressure 300 psig (2070 kPa), control range of 0 to 160 psig (0 to 1100-kPa).
4. Gages: Supply and demand side gages to accurately control pressure and operate valve.

C. Air-Line Pressure Regulators: Semi-precise pressure regulator.

1. Basis-of-Design Product: Subject to compliance with requirements, provide Applied System Technologies; Optiflo or a comparable product by one of the following:

    a. Gardner Denver, Inc.; XMX.
    b. Ingersoll-Rand; Pace.
    c. Or approved equal.

2. Type: Semi-precise poppet valve operated, aluminum body, direct acting, spring-loaded manual pressure-setting adjustment.
3. Pressure: Maximum inlet pressure 300 psig (2070 kPa), control range of 0 to 160 psig (0 to 1100-kPa).
4. Gages: Supply and demand side gages to accurately control pressure and operate valve.

D. Automatic Drain Valves: Zero loss drains.

1. Basis-of-Design Product: Subject to compliance with requirements, provide Applied System Technologies; Powermizer or a comparable product by one of the following:

    a. Gardner Denver, Inc.
    b. SynergAir.
    c. Or approved equal.
2. Liquid level sensing, capable of automatic discharge of collected condensate.
3. Internal strainer, rated for 12 to 235 psig (83 to 1620 kPa).

E. Coalescing Filters: Coalescing type with activated carbon capable of removing water and oil aerosols; with color-change dye to indicate when carbon is saturated and warning light to indicate when selected maximum pressure drop has been exceeded.

F. Mechanical Filters: Two-stage, mechanical-separation-type, air-line filters. Equip with deflector plates, resin-impregnated-ribbon-type filters with edge filtration, and drain cock.

G. Air-Line Lubricators: With drip chamber and sight dome for observing oil drop entering air stream; with oil-feed adjustment screw and quick-release collar for easy bowl removal.

1. Provide with automatic feed device for supplying oil to lubricator.

2.6. QUICK COUPLINGS

A. Basis-of-Design Product: Subject to compliance with requirements, provide Applied System Technologies; quick couplings or comparable products by one of the following:

1. Aeroquip Corporation.
2. Bowes Manufacturing Inc.
3. Foster Manufacturing, Inc.
4. Milton Industries, Inc.
5. Parker Hannifin Corp.
6. Rectus Corp.
7. Schrader-Bridgeport/Standard Thomson.
8. TOMCO Products Inc.
9. Tuthill Corporation.
10. Or approved equal.

B. General Requirements for Quick Couplings: Assembly with locking-mechanism feature for quick connection and disconnection of compressed-air hose.

C. Automatic-Shutoff Quick Couplings: Straight-through brass body with O-ring or gasket seal and stainless-steel or nickel-plated-steel operating parts.

1. Socket End: With one-way valve and threaded inlet for connection to piping or threaded hose fitting.
2. Plug End: Flow-sensor-bleeder, check-valve type with barbed outlet for attaching hose.

D. Valveless Quick Couplings: Straight-through brass body with stainless-steel or brass, nickel-plated, operating parts.

1. Socket End: With O-ring or gasket seal, without valve, and with barbed inlet for attaching hose.
2. Plug End: With barbed outlet for attaching hose.

2.7. HOSE ASSEMBLIES

A. Description: Compatible hose, clamps, couplings, and splicers suitable for compressed-air service, of nominal diameter indicated, and rated for 300-psig (2070-kPa) minimum working pressure, unless otherwise indicated.

1. Hose: Reinforced double-wire-braid, CR-covered hose for compressed-air service.
2. Hose Clamps: Stainless-steel clamps or bands.
3. Hose Couplings: Two-piece, straight-through, threaded brass or stainless-steel O-ring or gasket-seal swivel coupling with barbed ends for connecting two sections of hose.
4. Hose Splicers: One-piece, straight-through brass or stainless-steel fitting with barbed ends for connecting two sections of hose.

PART 3 - EXECUTION

3.1. EXECUTION REQUIREMENTS

A. Refer to DDC General Conditions for execution requirements.

3.2. PIPING APPLICATIONS

A. Compressed-Air Piping between Air Compressors and Receivers: Use one of the following piping materials for each size range:

1. INFINITY, 63 mm and Smaller: Aluminum pipe; solid-brass nickel-plated fittings; and push-connect bite ring couplings.
2. ELEVATION, 73 mm and Larger: Aluminum pipe; and roll-groove couplings.

B. Low-Pressure Compressed-Air Distribution Piping: Use one of the following piping materials for each size range:

1. INFINITY, 63 mm and Smaller: Aluminum pipe; solid-brass nickel-plated fittings; and push-connect bite ring couplings.
2. ELEVATION, 73 mm and Larger: Aluminum pipe; and roll-groove couplings.

C. High-Pressure Compressed-Air Distribution Piping: Use one of the following piping materials for each size range:

1. INFINITY, 63 mm and Smaller: Aluminum pipe; solid-brass nickel-plated fittings; and push-connect bite ring couplings.
2. ELEVATION, 73 mm and Larger: Aluminum pipe; and roll-groove couplings.

D. Compressor Drain Lines: For compressor drain lines between air compressor, dryers, receivers, and accessory condensate drains, and the oil-water separator, use the following piping materials for size range:

1. INFINITY, 14 mm: Aluminum pipe; solid-brass nickel-plated fittings; and push-connect bite ring couplings.

3.3. VALVE APPLICATIONS

A. General-Duty Valves for Aluminum Piping Systems: Provide valves, made by piping system manufacturer, that are compatible with piping.

1. Aluminum Piping System: Ball and butterfly valves.

B. Metal General-Duty Valves: Comply with requirements and use valve types specified in 22 05 23 "General Duty Valves for Plumbing Piping" according to the following:

1. Low-Pressure Compressed Air: Valve types specified for low-pressure compressed air.
2. High-Pressure Compressed Air: Valve types specified for high-pressure compressed air.
3. Grooved-end valves may be used with grooved-end piping and grooved joints.

3.4. PIPING INSTALLATION

A. Coordinate piping installations and specialty arrangements with schematics on Drawings and with requirements specified.

B. Drawing plans, schematics, and diagrams indicate general location and arrangement of compressed-air piping. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, air-compressor sizing, and other design considerations. Install piping as indicated unless deviations to lay-out are approved on Coordination Drawings.

C. Install piping concealed from view and protected from physical contact by building occupants, unless otherwise indicated and except in equipment rooms and service areas.

D. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited, unless otherwise indicated.

E. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal and to coordinate with other services occupying that space.

F. Install piping adjacent to equipment and machines to allow service and maintenance.

G. Install air and drain piping with 1 percent slope downward in direction of flow.

H. Install nipples, flanges, unions, transition and special fittings, and valves with pressure ratings same as or higher than system pressure rating, unless otherwise indicated.

I. Equipment and Specialty Flanged Connections:

1. Use steel companion flange with gasket for connection to steel pipe.
2. Use cast-copper-alloy companion flange with gasket and brazed or soldered joint for connection to copper tube. Do not use soldered joints for connection to air compressors or to equipment or machines producing shock or vibration.

J. Install concentric reducers where compressed-air piping is reduced in direction of flow.

K. Install branch connections 73 mm and larger, to compressed-air mains from top of main. Provide drain leg and drain trap at end of each main and branch and at low points.

L. Install branch connections 63 mm and smaller, to compressed-air mains using Applied System Technologies reducing outlet tee with water trapping capabilities. Provide drain leg and drain trap at end of each main and branch and at low points.

M. Install thermometer and pressure gage on discharge piping from each air compressor and on each receiver. Comply with requirements in Section 220519 "Meters and Gages for Plumbing Piping."

N. Install piping to permit valve servicing.

O. Install piping free of sags and bends.

P. Install fittings for changes in direction and branch connections.

Q. Install seismic restraints on piping. Seismic-restraint devices are specified in Section 23 05 48 "Vibration and Seismic Controls for HVAC Piping and Equipment."

R. Install sleeves for piping penetrations of walls, ceilings, and floors. Comply with requirements for sleeves specified in Section 220500 "Common Work Results for Plumbing."

S. Install sleeve seals for piping penetrations of concrete walls and slabs. Comply with requirements for sleeve seals specified in Section 220500 "Common Work Results for Plumbing."

T. Install escutcheons for piping penetrations of walls, ceilings, and floors. Comply with requirements for escutcheons specified in Section 220500 "Common Work Results for Plumbing."

U. ALUMINUM PIPING SYSTEM INSTALLATION, ADDITIONAL REQUIREMENTS

A. Install aluminum piping systems according to manufacturer's instructions, using manufacturer's recommended tools, accessories, and methods.

B. Support aluminum pipe using manufacturer's hangers and supports, designed for use with the system.

C. Allow for expansion and contraction of the aluminum piping system.

D. Do not use plastic components or plastic fittings of any kind within the pressurized aluminum piping system. This applies to main headers, branches, and drops.

3.5. JOINT CONSTRUCTION

A. Deburr outside diameter on ends of tubing to remove burrs.

B. Chamfer outside diameter ends of 14 mm to 63 mm tubing to ensure proper fitting installation.

C. Flanged Joints: Use asbestos-free, nonmetallic gasket suitable for compressed air. Join flanges with gasket and bolts according to ASME B31.9 for bolting procedure.

D. Grooved Joints: Assemble couplings with housing, gasket, lubricant, and bolts. Join according to AWWA C606 for grooved joints. Do not apply lubricant to prelubricated gaskets.

3.6. VALVE INSTALLATION

A. General-Duty Valves: Comply with requirements in Section 22 05 23 "General Duty Valves for Plumbing Piping"

B. Install shutoff valves and unions or flanged joints at compressed-air piping to air compressors.

C. Install shutoff valve at inlet to each automatic drain valve, filter, lubricator, and pressure regulator.

D. Install check valves to maintain correct direction of compressed-air flow to and from compressed-air piping specialties and equipment.

3.7. SPECIALTY INSTALLATION

A. Install safety valves on receivers in quantity and size to relieve at least the capacity of connected air compressors.

B. Install air-main pressure regulators in compressed-air piping at or near compressed-air storage tank.

C. Install air-line pressure regulators in branch piping to equipment and tools.

D. Install automatic drain valves on aftercoolers, receivers, and dryers. Discharge condensate shall be piped and connected to oil-water separator.

E. Install coalescing filters in compressed-air piping at or near air compressors and upstream from mechanical filters.

F. Install mechanical filters in compressed-air piping at or near air compressors and downstream from coalescing filters.

G. Install quick couplings at piping terminals for hose connections.

H. Install hose assemblies at hose connections.

3.8. HANGER AND SUPPORT INSTALLATION

A. Comply with requirements in Section 23 05 48 "Vibration and Seismic Controls for HVAC Piping and Equipment" for seismic-restraint devices.

B. Use manufacturer's hangers and supports for aluminum piping systems.

C. Comply with requirements in Section 220529 "Hangers and Supports for Plumbing Piping and Equipment" for pipe hanger and support devices.

D. Vertical Piping: Supports and clamps approved for use by piping system manufacturer.

E. Individual, Straight, Horizontal Piping Runs:

1. 100 Feet or Less: Adjustable, steel clevis hangers or hangers approved for use by piping system manufacturer.
2. Longer Than 100 Feet : Adjustable, steel clevis hangers or hangers approved for use by piping system manufacturer.

F. Multiple, Straight, Horizontal Piping Runs 100 Feet (30 m) or Longer: Support pipe rolls on trapeze.

G. Support horizontal piping within 12 inches (300 mm) of each fitting and coupling.

H. Threaded rod may be used in conjunction with piping system manufacturer's clevis hangers, struts, and strut brackets.

I. Install hangers for aluminum piping every 8 feet

J. Install supports for vertical aluminum piping every 8 feet

3.9. LABELING AND IDENTIFICATION

A. Install identifying labels provided by Applied System Technologies for general-service compressed-air piping system. Comply with requirements in Section 220553 "Identification for Plumbing Piping and Equipment."

3.10. FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Follow provided test instructions from manufacturer.

C. Tests and Inspections:

1. Piping Leak Tests for Aluminum Compressed-Air Piping: Test new piping system and modified parts of existing piping system. Evacuate all areas where test is being performed for duration of testing. Cap and fill general-service compressed-air piping system to pressure of 15 psig (105 kPa), hold pressure for 10 minutes. Repeat until reaching required operating pressure, not to exceed 220 psig (1515 kPa). Once desired operating pressure is met, let stand for one hour.
2. Repair leaks and retest until no leaks exist.
3. Inspect filters, lubricators, and pressure regulators for proper operation.

D. Prepare test and inspection reports.

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SECTION 223500
Domestic Water Heat Exchangers

PART 1 - GENERAL

1.1. RELATED DOCUMENTS

A. The following documents apply to all required work for the Project: (1) the Contract Drawings, (2) the Specifications, (3) the General Conditions, (4) the Addendum and (5) the Contract (City of New York Standard Construction Contract).

B. LEED General Requirements.

1. Refer to DDC General Conditions.

a. Section 01 81 13.04 "Sustainable Design Requirements for LEED v4 Buildings."

1.2. SUMMARY

A. This Section includes plate heat exchangers.

1.3. SUBMITTALS

A. Refer to DDC General Conditions Section 01 33 00 "Submittal Procedures."

B. Product Data: Include rated capacities, operating characteristics, furnished specialties, and accessories.

C. Operation and Maintenance Data: For heat exchangers to include in emergency, operation, and maintenance manuals.

1.4. QUALITY ASSURANCE

A. Refer to DDC General Conditions Section 01 40 00 "Quality Requirements."

B. Product Options: Drawings indicate size, profiles, performance, and dimensional requirements of heat exchangers and are based on the specific equipment indicated. Refer to DDC General Condition Section "Product Requirements."

C. ASME Compliance: Fabricate and label heat exchangers to comply with ASME Boiler and Pressure Vessel Code: Section VIII, "Pressure Vessels," Division 1.

D. ARI Standard 400

PART 2 - PRODUCTS

2.1. PLATE HEAT EXCHANGERS

A. Manufacturers:

1. Plate Concepts
2. Sondex Inc. USA
3. API Heat Transfer Inc.
4. FlatPlate, Inc.
5. ITT Industries; Bell & Gossett.
6. Mueller, Paul Company.
7. Polaris Plate Heat Exchangers.
8. Tranter PHE, Inc.
9. Bell & Gossett.
10. Tigerflow.
11. Or approved equal.

B. Configuration: Brazed assembly consisting of two end plates, one with threaded nozzles and pattern-embossed plates, double wall construction.

C. End-Plate Material: Type 316 stainless steel.

D. Threaded Nozzles: Type 316 stainless steel.

E. Plate Material: Type 316 stainless steel.

F. Brazing Material: Copper.

G. Frame Material: Carbon Steel

PART 3 - EXECUTION

3.1. EXECUTION REQUIREMENTS

A. Refer to DDC General Conditions for execution requirements.

3.2. EXAMINATION

A. Examine areas for compliance with requirements for installation tolerances and for structural rigidity, strength, anchors, and other conditions affecting performance of heat exchangers.

1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.3. HEAT-EXCHANGER INSTALLATION

A. Concrete Bases: Anchor heat exchanger to concrete base.

1. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch centers around full perimeter of base.
2. For supported equipment, install epoxy-coated anchor bolts that extend through concrete base and anchor into structural concrete floor.
3. Place and secure anchorage devices. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
4. Install anchor bolts to elevations required for proper attachment to supported equipment.
5. Cast-in-place concrete materials and placement requirements are specified in Division 03.

3.4. CONNECTIONS

A. Piping installation requirements are specified in Section 23 57 00 "Heat Exchangers for HVAC." Drawings indicate general arrangement of piping, fittings, and specialties.

B. Maintain manufacturer's recommended clearances for service and maintenance. Install piping connections to allow service and maintenance of heat exchangers.

C. Install shutoff valves at heat-exchanger inlet and outlet connections.

D. Install relief valves on heat-exchanger heated-fluid connection and install pipe relief valves, full size of valve connection, to floor drain.

E. Install hose end valve to drain shell.

3.5. FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust field-assembled components and equipment installation, including connections, and to assist in field testing. Report results in writing.

B. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

C. Perform the following field tests and inspections and prepare test reports:

1. Leak Test: After installation, test for leaks. Repair leaks and retest until no leaks exist.
2. Operational Test: After electrical circuitry has been energized, confirm proper operation.
3. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

D. Remove and replace heat exchangers that do no pass tests and inspections and retest as specified above.

3.6. CLEANING

A. After completing system installation, including outlet fitting and devices, inspect exposed finish. Remove burrs, dirt, and construction debris and repair damaged finishes.

3.7. DEMONSTRATION

A. Engage a factory-authorized service representative to instruct the City of New York's maintenance personnel to adjust, operate, and maintain heat exchangers. Refer to DDC General Condition Section "Demonstration and Instruction."

END OF SECTION 223500

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SECTION 224000
Plumbing Fixtures

PART 1 - GENERAL

1.1. RELATED DOCUMENTS

A. The following documents apply to all required work for the Project: (1) the Contract Drawings, (2) the Specifications, (3) the General Conditions, (4) the Addendum and (5) the Contract (City of New York Standard Construction Contract).

B. LEED General Requirements:

1. Refer to DDC General Conditions.

a. Section 01 81 13.04 "Sustainable Design Requirements for LEED v4 Buildings."

1.2. SUMMARY

A. This Section includes the following conventional plumbing fixtures and related components:

1. Faucets for lavatories, bathtub/showers and sinks.
2. Toilet seats.
3. Protective shielding guards.
4. Fixture supports.
5. Dishwasher air-gap fittings.
6. Water closets.
7. Lavatories.
8. Kitchen sinks.
9. Service sinks.
10. Service basins.
11. Drinking Fountains.
12. Urinals.

B. Related Sections include the following:

1. Section 102813 "Toilet Accessories."
2. Section 221119 "Domestic Water Piping Specialties" for backflow preventers, floor drains, and specialty fixtures not included in this Section.
3. Section 221113 "Facility Water Distribution Piping" for exterior plumbing fixtures and hydrants.

1.3. DEFINITIONS

A. Accessible Fixture: Plumbing fixture that can be approached, entered, and used by people with disabilities.

B. Cast Polymer: Cast-filled-polymer-plastic material. This material includes cultured-marble and solid-surface materials.

C. Cultured Marble: Cast-filled-polymer-plastic material with surface coating.

D. Fitting: Device that controls the flow of water into or out of the plumbing fixture. Fittings specified in this Section include supplies and stops, faucets and spouts, shower heads and tub spouts, drains and tail-pieces, and traps and waste pipes. Piping and general-duty valves are included where indicated.

E. Solid Surface: Nonporous, homogeneous, cast-polymer-plastic material with heat-, impact-, scratch-, and stain-resistance qualities.

1.4. SUBMITTALS

A. Refer to DDC General Conditions Section 01 33 00 "Submittal Procedures."

B. Product Data: For each type of plumbing fixture indicated. Include selected fixture and trim, fittings, accessories, appliances, appurtenances, equipment, and supports. Indicate materials and finishes, dimensions, construction details, and flow-control rates.

C. Operation and Maintenance Data: For plumbing fixtures to include in emergency, operation, and maintenance manuals.

D. Warranty: Special warranty specified in this Section.

1.5. QUALITY ASSURANCE

A. Refer to DDC General Conditions Section 01 40 00 "Quality Requirements."

B. Materials and work shall conform to the latest edition of reference specifications specified herein and to codes and requirements of NYC Department of Buildings.

C. Source Limitations: Obtain plumbing fixtures, faucets, and other components of each category through one source from a single manufacturer.

1. Exception: If fixtures, faucets, or other components are not available from a single manufacturer, obtain similar products from other manufacturers specified for that category.

D. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to NYC Department of Buildings, and marked for intended use.

E. Regulatory Requirements: Comply with requirements in ICC A117.1, "Accessible and Usable Buildings and Facilities" for plumbing fixtures for people with disabilities, Public Law 102-486, "Energy Policy Act," about water flow and consumption rates for plumbing fixtures, New York City Plumbing Code.

F. NSF Standard: Comply with NSF 61, "Drinking Water System Components--Health Effects," for fixture materials that will be in contact with potable water.

G. Select combinations of fixtures and trim, faucets, fittings, and other components that are compatible.

H. Comply with the following applicable standards and other requirements specified for plumbing fixtures:

1. Enameled, Cast-Iron Fixtures: ASME A112.19.1M.
2. Plastic Bathtubs: ANSI Z124.1.
3. Plastic Lavatories: ANSI Z124.3.
4. Plastic Laundry Trays: ANSI Z124.6.
5. Plastic Mop-Service Basins: ANSI Z124.6.
6. Plastic Shower Enclosures: ANSI Z124.2.
7. Porcelain-Enameled, Formed-Steel Fixtures: ASME A112.19.4M.
8. Slip-Resistant Bathing Surfaces: ASTM F 462.
9. Solid-Surface-Material Lavatories and Sinks: ANSI/ICPA SS-1.
10. Stainless-Steel Commercial, Handwash Sinks: NSF 2 construction.
11. Stainless-Steel Residential Sinks: ASME A112.19.3.
12. Vitreous-China Fixtures: ASME A112.19.2M.
13. Water-Closet, Flush Valve, Tank Trim: ASME A112.19.M.
14. Sanitary Floor Sink: ASME A112.6.7.

I. Comply with the following applicable standards and other requirements specified for lavatory and sink faucets:

1. Faucets and fixture fittings shall conform to ASME A112.18.1 or CSA B125.
2. NSF Potable-Water Materials: NSF 61.

J. Comply with the following applicable standards and other requirements specified for bathtub and shower faucets:

1. Backflow Protection Devices for Hand-Held Showers: ASME A112.18.3M.
2. Combination, Pressure-Equalizing and Thermostatic-Control Antiscald Faucets: ASSE 1016.
3. Deck-Mounted Bath/Shower Transfer Valves: ASME A112.18.7.
4. Faucets and fixture fittings with hose-connected outlets: ASME A112.18.3.M.
5. Hand-Held Showers: ASSE 1014 or CSA B125.
6. High-Temperature-Limit Controls for Thermal-Shock-Preventing Devices: ASTM F 445.
7. Hose-Coupling Threads: ASME B1.20.7.
8. Manual-Control Antiscald Faucets: ASTM F 444.
9. Pipe Threads: ASME B1.20.1.
10. Pressure-Equalizing-Control Antiscald Faucets: ASTM F 444 and ASSE 1016.
11. Sensor-Actuated Faucets and Electrical Devices: UL 1951.
12. Thermostatic-Control Antiscald Faucets: ASTM F 444 and ASSE 1016.

K. Comply with the following applicable standards and other requirements specified for miscellaneous fittings:

1. Atmospheric Vacuum Breakers: ASSE 1001.
2. Brass and Copper Supplies: ASME A112.18.1.
3. Dishwasher Air-Gap Fittings: ASSE 1021.
4. Manual-Operation Flushometers: ASSE 1037.
5. Brass Waste Fittings: ASME A112.18.2.
6. Sensor-Operation Flushometers: ASSE 1037 and UL 1951.

L. Comply with the following applicable standards and other requirements specified for miscellaneous components:

1. Disposers: ASSE 1008 and UL 430.
2. Dishwasher Air-Gap Fittings: ASSE 1021.
3. Flexible Water Connectors: ASME A112.18.6.
4. Floor Drains: ASME A112.6.3.
5. Grab Bars: ASTM F 446.
6. Hose-Coupling Threads: ASME B1.20.7.
7. Hot-Water Dispensers: ASSE 1023 and UL 499.
8. Off-Floor Fixture Supports: ASME A112.6.1M.
9. Pipe Threads: ASME B1.20.1.
10. Plastic Shower Receptors: ANSI Z124.2.
11. Plastic Toilet Seats: ANSI Z124.5.
12. Supply and Drain Protective Shielding Guards: ICC A117.1.

PART 2 - PRODUCTS

2.1. GENERAL

A. Fixture specifications are for reference information only. Contractor shall obtain approval from Commissioner for all fixtures prior to installation.

B. Fixture model numbers are indicated to establish type and quality. Fixtures shall be white, unless otherwise noted.

C. Trim which includes faucets, strainers, escutcheons, lavatory supplies, etc., shall be made of brass and shall be polished chromium-plated. Material specified as chromium-plated shall be thoroughly and evenly applied and guaranteed not to strip or peel. Plated work shall be highly buffed. Plastic, zinc or white metal will not be approved.

D. All fixtures shall be separately controlled by individual stops. Shower water supplies shall have screwdriver stops.

E. Faucets shall have indexes.

F. All trim shall be permanently stamped with manufacturer's identification and visible after installation.

G. For plumbing fixtures refer to Plumbing Fixture Schedule drawing # A1-603.

H. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Toto.
2. Bradley.
3. Kohler.
4. Delta.
5. American Standard.
6. Or Approved Equal

PART 3 - EXECUTION

3.1. EXECUTION REQUIREMENTS

A. Refer to DDC General Conditions for execution requirements.

3.2. INSTALLATION

A. Assemble plumbing fixtures, trim, fittings, and other components according to manufacturers' written instructions.

B. Install off-floor supports, affixed to building substrate, for wall-mounting fixtures.

1. Use carrier supports with waste fitting and seal for back-outlet fixtures.
2. Use carrier supports without waste fitting for fixtures with tubular waste piping.
3. Use chair-type carrier supports with rectangular steel uprights for accessible fixtures.

C. Install floor-mounting fixtures on closet flanges or other attachments to piping or building substrate.

D. Install wall-mounting fixtures with tubular waste piping attached to supports.

E. Install floor-mounting, back-outlet water closets attached to building floor substrate and wall bracket and onto waste fitting seals.

F. Install counter-mounting fixtures in and attached to casework.

G. Install fixtures level and plumb according to roughing-in drawings.

H. Install water-supply piping with stop on each supply to each fixture to be connected to water distribution piping. Attach supplies to supports or substrate within pipe spaces behind fixtures. Install stops in locations where they can be easily reached for operation.

1. Exception: Use ball, gate, or globe valves if supply stops are not specified with fixture. Valves are specified in Section 220523 "General-Duty Valves for Plumbing Piping."

I. Install trap and tubular waste piping on drain outlet of each fixture to be directly connected to sanitary drainage system.

J. Install tubular waste piping on drain outlet of each fixture to be indirectly connected to drainage system.

K. Install flushometer valves for accessible water closets and urinals with handle mounted on wide side of compartment. Install other actuators in locations that are easy for people with disabilities to reach.

L. Install tanks for accessible, tank-type water closets with lever handle mounted on wide side of compartment.

M. Install toilet seats on water closets.

N. Install trap-seal liquid in dry urinals.

O. Install faucet-spout fittings with specified flow rates and patterns in faucet spouts if faucets are not available with required rates and patterns. Include adapters if required.

P. Install water-supply flow-control fittings with specified flow rates in fixture supplies at stop valves.

Q. Install faucet flow-control fittings with specified flow rates and patterns in faucet spouts if faucets are not available with required rates and patterns. Include adapters if required.

R. Install shower flow-control fittings with specified maximum flow rates in shower arms.

S. Install traps on fixture outlets.

1. Exception: Omit trap on fixtures with integral traps.
2. Exception: Omit trap on indirect wastes, unless otherwise indicated.

T. Install disposer in outlet of each sink indicated to have disposer. Install switch where indicated or in wall adjacent to sink if location is not indicated.

U. Install dishwasher air-gap fitting at each sink indicated to have air-gap fitting. Connect inlet hose to dishwasher and outlet hose to disposer.

V. Install hot-water dispensers in back top surface of sink or in countertop with spout over sink.

W. Install escutcheons at piping wall ceiling penetrations in exposed, finished locations and within cabinets and millwork. Use deep-pattern escutcheons if required to conceal protruding fittings. Escutcheons are specified in Section 220500 "Common Work Results for Plumbing."

X. Set bathtubs and service basins in leveling bed of cement grout. Grout is specified in Section 220500 "Common Work Results for Plumbing."

3.3. CONNECTIONS

A. Piping installation requirements are specified in other plumbing specification sections. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Connect fixtures with water supplies, stops, and risers, and with traps, soil, waste, and vent piping. Use size fittings required to match fixtures.

C. Ground equipment according to Section 260526 "Grounding and Bonding for Electrical Systems."

D. Connect wiring according to Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

3.4. FIELD QUALITY CONTROL

A. Verify that installed plumbing fixtures are categories and types specified for locations where installed.

B. Check that plumbing fixtures are complete with trim, faucets, fittings, and other specified components.

C. Inspect installed plumbing fixtures for damage. Replace damaged fixtures and components.

D. Test installed fixtures after water systems are pressurized for proper operation. Replace malfunctioning fixtures and components, then retest. Repeat procedure until units operate properly.

E. Install fresh batteries in sensor-operated mechanisms.

3.5. ADJUSTING

A. Operate and adjust faucets and controls. Replace damaged and malfunctioning fixtures, fittings, and controls.

B. Adjust water pressure at faucets to produce proper flow and stream.

C. Replace washers and seals of leaking and dripping faucets and stops.

D. Install fresh batteries in sensor-operated mechanisms.

3.6. CLEANING

A. Clean fixtures, faucets, and other fittings with manufacturers' recommended cleaning methods and materials. Do the following:

1. Remove faucet spouts and strainers, remove sediment and debris, and reinstall strainers and spouts.
2. Remove sediment and debris from drains.

B. After completing installation of exposed, factory-finished fixtures, faucets, and fittings, inspect exposed finishes and restore damaged finishes.

3.7. PROTECTION

A. Provide protective covering for installed fixtures and fittings.

B. Do not allow use of plumbing fixtures for temporary facilities unless approved in writing by the Commissioner.

END OF SECTION 224000

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SECTION 230500
Common Work Results for HVAC

PART 1 - GENERAL

1.1. RELATED DOCUMENTS

A. The following documents apply to all required work for the Project: (1) the Contract Drawings, (2) the Specifications, (3) the General Conditions, (4) the Addendum and (5) the Contract (City of New York Standard Construction Contract).

B. LEED General Requirements:

1. Refer to DDC General Conditions.
   a. Section 01 33 00 "Submittal Procedures."
   b. Section 01 81 13.04 "Sustainable Design Requirements for LEED v4 Buildings."
   c. Section 01 81 19 "Indoor Air Quality Requirements for LEED Building."

1.2. SUMMARY

A. This specification is intended to cover all the labor and material necessary for proper installation of the following work:

1. Provide air handling systems as indicated on the drawings.
2. Provide duct work, diffusers, registers, dampers, insulation, acoustic lining, accessories, etc., as specified herein or as indicated on the drawings.
3. Provide pumping systems.
4. Provide hot water, refrigerant and condensate drain piping systems, insulation, hangers, etc.
5. All necessary hangers for ducts, equipment and piping.
6. Exhaust systems and return/exhaust systems including all ductwork, hangers and accessories.
7. All temperature controls including control wiring.
8. Testing, adjusting and balancing of all systems.
9. Shop drawings.
10. Record drawings.
11. As-built drawings.
12. Provide seismic bracing and/or anchor for all life safety equipment as per New York City Local Law 17/95.

1.3. COORDINATION

A. Dimensional layout plans of equipment rooms shall be made showing all bases, pads and inertia blocks required for mechanical equipment. Include dimensions of bases, bolt layouts, details, etc.

B. Contractor shall furnish all necessary templates, patterns, etc., for installing work and for purpose of making adjoining work conform, furnish setting plans and shop details to other trades as required.

1.4. ACOUSTICAL PERFORMANCE OF EQUIPMENT AND SYSTEMS

A. Noise levels from operation of motor driven equipment, whether airborne or structure-borne, and noise levels created by or within air handling equipment and air distribution and control media, are not to exceed sound pressure levels determined by the ASHRAE noise criteria curves and NYC Noise Code.

B. Acoustical Tests shall be conducted by an acoustical consultant:

1. The Commissioner may conduct room sound tests for those areas he deems too noisy.

2. If NC level in any space exceeds that in the schedule or the specification due to improper installation or operation of mechanical systems, make remedial changes or restores.

3. Respective Trade is required to retest until specified criteria has been met.

1.5. SUBMITTAL PROCEDURES

A. Refer to DDC General Conditions Section 01 33 00 "Submittal Procedures."

1.6. QUALITY ASSURANCE

A. Refer to DDC General Conditions Section 01 40 00 "Quality Requirements."

PART 2 - PRODUCTS

(Not Used)

PART 3 - EXECUTION

3.1. EXECUTION REQUIREMENTS

A. Refer to DDC General Conditions for execution requirements.

END OF SECTION 230500

SECTION 230513
Common Motor Requirements For HVAC Equipment

PART 1 - GENERAL

1.1. RELATED DOCUMENTS

A. The following documents apply to all required work for the Project: (1) the Contract Drawings, (2) the Specifications, (3) the General Conditions, (4) the Addendum and (5) the Contract (City of New York Standard Construction Contract).

1.2. SUMMARY

A. Work Included: The work includes, but is not necessarily limited to the following:

1. Providing all motors and motor controls as specified herein, as indicated on the drawings, and as needed for a complete and proper installation.

B. Related Work: The following related items are specified in other sections of the specifications:

2.	Centrifugal HVAC Fans	Section 233416
3.	Instrumentation and Control for HVAC	Section 230900
4.	Sequence of Operations for HVAC Controls	Section 230993

1.3. QUALITY ASSURANCE

A. Refer to DDC General Conditions Section 01 40 00 "Quality Requirements."

B. Codes and Standards:

1. UL Compliance: Construct motors and motor controls in compliance with UL Standards. All electrical components shall be UL listed or labeled.
2. NEC: All fans shall be AMCA certified.
3. NEMA: All electrical devices shall conform to NEMA standards.
4. NEC: All wiring shall conform to the NEC.

1.4. SUBMITTALS

A. Refer to DDC General Conditions Section 01 33 00 "Submittal Procedures."

B. Product Data: Catalog cuts, specifications, installation and instructions.

C. Schedule: List manufacturer, unit type, model number, and performance data for each motor control device unit along with their location.

D. Wiring Diagrams: Submit manufacturer's electrical requirements for power supply wiring to motor control device. Submit manufacturer's wiring diagrams for interlock and control wiring. Clearly differentiate between portions of wiring that are factory-installed and portions to be field installed.

E. Motors furnished, as part of packaged units shall be standard with the unit manufacturer.

1.5. DELIVERY, STORAGE AND HANDLING

A. Handle motors and controls carefully to prevent damage, breaking, denting and scoring. Do not install damaged units or components; replace with new.

B. Store motor controls units in clean dry place. Protect from weather, dirt, fumes, water, construction debris and physical damage.

C. Comply with manufacturer's installation instructions.

PART 2 - PRODUCTS

2.1. GENERAL

A. Motors

1. All motors shall conform to the requirements listed herein.
2. Each motor shall have capacity to start and operate machine it drives without exceeding motor nameplates rating at the speed specified or at any speed and load which may be obtained by drive provided.
3. Each motor that is provided with automatic control shall be capable of making as frequent starts as control device demands without damage and without exceeding the maximum permissible hot spot temperature. Motors not provided with automatic control shall be capable of making not less than 4 starts per hour without damage and without exceeding the maximum permissible hot spot temperature.
4. All belt-connected motors shall be equipped with shafts and bearings that will withstand both the belt pull of drive furnished and momentary or continuous overloads due to acceleration or incorrect belt tension.
5. Motors shall be rated for continuous duty at 100 percent of rated capacity, and temperature rise shall be based on an ambient temperature of 40 degrees centigrade. Service factors shall be as follows:
6. Open Drip Proof Enclosure 1.15
7. Totally Enclosed Fan Cooled 1.00
8. Encapsulated Windings1.00
9. One-half horsepower and larger motors shall be three phase and motors smaller than one-half horsepower shall be single phase. See schedule drawings for details.
10. Three phase motors shall be Type II - Polyphase, Class B insulated, Style A2 (ODP or B2 TEFC) NEMA Design B. squirrel cage induction.
11. Unless otherwise specified, single phase motors shall be of open, capacitor start type. Single phase motors shall be wound for 115 volts, 60 cycle alternating current and may be either single or dual voltage type. In lieu of capacitor start type, 1/6 horsepower and smaller motors may be of the split-phase type except for fan coil units.
12. Motor leads shall be terminated with solderless pressure type connectors.

13. Each direct-connected motor shall be mounted in accurate alignment. The drive shall be free from both angular and parallel misalignment when both motor and driven machine are operating at operating temperatures. Each belt-connected motor shall be provided with an adjustable base to permit installation and adjustment of belts.
14. Insulation resistance between starter conductors and frames of motors at time of final inspection shall be not less than one-half megohm.
15. No shop test of motors will be required but the temperature rise, insulation resistance and general operating characteristics shall be witnessed by the Commissioner at the time of final inspection.
16. Motors shall have cast terminal boxes for watertight flexible watertight connections.
17. Motors weighing over 25 pounds shall be provided with lifting eyes. Bases shall be cast iron frame mounted except where motor frame is attached directly to the load machinery base.
18. Enclosure for motors shall be as follows:
    a. Dry, indoor locations, open drip proof.
    b. Outdoor, 1/2 through 20 horsepower - totally enclosed.
19. Motors shall be single speed as indicated on the drawings.
20. Motors shall have proper characteristics to suit specified makes of equipment. Unless indicated otherwise, the motor horsepower shown shall be the minimum acceptable and the motor speed the maximum acceptable. Motor speed shall be 1800 RPM unless otherwise indicated.
21. Motors and accessories shall comply in all respects with ANSI, MEC and NEMA Standards.
22. Motors size 1 to 25 HP shall be energy efficient type, Gould E-plus, Westinghouse "MAC 11" or Louis Allis "Pacemaker Spartan" or equal.
23. Acceleration time (zero to synchronous speed) shall not exceed 15 seconds.
24. Locked rotor code letter designation (KVA/HP) for all motors shall not exceed "F".
25. All motors shall have sealed bearings.

2.2. POWER FACTOR CORRECTION

A. All motors, 1 1/2HP and larger, having a power factor less than 85%, shall be corrected to at least 90% under rated load conditions. By the use of Power factor correction equipment furnished and installed by this Section of the work. Power factor corrective devices shall be switched with the motors except where this results in an unsafe condition or interferes with the intended operation of the equipment.

2.3. NAMEPLATE DATE

A. The motor nameplate and connection diagram shall be stainless steel and contain the following information:

1. Manufacturer's name
2. Rated volts and full load current
3. Rated frequency and number of phases
4. Rated full load speed
5. Rated temperature rise and rated ambient temperature
6. Time rating
7. Rating horsepower
8. Locked rotor code letter

B. Motors starting on wye connection and running on delta, shall be marked with the code letter corresponding to the wye connection.

C. Dual voltage motors, which have a different locked rotor KVA on the two voltages, shall be marked with the code letter for the voltage giving the highest locked rotor KVA.

1. NEMA design letter
2. Service factor

D. In general, motors shall be furnished integrally mounted on all items of mechanical equipment.

2.4. MOTOR STARTERS AND CONTROLS

A. All motor controllers and starters integral with equipment or furnished as part of the equipment control panel shall be in accordance with the following:

1. Each controller, mounted in NEMA type enclosure shall be suitable for the particular service and/or location as approved.
2. Provide HOA switch in starter covers for all motors automatically controlled. Pushbuttons not required where HOA switches are used.
3. Provide control circuit fusing in all controllers.
4. Provide all necessary auxiliary contacts and transformers in starters as required. Provide time delay relays for all interlocked motors.
5. All pilot lights shall be incandescent; candelabra base receptacles, with red or green jewel as approved. Provide pilot lights where required as follows:
6. Starters with start-up pushbutton: 1 pilot light to indicate "Motor On".
7. Starters with HOA switches: 1 pilot light to indicate "Motor On".
8. All motor controllers and starters individually mounted shall be of the following type:
9. Combination fused or unfused disconnect switch and magnetic unfused controller with overload protection and low voltage protection.
10. Manual toggle switch operation 2 pole or single pole starter with overload protection in approved NEMA enclosure. Where motors are installed remote from starters, provide pilot light.
11. Provide all starters with reset button in cover and overload protection. For 3 phase starters, all three phases shall have overload protection.
12. Provide current limiting fuses in all units requiring fuse protection to suit the Selective Protection System on this job.
13. Enclosure sizes and wiring terminals shall be suitable for the application of both copper and aluminum power control circuit wires.
14. Starters shall be subject to the approval, as to limit of inrush current, as set up by the Utility Company. In general, magnetic starters shall be located close to the equipment controlled.
15. Motor starters for motors 1/2 HP and over and all automatically controlled motors shall be magnetic across the line type.
16. Motor starters for motors smaller than 1/2 HP and not automatically controlled shall be manual thermal overload switch type.

2.5. FACTORY FURNISHED CONTROL PANELS

A. The packaged control panel furnished with packaged units shall be provided with a circuit breaker and a magnetic starter with three (3) overloads for each motor. The incoming line lugs shall be arranged to accept a separate branch circuit to each circuit breaker. A control power transformer shall be provided and served via a transfer relay with power taken from the load side of each incoming line circuit breaker.

PART 3 - EXECUTION

3.1. EXECUTION REQUIREMENTS

A. Refer to DDC General Conditions for execution requirements.

3.2. ELECTRICAL WIRING

A. Provide all necessary wiring diagrams indicating wire size and connections as required for the proper operation of the equipment.

B. Contractor shall be responsible for replacing all fuses in the electrical systems during construction, which blow due to tests or malfunction of his motorized or other electrical equipment.

END OF SECTION 230513

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SECTION 230516
Expansion Fittings and Loops for HVAC Piping

PART 1 - GENERAL

1.1. RELATED DOCUMENTS

A. The following documents apply to all required work for the Project: (1) the Contract Drawings, (2) the Specifications, (3) the General Conditions, (4) the Addendum and (5) the Contract (City of New York Standard Construction Contract).

1.2. SUMMARY

A. Section Includes:

1. Flexible, ball-joint, packed expansion joints.
2. Slip-joint packed expansion joints.
3. Expansion-compensator packless expansion joints.
4. Flexible-hose packless expansion joints.
5. Metal-bellows packless expansion joints.
6. Rubber packless expansion joints.
7. Grooved-joint expansion joints.
8. Pipe loops and swing connections.
9. Alignment guides and anchors.

1.3. PERFORMANCE REQUIREMENTS

A. Compatibility: Products shall be suitable for piping service fluids, materials, working pressures, and temperatures.

B. Capability: Products to absorb 200 percent of maximum axial movement between anchors.

1.4. SUBMITTALS

A. Refer to DDC General Conditions Section 01 33 00 "Submittal Procedures."

B. Product Data: For each type of product indicated

1. Expansion Compensators and Housed Expansion Joints: Bellows material, pressure rating, temperature rating, compression and elongation allowable motion, maximum installation extension, end fitting information, pressure thrust area and forces.
2. Flexible-Hose Expansion Joints: Bellows, braid and end connection materials, overall length, live length, corrugations per foot, lateral stiffness based on testing at all operating pressures, maximum temperature and pressure ratings, maximum allowable displacement due to seismic motion and thermal motion.
3. Guides: Load ratings for bottom, overhead or side mounting.

C. Engineering Services Submittal: For each anchor and alignment guide indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional Engineer licensed in NY State responsible for their preparation.

1. Engineering Calculations: Calculate requirements for thermal expansion of piping systems and for selecting and designing expansion joints, loops, and swing connections.
2. Anchor Details: Detail fabrication of each anchor indicated. Show dimensions and methods of assembly and attachment to building structure.
3. Alignment Guide Details: Detail field assembly and attachment to building structure.
4. Schedule: Indicate type, manufacturer's number, size, material, pressure rating, end connections, and location for each expansion joint.

D. Welding certificates.

E. Product Certificates: For each type of expansion joint, from manufacturer.

F. Maintenance Data: For expansion joints to include in maintenance manuals.

1.5. QUALITY ASSURANCE

A. Refer to DDC General Conditions Section 01 40 00 "Quality Requirements."

B. Welding Qualifications: Qualify procedures and personnel according to the following:

1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."
2. ASME Boiler and Pressure Vessel Code: Section IX.

PART 2 - PRODUCTS

2.1. PACKED EXPANSION JOINTS

A. Flexible, Ball-Joint, Packed Expansion Joints:

1. Basis-of-Design Product: Subject to compliance with requirements, provide Mason Industries type BJ assemblies or comparable product by one of the following:

a. Advanced Thermal Systems, Inc.
b. Hyspan Precision Products, Inc.
c. Grainger
d. Or approved equal.

2. Standards: ASME Boiler and Pressure Vessel Code: Section II, "Materials"; and ASME B31.9, "Building Services Piping," for materials and design of pressure-containing parts and bolting.
3. Material: Carbon-steel assembly with asbestos-free composition packing.
4. Design: Provide 360-degree rotation and angular deflection.
5. Minimum Pressure Rating: 250 psig at 400 deg F.
6. Angular Deflection for NPS 2 and Smaller: 30 degree minimum.
7. Angular Deflection for NPS 2-1/2 to NPS 14 inclusive: 15 degree minimum.
8. End Connections for NPS 2-1/2 and Larger: Welded ends.

9. Seal Type: Two carbon steel and graphite seals suitable for continuous operation at temperature up to 650 deg F
10. Internal Ball: Plated with minimum 1 mil chrome cover.
11. Ball Socket: One or two piece design with integral socket/retainer.

    a. Stuffing Box: Incorporates graphite containment seals and compression seals for containment of injectable packing

    b. Packing Cylinders: Providing packing under full line pressure with check valves to prevent blowback.

Ball Joint Pipe Size NPS	Quantity of Packing Cylinders
1-1/2 to 3	3
4	4
5	4
6	5
8	6

B. Slip-Joint Packed Expansion Joints:

1. Basis-of-Design Product: Subject to compliance with requirements, provide Mason Industries type SJ assemblies or comparable product by one of the following:

    a. Advanced Thermal Systems, Inc.
    b. Hyspan Precision Products, Inc.
    c. Or approved equal.

2. Standard: ASTM F 1007.
3. Material: Carbon steel with asbestos-free PTFE packing.
4. Design: Provide internal guide and minimum of two injection ports for repacking with injectable graphite under full system pressure. Housing shall be furnished with drain ports and lifting ring. Include drip connection if used for steam piping.
5. Configuration: Single joint/Single joint with base class unless otherwise indicated.
6. Slip Tube for sizes NPS 1-1/2 through NPS 16: Schedule 80
7. Slip Tube for sizes NPS 18 through NPS 24: Schedule 60
8. Sliding Surface: 2 mil thick chrome finish
9. End Connections: Flanged or weld ends to match piping system.

2.2. PACKLESS EXPANSION JOINTS

A. Metal, Expansion-Compensator Packless Expansion Joints: NPS 3/4 (DN 20) through NPS 4 (DN 100)

1. Basis-of-Design Product: Subject to compliance with requirements, provide Mason Industries type EC assemblies or comparable product by one of the following:

    a. Adsco Manufacturing LLC.
    b. Hyspan Precision Products, Inc.

c. Or approved equal.

2. Minimum Pressure Rating: 200 psig operating pressure and 700 psig minimum burst pressure.
3. Description: Totally enclosed externally pressurized two-ply, stainless-steel bellows isolated from fluid flow by an internal pipe sleeve; carbon or stainless-steel external shroud, two drain plugs and lifting lug for the NPS 3 and larger. The bellows are to have operating clearance between the internal pipe sleeves and the external shrouds. Joints shall be supplied with a built in scale to confirm the starting position and operating movement.

   a. Joint axial movement: 2-inch of compression and .5 in of extension.

4. Permanent Locking Bolts: Set locking bolts to maintain joint lengths during installation. Temporary welding tabs that are removed after installation in lieu of locking bolts are not acceptable.
5. Configurations:

   a. Copper Tubing: Solder joint
   b. Steel Pipe NPS 2 and Smaller: Threaded.
   c. Steel Pipe NPS 2-1/2 to NPS 4: Flanged

      1) Compensators to be furnished with one raised fixed and one floating flange. Two fixed flanges are not acceptable.

B. Metal, Expansion-Compensator Packless Expansion Joints: NPS 2 through NPS 14

1. Basis-of-Design Product: Subject to compliance with requirements, provide Mason Industries type HEJ assemblies or comparable product by one of the following:

   a. Adsco Manufacturing LLC.
   b. Hyspan Precision Products, Inc.
   c. Or approved equal.

2. Pressure Ratings: 225 psig. minimum operating pressure and 788 psig minimum burst pressure.
3. Description: Totally enclosed externally pressurized two-ply, stainless-steel bellows isolated from fluid flow by an internal pipe sleeve; carbon-steel shroud, two drain plugs and lifting lug for the NPS 3 and larger. The bellows are to have operating clearance between the internal pipe sleeves and the external shrouds. Joints shall be supplied with a built in scale to confirm the starting position and operating movement.

   a. Joint axial movement: 4-inch of compression and .75-inch of extension; 8-inch of compression and 1-1/2-inch of extension.

4. Permanent Locking Bolts: Set locking bolts to maintain joint lengths during installation. Temporary welding tabs that are removed after installation in lieu of locking bolts are not acceptable.
5. End Connection Configuration: Flanged; one raised fixed and one floating flange.

C. Rubber, Expansion-Compensator Packless Expansion Joints:

1. Basis-of-Design Product: Subject to compliance with requirements, provide products by Mason Industries, Safeflex SFDEJ, SFEJ or comparable product by one of the following:

   a. General Rubber Corporation.

b. Unaflex.
c. Or approved equal.

2. Description: Flexible spherical expansion joints shall employ peroxide cured EPDM in the covers, liners and Kevlar tire cord frictioning.

a. Solid steel rings shall be used within the raised face rubber flanged ends to prevent pullout. Flexible cable bead wire is not acceptable. Sizes NPS 2 and larger shall have two spheres reinforced with a ductile iron external ring between spheres. Flanges shall be split ductile iron or steel with hooked or similar interlocks. Sizes NPS 3/4 to 2 may have threaded two piece bolted flange assemblies, one sphere and cable retention. Connectors shall be rated at 250 psig up to 170 deg F with a uniform drop in allowable pressure to 215 psig at 250 deg F in sizes NPS 14 and smaller.
b. All expansion joints must be factory tested to 150 percent of rated pressure for 12 minutes before shipment. Safety factors to burst and flange pullout shall be a minimum of 3/1. Concentric reducers to the above ratings may be substituted for equal ended expansion joints. Expansion joints shall be installed in piping gaps equal to the length of the expansion joints under pressure.
c. Mason CR control rods need only be used in unanchored piping locations where the manufacturer determines the installation exceeds the pressure requirement without control rods. If control rods are used, they must have 1/4-inch thick Neoprene washer bushings large enough in diameter to take the thrust at 1000 psig maximum on the washer area. Submittals shall include two test reports by independent consultants showing minimum reductions of 20 dB in vibration accelerations and 10 dB in sound pressure levels at typical blade passage frequencies on this or a similar product by the same manufacturer.

D. Flexible-Hose Packless Expansion Joints:

1. Basis-of-Design Product: Subject to compliance with requirements, provide Mason Industries type 60 degree VEE assemblies or comparable product by one of the following:

a. Adsco Manufacturing LLC.
b. Hyspan Precision Products, Inc.
c. Or approved equal.

2. Description: Manufactured assembly with inlet and outlet 120-degree elbow fittings, two flexible-metal-hose legs joined by a 60-degree elbow. Loop configuration shall be capable of plus or minus 4 inches of motion in all planes for thermal expansion and contraction or seismic motion
3. Flexible Hose: Corrugated stainless-steel hose and braided stainless-steel sheaths. Minimum live hose lengths and number of corrugations are shown below.

Pipe Size NPS	**Live Length** inch	**Corrugations per Foot**
1/2	14	92
3/4	15	80
1	16	72
1-1/4	17	67

1-1/2	19	63
2	20	58
2-1/2	22	48
3	24	46
4	26	32
5	30	29
6	33	25
8	36	23

4. Connections:
5. Copper Tubing NPS 4 and smaller: Copper-alloy fittings with solder-joint or threaded ends.
6. Steel Piping NPS 4 and Smaller: Carbon-steel fittings with threaded or welded ends.
7. Steel Piping NPS 2 to NPS 12: Carbon-steel fittings with free-floating flanged ends.
8. Rated Pressure: Minimum rated pressures for flanged ends are shown below

PipeSize inch	Rated Pressure at 70 deg F	Rated Pressure at 250 deg F
2	360 psig	330 psig
2-1/2	290 psig	270 psig
3	280 psig	260 psig
4	225 psig	210 psig
5	200 psig	190 psig
6	200 psig	190 psig
8	180 psig	170 psig

E. Metal-Bellows Packless Expansion Joints:

1. Basis-of-Design Product: Subject to compliance with requirements, provide Mason Industries type EJFFL, EJW or comparable product by one of the following:

   a. Adsco Manufacturing LLC.
   b. Hyspan Precision Products, Inc.
   c. Or approved equal.

2. Standards: ASTM F 1120 and EJMA's "Standards of the Expansion Joint Manufacturers Association, Inc."
3. Type: Circular, corrugated two-ply, stainless-steel bellows with external tie rods.

   a. Joint axial movement: 2-inch

4. End Configurations: Flanged ends.

    a. Expansion joints are to be furnished with one raised fixed and one floating flange. Two fixed flanges are not acceptable.

5. Pressure Rating: 50 psig minimum operating pressure and 175 psig rated burst pressure 250 psig minimum operating pressure
6. Configuration: Single joint class.
7. Expansion Joints for Copper Tubing: Single-ply phosphor-bronze bellows, copper pipe ends, and brass shrouds.

    a. End Connections for Copper Tubing NPS 2 and Smaller: Solder joint or threaded.
    b. End Connections for Copper Tubing NPS 2-1/2 to NPS 4: Threaded.
    c. End Connections for Copper Tubing NPS 5 and Larger: Flanged.

8. Expansion Joints for Steel Piping: Single-ply stainless-steel bellows, steel pipe ends, and carbon-steel shroud.

    a. End Connections for Steel Pipe NPS 2 and Smaller: Threaded.
    b. End Connections for Steel Pipe NPS 2-1/2 and Larger: Flanged.

2.3. GROOVED-JOINT EXPANSION JOINTS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following

B. Basis-of-Design Product: Subject to compliance with requirements, provide Victaulic or comparable product by one of the following:

    1. Anvil International, Inc.
    2. Shurjoint Piping Products.
    3. Or approved equal.

C. Description: Factory-assembled expansion joint made of several grooved-end pipe nipples, couplings, and grooved joints.

D. Standard: AWWA C606, for grooved joints.

E. Nipples: Galvanized, ASTM A 53/A 53M, Schedule 40, Type E or S, steel pipe with grooved ends.

F. Couplings: for steel-pipe dimensions. Include ferrous housing sections, gasket suitable for cold and hot water,EPDM gasket suitable for cold and hot water, and bolts and nuts.

2.4. ALIGNMENT GUIDES AND ANCHORS

A. Height Adjustable Sliding Alignment Guides

1. Basis-of-Design Product: Subject to compliance with requirements, provide Mason Industries type ASG assemblies or comparable product by one of the following:

   a. Adsco Manufacturing LLC.
   b. Hyspan Precision Products, Inc.
   c. Or approved equal.

2. Description: Carbon-steel base with holes for attachment to structure, and carbon-steel adjustable pipe support frame attached to base by interfacing stainless-steel sliding alignment guides. the guides allow for axial movement only. The adjustable support frame allows up to 4 in (100mm) of insulation thickness. A minimum of two bolted pipe clamps attach pipe to the guide.

3. Pipe guides shall be manufactured with stainless steel wrapping the carbon steel foot where it passes through horizontal U guides similarly lined to prevent corrosion. The baseplate shall have multiple holes for bolting to beam flanges or flat surfaces. Bases may be welded in position in lieu of bolting. Height must be adjustable to accept different thicknesses of insulation. Guides shall be professionally load rated for bottom, overhead, side mounted, or riser positioning to provide both load bearing and guiding capabilities.

   a. Axial Movement: 4-in for NPS 3/4 to NPS 2-1/2 and 6-in for NPS 3 to NPS 12
   b. Finish: Electro galvanized

B. Anchor Materials:

1. Steel Shapes and Plates: ASTM A 36/A 36M.
2. Bolts and Nuts: ASME B18.10 or ASTM A 183, steel hex head.
3. Washers: ASTM F 844, steel, plain, flat washers.
4. Mechanical Fasteners: Insert-wedge-type stud with expansion plug anchor for use in hardened portland cement concrete, with tension and shear capacities appropriate for application.

   a. Stud: Threaded, zinc-coated carbon steel.
   b. Expansion Plug: Zinc-coated steel.
   c. Washer and Nut: Zinc-coated steel.

5. Chemical Fasteners: Insert-type-stud, bonding-system anchor for use with hardened portland cement concrete, with tension and shear capacities appropriate for application.

   a. Bonding Material: ASTM C 881/C 881M, Type IV, Grade 3, two-component epoxy resin suitable for surface temperature of hardened concrete where fastener is to be installed.
   b. Stud: ASTM A 307, zinc-coated carbon steel with continuous thread on stud unless otherwise indicated.
   c. Washer and Nut: Zinc-coated steel.

PART 3 - EXECUTION

3.1. EXECUTION REQUIREMENTS

A. Refer to DDC General Conditions for execution requirements.

3.2. EXPANSION-JOINT INSTALLATION

A. Install expansion joints of sizes matching sizes of piping in which they are installed.

B. Install packed-type expansion joints with packing suitable for fluid service.

C. Install metal-bellows expansion joints according to EJMA's "Standards of the Expansion Joint Manufacturers Association, Inc."

D. Install grooved-joint expansion joints to grooved-end steel piping

3.3. PIPE LOOP AND SWING CONNECTION INSTALLATION

A. Install pipe loops cold-sprung in tension or compression as required to partly absorb tension or compression produced during anticipated change in temperature. After installation remove temporary space holders as required.

B. Connect risers and branch connections to mains with at least five pipe fittings including tee in main.

C. Connect risers and branch connections to terminal units with at least four pipe fittings including tee in riser.

D. Connect mains and branch connections to terminal units with at least four pipe fittings including tee in main.

3.4. ALIGNMENT-GUIDE AND ANCHOR INSTALLATION

A. Install alignment guides to guide expansion and to avoid end-loading and torsional stress.

B. Install one guide on each side of pipe expansion fittings and loops. Install guides nearest to expansion joint not more than four pipe diameters from expansion joint.

C. Attach guides to pipe and secure guides to building structure.

D. Install anchors at locations to prevent stresses from exceeding those permitted by ASME B31.9 and to prevent transfer of loading and stresses to connected equipment.

E. Anchor Attachments:

1. Anchor Attachment to Steel Pipe: Attach by welding. Comply with ASME B31.9 and ASME Boiler and Pressure Vessel Code: Section IX, "Welding and Brazing Qualifications."

2. Anchor Attachment to Copper Tubing: Attach with pipe hangers. Use MSS SP-69, Type 24, U-bolts bolted to anchor.

F. Fabricate and install steel anchors by welding steel shapes, plates, and bars. Comply with ASME B31.9 and AWS D1.1/D1.1M.

1. Anchor Attachment to Steel Structural Members: Attach by welding.
2. Anchor Attachment to Concrete Structural Members: Attach by fasteners. Follow fastener manufacturer's written instructions.

G. Use grout to form flat bearing surfaces for guides and anchors attached to concrete.

END OF SECTION 220516

SECTION 230519
Meters and Gages for HVAC Piping

PART 1 - GENERAL

1.1. RELATED DOCUMENTS

A. The following documents apply to all required work for the Project: (1) the Contract Drawings, (2) the Specifications, (3) the General Conditions, (4) the Addendum and (5) the Contract (City of New York Standard Construction Contract).

B. LEED General Requirements:

1. Refer to DDC General Conditions.
   a. Section 01 33 00 "Submittal Procedures."
   b. Section 01 81 13.04 "Sustainable Design Requirements for LEED v4 Buildings."

1.2. SUMMARY

A. General: Provide all plant, labor, tools, appliances, equipment, materials and services required for the work indicated on the drawings and specified in this Section.

B. Section includes, but not limited to:

1. Bimetallic-actuated thermometers.
2. Liquid-in-glass thermometers.
3. Thermowells.
4. Dial-type pressure gages.
5. Gage attachments.
6. Test plugs.
7. Turbine flowmeters.

C. Related Sections:
1. Division 22 Section "Facility Natural-Gas Piping" for gas meters.

1.3. QUALITY ASSURANCE

A. Refer to DDC General Conditions Section 01 40 00 "Quality Requirements."

B. Manufacturer's Qualifications: Firm regularly engage in manufacturer of thermometers and gages, of types and sizes required, whose products have been in satisfactory use in similar service for not less than five (3) years.

C. Code and Standards:

1. UL Compliance: Comply with applicable UL standards pertaining to gauges.

2. ANSI and ISA Compliance: Comply with applicable portions of ANSI and Instrument Society of America (ISA) standards pertaining to construction and installation of thermometers and gages. ANSI B 31.1 - Power Piping.

1.4. SUBMITTALS

A. Refer to DDC General Conditions Section 01 33 00 "Submittal Procedures."

B. Product Data: Submit manufacturer's product data, including installation instructions for each type of gage and thermometer. Include scale range, ratings, and calibrated performance curves..

C. Product Certificates: For each type of meter and gage, from manufacturer.

D. Operation and Maintenance Data: For meters and gages to include in operation and maintenance manuals.

PART 2 - PRODUCTS

2.1. BIMETALLIC-ACTUATED THERMOMETERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Ernst Flow Industries.
2. Marsh Bellofram.
3. Trerice, H. O. Co.
4. Watts Regulator Co.; a div. of Watts Water Technologies, Inc.
5. Weiss Instruments, Inc.
6. WIKA Instrument Corporation - USA.
7. Or approved equal.

B. Standard: ASME B40.200.

C. Case: Hermetically sealed type(s); stainless steel with 3-inch nominal diameter.

D. Dial: Nonreflective aluminum with permanently etched scale markings and scales in deg F.

E. Connector Type(s): Union joint, adjustable angle, with unified-inch screw threads.

F. Connector Size: 1/2 inch, with ASME B1.1 screw threads.

G. Stem: 0.25 in diameter; stainless steel.

H. Window: Double strength glass.

I. Ring: Stainless steel.

J. Element: Bimetal coil.

K. Pointer: Dark-colored metal.

L. Accuracy: Plus or minus 1 percent of scale range.

2.2. LIQUID-IN-GLASS THERMOMETERS

A. Metal-Case, Industrial-Style, Liquid-in-Glass Thermometers:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Ernst Flow Industries.
   b. Trerice, H. O. Co.
   c. Weiss Instruments, Inc.
   d. Or approved equal.
2. Standard: ASME B40.200.
3. Case: Cast aluminum; 9-inch nominal size unless otherwise indicated.
4. Case Form: Adjustable angle unless otherwise indicated.
5. Tube: Glass with magnifying lens and blue or red organic liquid.
6. Tube Background: Nonreflective aluminum with permanently etched scale markings graduated in deg F.
7. Window: Glass or acrylic.
8. Stem: Aluminum, brass or stainless steel and of length to suit installation.
   a. Design for Air-Duct Installation: With ventilated shroud.
   b. Design for Thermowell Installation: Bare stem.
9. Connector: 1-1/4 inches, with ASME B1.1 screw threads.
10. Accuracy: Plus or minus 1 percent of scale range or one scale division, to a maximum of 1.5 percent of scale range.

2.3. DUCT-THERMOMETER MOUNTING BRACKETS

A. Description: Flanged bracket with screw holes, for attachment to air duct and made to hold thermometer stem.

2.4. THERMOWELLS

A. Thermowells:
   1. Standard: ASME B40.200.
   2. Description: Pressure-tight, socket-type fitting made for insertion into piping tee fitting.
   3. Material: Brass.
   4. Type: Stepped shank unless straight or tapered shank is indicated.
   5. External Threads: ½ inch, ¾ inch, or 1 inch, ASME B1.20.1 pipe threads.
   6. Internal Threads: 1/2, 3/4, and 1 inch, with ASME B1.1 screw threads.
   7. Bore: Diameter required to match thermometer bulb or stem.
   8. Insertion Length: Length required to match thermometer bulb or stem.
   9. Lagging Extension: Include on thermowells for insulated piping and tubing.
   10. Bushings: For converting size of thermowell's internal screw thread to size of thermometer connection.

2.5. PRESSURE GAGES

A. Direct-Mounted, Metal-Case, Dial-Type Pressure Gages:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. AMETEK, Inc.; U.S. Gauge.
   b. Marsh Bellofram.
   c. Trerice, H. O. Co.
   d. Watts Regulator Co.; a div. of Watts Water Technologies, Inc.
   e. Weiss Instruments, Inc.
   f. WIKA Instrument Corporation - USA.
   g. Or approved equal.
2. Standard: ASME B40.100.
3. Case: Liquid-filled type(s); stainless steel; 4-1/2-inch nominal diameter.
4. Pressure-Element Assembly: Bourdon tube unless otherwise indicated.
5. Pressure Connection: 316L stainless steel, with 1/4 inch, ASME B1.20.1 pipe threads and bottom-outlet type unless back-outlet type is indicated.
6. Movement: Mechanical, with link to pressure element and connection to pointer.
7. Dial: Nonreflective aluminum with permanently etched scale markings graduated in psi.
8. Pointer: Dark-colored metal.
9. Window: Glass.
10. Ring: Stainless steel.
11. Accuracy: Grade A, plus or minus 1 percent of middle half of scale range.
12. Range: Scale and indicator shall cover the operating range of equipment or system served.

2.6. GAGE ATTACHMENTS

A. Snubbers: ASME B40.100, brass; with 1/4 inch ASME B1.20.1 pipe threads and surge-dampening device. Include extension for use on insulated piping.

B. Siphons: Loop-shaped section of brass pipe with 1/4 inch pipe threads.

C. Valves: Brass or stainless-steel needle, with 1/4 inch, ASME B1.20.1 pipe threads.

2.7. TEST PLUGS

A. Basis-of-Design Product: Subject to compliance with requirements, provide Petersin Equipment Co. Inc., or comparable product by one of the following:
   1. Trerice, H. O. Co.
   2. Watts Regulator Co.; a div. of Watts Water Technologies, Inc.
   3. Weiss Instruments, Inc.
   4. Or approved equal.

B. Description: Test-station fitting made for insertion into piping tee fitting.

C. Body: Brass or stainless steel with core inserts and gasketed and threaded cap. Include extended stem on units to be installed in insulated piping.

D. Thread Size: 1/2 inch, ASME B1.20.1 pipe thread.

E. Minimum Pressure and Temperature Rating: 500 psig at 240 deg F.

F. Core Inserts: Neoprene self-sealing rubber.

2.8. FLOWMETERS

A. Impeller Flowmeters:

1. Basis-of-Design Product: Subject to compliance with requirements, provide Badger Meter Series 3000 by Data Industrial Corp. or comparable product by one of the following:
   a. ABB; Instrumentation and Analytical.
   b. EMCO Flow Systems; a division of Spirax Sarco, Inc.
   c. ERDCO Commissionering Corp.
   d. Hoffer Flow Controls, Inc.
   e. Liquid Controls; a unit of IDEX Corporation.
   f. McCrometer, Inc.
   g. Midwest Instruments & Controls Corp.
   h. ONICON Incorporated.
   i. SeaMetrics, Inc.
   j. Sponsler, Inc.; a unit of IDEX Corporation.
   k. Or approved equal.
2. Description: Flowmeter with sensor and indicator.
3. Flow Range: Sensor and indicator shall cover operating range of equipment or system served.
4. Sensor: Impeller turbine; for inserting into pipe fitting or for installing in piping and measuring flow directly in gallons per minute.
   a. Design: Device or pipe fitting with inline turbine and integral direct-reading scale for water.
   b. Construction: Bronze or stainless-steel body, with plastic turbine or impeller.
   c. Minimum Pressure Rating: 150 psig.
   d. Minimum Temperature Rating: 180 deg F.
5. Indicator: Hand-held meter; either an integral part of sensor or a separate meter.
6. Accuracy: Plus or minus 1 percent.
7. Display: Shows rate of flow, with register to indicate total volume in gallons .
8. Operating Instructions: Include complete instructions with each flowmeter.

PART 3 - EXECUTION

3.1. EXECUTION REQUIREMENTS

A. Refer to DDC General Conditions for execution requirements.

3.2. INSTALLATION

A. Install thermowells with socket extending third of pipe diameter and in vertical position in piping tees.

B. Install thermowells of sizes required to match thermometer connectors. Include bushings if required to match sizes.

C. Install thermowells with extension on insulated piping.

D. Fill thermowells with heat-transfer medium.

E. Install direct-mounted thermometers in thermowells and adjust vertical and tilted positions.

F. Install remote-mounted thermometer bulbs in thermowells and install cases on panels; connect cases with tubing and support tubing to prevent kinks. Use minimum tubing length.

G. Install duct-thermometer mounting brackets in walls of ducts. Attach to duct with screws.

H. Install direct-mounted pressure gages in piping tees with pressure gage located on pipe at the most readable position.

I. Install remote-mounted pressure gages on panel.

J. Install valve and snubber in piping for each pressure gage for fluids (except steam).

K. Install valve and syphon fitting in piping for each pressure gage for steam.

L. Install test plugs in piping tees.

M. Install flow indicators in piping systems in accessible positions for easy viewing.

N. Assemble and install connections, tubing, and accessories between flow-measuring elements and flowmeters according to manufacturer's written instructions.

O. Install flowmeter elements in accessible positions in piping systems.

P. Install wafer-orifice flowmeter elements between pipe flanges.

Q. Install differential-pressure-type flowmeter elements, with at least minimum straight lengths of pipe, upstream and downstream from element according to manufacturer's written instructions.

R. Install permanent indicators on walls or brackets in accessible and readable positions.

S. Install connection fittings in accessible locations for attachment to portable indicators.

T. Mount thermal-energy meters on wall if accessible; if not, provide brackets to support meters.

U. Install thermometers in the following locations:

1. Inlet and outlet of each hydronic zone.
2. Inlet and outlet of each hydronic boiler.
3. Two inlets and two outlets of each chiller.
4. Inlet and outlet of each hydronic coil in air-handling units.
5. Two inlets and two outlets of each hydronic heat exchanger.
6. Inlet and outlet of each thermal-storage tank.
7. Outside-, return-, supply- air ducts.

3.3. CONNECTIONS

A. Install meters and gages adjacent to machines and equipment to allow service and maintenance of meters, gages, machines, and equipment.

B. Connect flowmeter-system elements to meters.

C. Connect flowmeter transmitters to meters.

D. Connect thermal-energy meter transmitters to meters.

3.4. ADJUSTING

A. After installation, calibrate meters according to manufacturer's written instructions.

B. Adjust faces of meters and gages to proper angle for best visibility.

3.5. THERMOMETER SCHEDULE

A. Install thermometers at the following locations:

1. Inlet and outlet of each hydronic zone.
2. Inlet and outlet of each hydronic boiler.
3. Inlet and outlet of each hydronic coil in air-handling units and built-up central systems.
4. Inlets and outlets of each hydronic heat exchanger.
5. Inlet and outlet of each thermal-storage tank.
6. At outside-, return-, supply air ducts.

B. Thermometer stems shall be of length to match thermowell insertion length.

C. Install thermometer gage connectors in piping tee where required, located on pipe at most readable position. Secure cap.

3.6. THERMOMETER SCALE-RANGE SCHEDULE

A. Scale Range for Heating, Hot-Water Piping: 20 to 240 deg F.

B. Scale Range for Air Ducts: 0 to 180 deg F.

3.7. PRESSURE-GAGE SCHEDULE

A. Install pressure gages at the following locations:

1. Inlet and outlet of each hydronic boiler.
2. Discharge of each pressure-reducing.
3. Suction and discharge of each pump.
4. Inlet and outlet of the hot water heating coil most remote from pump.
5. Expansion tank.

3.8. PRESSURE-GAGE SCALE-RANGE SCHEDULE

A. Scale Range for Heating, Hot-Water Piping: 0 to 160 psi.

3.9. FLOWMETER SCHEDULE

A. Flowmeters for Heating, Hot-Water Piping: Impeller turbine type.

END OF SECTION 230519

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SECTION 230523
General-Duty Valves For HVAC Piping

PART 1 - GENERAL

1.1. RELATED DOCUMENTS

A. The following documents apply to all required work for the Project: (1) the Contract Drawings, (2) the Specifications, (3) the General Conditions, (4) the Addendum and (5) the Contract (City of New York Standard Construction Contract).

1.2. SUMMARY

A. General: Provide all plant, labor, tools, appliances, equipment, materials and services required for the work indicated on the drawings and specified in this section.

B. Work Included: The work includes, but is not necessarily limited to, the following:

1. All labor, materials, equipment, accessories, services and test necessary to complete and make ready for operation, all valves indicated on the drawings and hereinafter specified in other HVAC Piping Sections

C. Related Work: The following related items are specified in other sections of the specifications:

1.	Access Doors	Section 083113
2.	Hangers and Supports for HVAC Piping and Equipment	Section 230529
3.	Identification for HVAC Piping and Equipment	Section 230553
4.	Instrumentation and Control for HVAC	Section 230900

1.3. QUALITY ASSURANCE

A. Refer to DDC General Conditions Section 01 40 00 "Quality Requirements."

B. Manufacturers: Firms engaged in manufacturing of valves, of types and sizes required, whose products have been in satisfactory use in similar service for not less than three (3) years.

C. Codes and Standards

1. MSS Compliance: Mark valves in accordance with MSS-25 "Standard Marking System for Valves, Fittings, Flanges and Unions".
2. ANSI Compliance: For face-to-face and end-to-end dimensions.
3. Valves of one type throughout the Project shall be of the same manufacturer.

1.4. SUBMITTALS

A. Refer to DDC General Conditions Section 01 33 00 "Submittal Procedures."

B. Product Data: Submit manufacturer's product data, including installation instructions for each type of valve. Include pressure drop curve or chart for each type and size of valve. Submit valve schedule showing manufacturer's figure number, size, location, and valve features for each required valve.

C. Shop Drawings: Submit manufacturer's assembly-type (exploded view) shop drawing for each type of valve, indicating dimensions, weights, materials, and methods of assembly of components.

D. Maintenance Data: Submit maintenance data and spare parts lists for each type of valve. Include this data, product data, and shop drawings in maintenance manual in accordance with requirements of DDC General Conditions.

PART 2 - PRODUCTS

2.1. VALVE LOCATIONS AND VALVE MANUFACTURERS

A. Provide valves where indicated on the drawings, where required by code and where called for in the specifications. Valves shall be as manufacturer by Nibco, Walworth, Jenkins, Fairbanks Co., Hills McCanna, Or Approved Equal.

B. Where manufacturer's names and model numbers are listed they are intended to represent the type and quality established for the project.

C. Provide valves with manufacturer's name and guaranteed working pressure rating cast stamped on the body of the valve.

D. All valves, including gate valves, check valves, pressure reducers, backflow preventers, butterfly valves, etc., shall be designed for a minimum working pressure of 125 psig to 250 psig range unless otherwise noted.

2.2. VALVE APPLICATIONS

A. Valve 3" size and smaller used for shutoff shall be gate valve type.

B. Valves 4" size and larger used for hot or cold water shutoff shall be butterfly type.

C. Valves 2" size and smaller used for bypass or for flow control shall be ball valve type.

D. Valves 2 1/2" size and larger used for controlling water flow at pumps and at equipment and for bypass control shall be lubricated plug type.

E. Valves used for hot and cold water piping, 3" and smaller, shall be all bronze rising stem 150 psi WSP threaded or solder joint type. All drip valves such as on drain lines, etc., shall be angle, composition disc valves with hose end and cap.

F. Valves used for cold and hot water piping, 4" and larger, shall be OS&Y flanged, IBBM gate Type 150 psi WSP to Type 250 psi WSP.

G. Check valves used for water piping, 3" and smaller, shall be all bronze swing check valves with finished bronze trimmings and brazed or threaded ends.

H. Check valves used for water piping, 4" and larger, shall be cast iron body, bronze trimmings and swing check valves with flanged ends.

I. Check valves as discharge water pumps shall be vertical "silent" lift type, 200-psig designs.

J. Gate valves shall be of the solid wedge type and shall be provided with gland and packing boxes, and have top seat for packing under pressure when wide open.

2.3. BUTTERFLY VALVES

A. Butterfly valves shall be as manufacturer by Hills-McCanna, Jamesbury, Durion, or Approved Equal.

2.4. BALL VALVES

A. Ball valves shall be as manufacturer by Hills-McCanna, Jamesbury, Durion, or Approved Equal

2.5. PLUG VALVES

A. Plug valves of tapered lubricated type shall have fixed adjustment:

B. Valves up to and including 8" shall be wrench operated.

C. Valves shall be furnished with proper lubricant for service intended.

D. Valves shall be flanged type

1. 2 1/2" - 4" Fig. 115 (250#WOG)
2. 4" to 8" Fig. 143 (250#WOG)

2.6. GATE VALVES

A. Gate valves 3" and smaller shall be bronze, screwed, 125#/250# S.W.P. with solid wedge disc and non-rising stem.

B. Gate valves 3" and over shall be iron body, flanged, 125#/250# S.W.P., O.S.& Y., with bronze trim.

2.7. AIR RELIEF VALVES

A. Where the hot and cold water system is trapped and air is liable to be packeted, furnish and install a manual vent to properly relieve the system of air. The discharge from these vents shall be piped with copper tubing to the nearest slop sink, floor drain or to a location easily accessible from the floor.

2.8. DRAIN VALVES (COCKS)

A. Provide drain valves with hose bibb end at all low points of water systems. Drain valves shall be gate type. Minimum 3/4" drain size shall be used up to 4" pipe size. 2" drain size shall be used for pipes 5" size and over. Also provide a fill valve for each water system, with a back-flow preventer as described below. All drain and fill valves shall have caps or plugs as applicable.

2.9. WATER RELIEF VALVES

A. Where required provide ASME water relief valve. Each valve shall be provided with manual lifting lever capable of opening the valve as desired. A discharge line shall be run to floor drain from each valve. No shutoff valve shall be placed between relief valve and system.

2.10. GLOBE VALVES

A. Except valves in pneumatic temperature control piping and pneumatic valves, no globe valve of size larger than 1/2" shall be used, unless otherwise specified or shown on the drawings. Where globe valves are approved, they shall be of the grade called for other valves.

2.11. CHECK VALVES

A. Check valves shall be of heavy pattern, straightway, horizontal swing, re-grinding type with hinged check, ground seat and approved type bronze discs. The discs for check valves, of size larger than 2" may be bronze faced.

B. Lift check valves shall be provided on all pump discharges and shall be globe style, streamline, spring loaded.

1. Up to 2" valves: Bronze body screwed ends, bronze trim.
2. 2 1/2" and larger valves: Iron and bronze body, flanges ends, bronze trim.

PART 3 - EXECUTION

3.1. EXECUTION REQUIREMENTS

A. Refer to DDC General Conditions for execution requirements.

3.2. INSTALLATION

A. Valves shall be installed so that they are readily accessible. For operation of valves not accessible for direct operation, furnish and install chain wheel, guide and sufficient length of chain to operate from floor level. Provide hooks for fastening chains out of the way. No valve shall be installed with the handle pointing downward. If, in the opinion of the Commissioner, valves have been installed so as to create a hazardous and unsafe condition, Contractor shall make corrections as directed, without additional cost to the City of New York.

B. Valves in Mechanical Rooms more than 7'-0" above the floor shall be chain operated, with either double end chain wrenches or chain wheels.

C. Systems shall be supplied with valves in all branches mains, risers, drains, at all pumps, equipment, coils, at all automatic valves and at all apparatus so located and arranged to give complete isolation and regulating control of the water.

D. The entire system shall be supplied with valves so located, arranged and operated as to give a complete regulating control to all fixtures and apparatus. Shut-off valves shall be provided on all risers, branch lines, branch lines from mains, mains and at each piece of equipment or fixture. Every section of branch supply and return piping and all risers of all services shall be controlled by a valve at the main. Every item of equipment shall be independently isolated by means of valves.

E. Valves, except as noted, shall be suitable for a working pressure of not less than 150 psi/250psi.

F. Valves in copper tubing shall have soldered ends for 95-5 solder.

END OF SECTION 230523

SECTION 230529
Hangers and Supports for HVAC Piping and Equipment

PART 1 - GENERAL

1.1. RELATED DOCUMENTS

A. The following documents apply to all required work for the Project: (1) the Contract Drawings, (2) the Specifications, (3) the General Conditions, (4) the Addendum and (5) the Contract (City of New York Standard Construction Contract).

1.2. SUMMARY

A. Work Included: The work includes, but is not necessarily limited to, the following:

1. Hangers, supports and anchors.

B. Related Work: The following related items are specified in other sections of the specifications:

1.	Hydronic Piping	Section 232113
2.	Refrigerant Piping	Section 232300
3.	General-Duty Valves for HVAC Piping	Section 230523
4.	Metal Ducts	Section 233113

1.3. QUALITY ASSURANCE

A. Refer to DDC General Conditions Section 01 40 00 "Quality Requirements."

B. Manufacturer's Qualifications

1. Firms regularly engaged in manufacturer of supports and anchors, of types and sizes required, whose products have been in satisfactory use in similar service for not less than three (3) years.

C. Codes and Standards

1. MSS Compliance: Comply with MSS SP-58 and MSS SP-69.

1.4. SUBMITTALS

A. Refer to DDC General Conditions Section 01 33 00 "Submittal Procedures."

B. Product Data

1. Submit manufacturer's product data, including installation instructions for each type of support and anchor. Submit pipe hanger and support schedule showing manufacturer's figure number, size, location, and features for each required pipe hanger and support.

C. Shop Drawings

1. Submit manufacturer's assembly-type shop drawings for each type of support and anchor, indicating dimensions, weights, required clearances, and methods of assembly of components.

D. Maintenance Data

1. Submit maintenance data and parts list for each type of support and anchor. Include this data, product data, and shop drawings in the maintenance manual.

1.5. DELIVERY

A. Deliver pipe hangers, supports, stands, etc., to the site with one coat of red oxide or zinc chromate primer.

PART 2 - PRODUCTS

2.1. MATERIALS AND MANUFACTURERS

A. Pipe Hangers and Supports Manufacturers:

1. Fee & Mason Mfg. Co.
2. Carpenter & Patterson, Inc.
3. F & S Central Mfg. Co.
4. Grabler Mfg. Co.
5. Grinnell Corp.
6. Or approved equal.

B. Insulated Piping: Each pipe hanger supporting insulated piping shall be provided with a pipe covering protection shield.

C. Hangers for Pipes Smaller than 5 Inches: Each hanger for pipe sized smaller than 5 inches shall be forged or malleable iron ring type, or steel clevis type, supported by a solid steel rod.

D. Hangers for Pipes 5 inches and Larger: Each hanger for pipe sized 5 inches and larger shall be formed of a section of steel angle having a 3/4" diameter steel rod, threaded at both ends, run through a drilled hole near each end of the angle. Secure two nuts at the bottom end of the rid.

E. Sockets: Sockets used on upper ends of rods at beam clamps and on lower ends of rods for single hangers shall be malleable or forged steel with standard machine threads.

F. Pipe Supports:

1. Mains located near floors shall be supported on roller type pipe stands, bedded in cement base. When mains are installed before concrete floor is laid, the mains shall be supported from overhead construction until the pipe stands can be put in place. Any work damaged in connection therewith shall be made good.

2. Horizontal piping connections (near floor) to convectors, etc., located more than 4 feet from risers shall be supported on adjustable iron pipe stands. Pipe stand shall consist of a split ring extension hanger mounted on a hanger flange, which shall be secured to the floor.

G. Inserts:

1. Piping hung from slabs of poured concrete construction shall be supported form the slab by means of inserts. Inserts shall be installed in their proper locations before pouring of the floor slabs. Contractor shall cooperate with all other trades engaged in this project, in the installation of inserts in order to prevent any conflict locations. Inserts shall not be painted.

2. Inserts for pipe anchors shall be provided with bars.

3. Inserts for composite metal decks shall be of a type that is supported entirely by the concrete slab, not be the metal deck. They shall be N.Y.C. Boards of Standards and Appeals approved.

H. Saddles and Shields:

1. Except as otherwise indicated on the drawings; provide saddles or shields under piping hangers and supports, factory-fabricated, for all insulated piping. Size saddles and shields for exact fit to mate with pipe insulation.

   a. Protection Saddles: MSS Type 39; fill interior voids with segments of insulation matching adjoining insulation.
   b. Protection Shields: MSS Type 40; of length recommended by manufacturer to prevent crushing of insulation.
   c. Thermal Hanger Shields: Constructed of 360 deg. insert of high density, 100 psi, waterproofed calcium silicate, encased in 360 deg. sheet metal shield. Provide assembly of same thickness as adjoining insulation.

2. Manufacturers: Subject to compliance with requirements, manufacturers offering thermal hanger shields which may be incorporated in the work include the following:

   a. Elcen Metal Products Co.
   b. Pipe Shields, Inc.
   c. PHD Manufacturing
   d. Or approved equal.

PART 3 - EXECUTION

3.1. EXECUTION REQUIREMENTS

A. Refer to DDC General Conditions for execution requirements.

3.2. INSPECTION

A. Examine areas and conditions under which supports and anchors to be installed. Do not proceed with work until unsatisfactory conditions have been corrected in manner acceptable to the Commissioner.

3.3. PREPARATION

A. Proceed with installation of hangers, supports and anchors only after required building structural work has been completed. Correct inadequacies including (but not limited to) proper placement of inserts, anchors and other building structural attachments.

B. Prior to installation of hangers, supports, anchors and associated work, Contractor shall meet at project site with testing agency representatives and other trades requiring coordination for purpose of reviewing material selections and procedures.

3.4. INSTALLATION OF BUILDING ATTACHMENTS

A. Install building attachments at required locations within concrete or on structural steel for proper piping support. Space attachments within maximum piping span length indicated in MSS SP-69. Install additional concentrated loads at valves, flanges, guides, strainers, expansion joints, and changes in direction of piping. Install concrete inserts before concrete is poured; fasten insert securely to forms. Where concrete with compressive strength less than 2500 psi is indicated, install reinforcing bars through openings at top of inserts.

B. Installation of Hangers and Supports:

1. Install hangers, supports, clamps and attachments to support piping properly from building structure. Arrange for grouping of parallel runs of horizontal piping to be supported together on trapeze type hangers where possible. Install supports with maximum spacings complying with MSS SP-69. Where piping of various sizes is to be supported together by trapeze hangers, space hangers for smallest pipe size or install intermediate supports for smaller diameter pipe. Do not use wire or perforated metal to support piping, and do not support piping from other piping.

2. Install hangers and supports complete with necessary inserts, bolts, rods, nuts, washers and other accessories. Except as otherwise indicated for exposed continuous pipe runs, install hangers and supports of same type and style as installed for adjacent similar piping.

3. Prevent electrolysis in support of copper tubing by use of hangers and supports which are copper plated or by other recognized industry methods.

4. Provisions for Movement:

   a. Install hangers and supports to allow controlled movement of piping systems, to permit freedom of movement between pipe anchors and to facilitate action of expansion joints, expansion loops, expansion bends and similar units.

   b. Load Distribution: Install hangers and supports so that piping live and dead loading and stresses from movement will not be transmitted to connected equipment.

   c. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes and so that maximum pipe deflections allowed by ANSI B31 Pressure Piping Codes are not exceeded.

5. Insulated Piping: Comply with the following installation requirements.

   a. Clamps: Attach clamps, including spacers (if any), to piping with clamps projecting through insulation; do not exceed pipe stresses allowed by ANSI B31.

b. Shields: Where low-compressive-strength insulation or vapor barriers are indicated on chilled water piping, install coated protective shields. For pipe 8" and over, install wood insulation saddles.

c. Saddles: Where insulation without vapor barrier is indicated, install protection saddles.

C. Installation of Anchors:

1. Install anchors at proper locations to prevent stresses form exceeding those permitted by ANSI B31 and to prevent transfer of loading and stresses to connected equipment.

2. Fabricate and install anchor by welding steel shapes plates and bars to piping and to structure. Comply with ANSI B31 and with AWS standards.

3. Where expansion compensators are indicated, install anchors in accordance with expansion unit manufacturer's written instructions and to limit movement of piping and forces to maximums recommended by manufacturer for each unit.

4. Anchor Spacing: Where not otherwise indicated, install anchors at ends of principal pipe-runs, at intermediate points in pipe-runs between expansion loops and bends. Make provisions for preset of anchors as required to accommodate both expansion and contraction of piping.

D. Equipment Supports:

1. Furnish scaled layouts of all required bases with dimensions of bases and location to column center lines. Furnish also templates, anchor bolts and accessories necessary for base construction.

2. Provide concrete housekeeping bases for all floor-mounted equipment. Size bases to extend minimum of 4" beyond equipment base in any direction; and 4" above finished floor elevation. Construction of reinforced concrete; roughen floor slab beneath base for bond; provide steel rod anchors between floor and base. Locate anchor bolts using equipment manufacturer's templates. Chamfer top and edge corners.

3. Provide structural steel stands to support equipment not floor mounted or hung from structure. Construct of structural steel members or steel pipe and fittings. Provide factory-fabricated tank saddled for tanks mounted on steel stands.

4. Provide inertia pads for all floor mounted pumps and boilers. Inertia pads shall be made of 4" concrete base on top of 2-inch thick isolation mat.

3.5. ADJUSTING AND CLEANING

A. Hanger Adjustments

1. Adjust hangers so as to distribute loads equally on attachments.

B. Support Adjustment

1. Provide grout under supports so as to bring piping and equipment to proper level and elevations.

C. Cleaning

1. Clean factory-installed surfaces. Restore any marred or scratched surfaces with manufacturer's touch-up paint (Refer to Section 099000 – Painting and Finishing).

END OF SECTION 230529

SECTION 230548
Vibration and Seismic Controls for HVAC Piping and Equipment

PART 1 - GENERAL

1.1. RELATED DOCUMENTS

A. The following documents apply to all required work for the Project: (1) the Contract Drawings, (2) the Specifications, (3) the General Conditions, (4) the Addendum and (5) the Contract (City of New York Standard Construction Contract).

1.2. SUMMARY

A. Work Included: The work includes, but is not necessarily limited to the following:

1. Vibration isolation elements for piping and equipment.
2. Equipment isolation bases.
3. Piping flexible connections.

B. Related Work Specified in Other Sections:

1.	Common Work Results for HVAC	Section 230500
2.	Hydronic Piping	Section 232123
3.	Refrigerant Piping	Section 232300
4.	Metal Ducts	Section 233113
5.	Split System Air Conditioners	Section 238126
6.	Centrifugal HVAC Fans	Section 233416
7.	Variable Refrigerant Flow HVAC Systems	Section 238129
8.	Condensing Boilers	Section 235233

1.3. QUALITY ASSURANCE

A. Refer to DDC General Conditions Section 01 40 00 "Quality Requirements."

B. It is the objective of this Specification to provide the necessary design for the control of excessive noise and vibration in the Building due to the operation of machinery or equipment, and/or due to interconnected piping, ductwork or conduit.

1. All vibration isolators shall have either known undeflected heights or calibration markings so that, after adjustment, when carrying their load, the deflection under load can be verified, thus determining that the load is within the proper range of the device and that the correct degree of vibration isolation is being provided according to the design.
2. All isolators shall operate in the linear portion of their load versus deflection curve. Load versus deflection curve. Load versus deflection curves shall be furnished by the manufacturer, and must be linear over a deflection range of not less than 50% above the design deflection.

3. The theoretical vertical natural frequency for each support point, based upon load per isolator and isolator stiffness, shall not differ from the design objectives for the equipment as a whole by more than + 10%.
4. All neoprene mountings shall have a Shore hardness of 30 to 60 +5, after minimum aging of 20 days or corresponding oven-aging.

1.4. SUBMITTALS

A. Refer to DDC General Conditions Section 01 33 00 "Submittal Procedures."

B. Product Data

1. Submit manufacturer's product data and installation instructions for each type of vibration isolation.

2. Submit schedule showing manufacturer's mounting sizes and guarantee deflections noted on the drawings.

C. Shop Drawing

1. Submit shop drawing for the vibration isolating supports required for each item of HVAC equipment, showing the types of isolation supports, equipment bases being furnished and the static deflection and efficiency to be attained.

D. Maintenance Data

1. Submit maintenance data and material lists for each type of vibration isolation system. Include this data, product data and shop drawings in maintenance manual in accordance with requirements of DDC General Conditions.

1.5. DELIVERY, STORAGE AND HANDLING

A. Deliver isolation units to project site in original, unopened packages and store them in fully enclosed space where they will be protected against damage.

PART 2 - PRODUCTS

2.1. MANUFACTURERS

A. Subject to compliance with requirements, manufacturers offering vibration isolators and bases which may be incorporated in the work include the following:

1. Mason Industries, Inc.
2. Vibration Eliminator Co.
3. Vibration Mountings & Controls Inc.
4. Or approved equal.

2.2. MATERIALS

A. Spring Mounts:

1. Housed Spring Mounts: Spring type mounts shall consist of cast telescoping housings containing one or more steel springs. The mount shall be provided with built-in leveling bolt(s), resilient inserts of neoprene to act as guides for upper and lower housing and with ribbed neoprene acoustical pads bonded to the bottom of the lower housing. The lower housing shall have slotted holes in the base, to permit fastening of the mount to the floor when specified.

2. Free standing spring mounts shall be laterally stable without housing. Each mount shall be provided with a leveling bolt, a ribbed neoprene pad on the underside of the base, and means of securing the spring to the floor when specified.

B. Neoprene-in-Shear Mounts

1. Each neoprene-in-shear type mount shall consist of a steel tip plate and steel base plate completely enclosed in oil resistant neoprene. Top plate shall have a threaded bolt hole for attachment of equipment to mount. Base plate shall have bolt holes, to permit fastening of the mount to the floor when specified. Underside of base plate shall have ribbed, neoprene construction. Single neoprene-in-shear mounts shall have a maximum deflection of 0.25 inches. Double neoprene-in-shear mounts shall have a maximum deflection of 0.50-inches.

C. Hanger Type Isolators

1. Hanger type isolators shall consist of a steel housing incorporating a single or double neoprene-in-shear element or a steel spring, or a combination of these two isolators, as needed to achieve the required static deflection. Provide threaded rods for attachment of hanger to overhead structure and to equipment.

D. Steel Bases

1. Integral structural steel bases for belt driven centrifugal fans shall be rectangular in shape, and each member shall be of wide flange beam or channel shaped cross-section. Based for fans having motors in the X or Y position may be of "L" shape configuration. Depth of section shall be equal to minimum of 1/10th of the longest span of the equipment Built-in adjustable motor slide rails shall be provided as an integral part of the base. Joints shall be continuously welded.

PART 3 - EXECUTION

3.1. EXECUTION REQUIREMENTS

A. Refer to DDC General Conditions for execution requirements.

3.2. PREPARATION

A. For vibration isolation equipment installed indoors, all metal parts, including rails and bases, shall be painted at the factory with one coat of red oxide paint and one coat of aluminum paint. Other means or rust resisting painting may be accepted, subject to prior approval.

B. Vibration isolation equipment installed outdoors shall have all steel parts hot dipped galvanized, all bolts cadmium plated, and all springs cadmium plated and neoprene coated.

3.3. INSTALLATION

A. At each equipment location, provide the required deflection under the imposed load and produce uniform loading and deflection even when equipment weight is not evenly distributed. Jack bases into position and wedge in place before spring loading; leveling bolts shall not be used as jacking screws. After equipment is in place and springs are loaded through leveling bolts, remove wedges and jacks. Isolators shall be suitable for the lowest operating speed of the equipment.

B. Where the floor is waterproofed or finished with waterproof cement, install vibration isolation in such manner that the waterproofing is not damaged.

C. Isolation equipment shall be in accordance with the following table:

Lowest RPM	Inches Deflection (Min.)	% Efficiency	Type
1750 & over	.25	95	Single neoprene-in-shear
1200-1749	.50	95	Double neoprene-in-shear
1100-1199	.75	95	Spring
570-999	1.25	90-95	Spring
330-519	1.5	80-90	Spring
Up to 329	3.5	80	Spring

D. Install combination spring and double deflection neoprene position hangers on the suction and discharge piping at each circulating pump in the hot and/or chilled water system. Each hanger shall be located on the pump side of the flexible hose connection.

3.4. FIELD QUALITY CONTROL

A. On completion of the vibration isolation system herein specified. The representative of the vibration isolation manufacturer shall inspect the completed systems and report in writing any installation error, improperly selected isolation devices, or any other faults that could affect performance. Submit report

indicating steps taken to properly complete the isolation work. Both of these reports shall be reviewed by the Commissioner for final approval.

3.5. SCHEDULE

A. Provide vibration isolation supports for HVAC equipment as indicated in this schedule:

Equipment	Location	Type of Support
Centrifugal fans, belt driven	Roof mounted	Integral steel base with isolators
H & V	Roof mounted	Integral steel base with isolators
Air handling unit	Overhead Supported	Spring and double deflecting neoprene hangers
RTU's unit	Roof mounted	Integral steel base with isolators
Pipe	At pumps	Spring and D.D.* hanger
Generator	Floor mounted	Springs

* D.D. = Double Deflecting

END OF SECTION 230548

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1. Life Safety Systems:

   a. All systems involved with fire protection including fire dampers and smoke exhaust systems.
   b. Fresh air relief systems on emergency control sequence including air handlers, duct, dampers, etc.

2. Positive Attachment:
   a. A positive attachment is defined as a cast-in anchor, a drill-in wedge anchor, a double-sided beam clamp loaded perpendicular to a beam, or a welded or bolted connection to structure. Single sided "C" type beam clamps for support rods of overhead piping, ductwork, fire protection, electrical conduit, bus duct, or cable trays, or any other equipment are not acceptable on this project as seismic anchor points.
3. Tracing Bracing
   a. Restraint(s) applied to limit motion perpendicular to the centerline of the pipe, duct or conduit.
4. Longitudinal Bracing:
   a. Restraint(s) applied to limit motion parallel to the centerline of the pipe, duct or conduit.

1.2. QUALITY ASSURANCE

A. Refer to DDC General Conditions Section 01 40 00 "Quality Requirements."

1.3. SUBMITTALS

A. Refer to DDC General Conditions Section 01 33 00 "Submittal Procedures."

B. The manufacturer of vibration isolation and seismic restraints shall provide submittals for products as follows:

1. Descriptive Data:
   a. Catalog cuts or data sheets on vibration isolators and specific restraints detailing compliance with the specification.
   b. Detailed schedules of flexible and rigidly mounted equipment, showing vibration isolators and seismic restraints by referencing numbered descriptive drawings.
2. Shop Drawings:

   a. Submit fabrication details for equipment bases including dimensions, structural member sizes and support point locations.
   b. Provide all details of suspension and support for ceiling hung equipment.
   c. Where walls, floors, slabs or supplementary steel work are used for seismic restraint locations, details of acceptable attachment methods for ducts, conduit and pipe must be included and approved before the condition is accepted for installation. Restraint manufacturers' submittals must include spacing, static loads and seismic loads at all attachment and support points.

SECTION 230549
HVAC Seismic Specification

PART 1 - GENERAL

1.1. RELATED DOCUMENTS

A. The following documents apply to all required work for the Project: (1) the Contract Drawings, (2) the Specifications, (3) the General Conditions, (4) the Addendum and (5) the Contract (City of New York Standard Construction Contract).

1. HVAC Seismic Bracing applies to all HVAC trades (to withstand applicable forces in shear).
2. The following life safety items shall be seismically braced in accordance with the New York City Building Code requirements.
3. All seismic mounts and bracing shall be in accordance with manufacturer's standards.
   a. Gas burning equipment.

B. Intent

1. All mechanical equipment, piping and ductwork as noted on the equipment schedule or in the specification shall be mounted on vibration isolators to prevent the transmission of vibration and mechanically transmitted sound to the building structure. Vibration isolators shall be selected in accordance with the weight distribution so as to produce reasonably uniform deflections. This applies only to life safety equipment and hazard systems (gas systems).
2. All isolators and isolation materials shall be of the same manufacturer and shall be certified by the manufacturer.
3. All such systems must be installed in strict accordance with seismic codes, component manufacturer's and building construction standards. Whenever a conflict occurs between the manufacturer's and construction standards, the most stringent shall apply.
4. Seismic restraints shall be designed in accordance with seismic force levels as detailed in this section

C. The work in this section applies only to "Life Safety Systems" and includes, but is not limited to the following:

1. Vibration isolation for piping, ductwork and equipment.
2. Equipment isolation bases.
3. Flexible piping connections.
4. Seismic restraints for isolated equipment.
5. Seismic restraints for non-isolated equipment.
6. Certification of seismic restraint designs and installation supervision.
7. Certification of seismic attachment of housekeeping pads.
8. All mechanical systems defined as life safety systems equipment buried underground is excluded but entry of services through the foundation wall is included. Equipment referred to below is typical.
   a. Fans
   b. Piping

D. Definitions

d. Provide specific details of seismic restraints and anchors; include number, size and locations for each piece of equipment.

3. Seismic Certification and Analysis:
   a. Seismic restraint calculations must be provided for all connections of equipment to the structure. Calculations must be stamped by a registered professional engineer with seismic design experience.
   b. All restraining devices shall have a preapproval number showing maximum restraint ratings. Preapprovals based on independent testing are preferred to preapprovals based on calculations. Where preapproved devices are not available, submittals based on independent testing are preferred. Calculations (including the combining of tensile and shear loadings) to support seismic restraint designs must be stamped by a registered professional engineer and licensed in the state of New York. Testing and calculations must include both shear and tensile loads.
   c. Analysis must indicate calculated dead loads, static seismic loads and capacity of materials utilized for connections to equipment and structure. Analysis must detail anchoring methods, bolt diameter, embedment and/or welded length. All seismic restraint devices shall be designed to accept, without failure, the forces detailed in section 1.06 acting through the equipment center of gravity. Overturning moments may exceed forces at ground level.

1.4. CODE AND STANDARDS REQUIREMENTS

A. Typical Applicable codes and Standards

1. New York City LL17/95 2.UBC Section 2312-1990

1.5. MANUFACTURER'S RESPONSIBILITY

A. Manufacturer of vibration isolation and seismic control equipment shall have the following responsibilities:

1. Determine vibration isolation and seismic restraint sizes and locations.
2. Provide vibration isolation and seismic restraints as schedules or specified.
3. Provide calculations and materials if required for restraint of unisolated equipment.
4. Provide installation instructions, drawings and trained field supervision to insure proper installation and performance.

1.6. RELATED WORK

A. Housekeeping Pads

1. Housekeeping pad reinforcement and monolithic pad attachment to the structure details and design shall be prepared by the restraint vendor if not already indicated on the drawings.
2. Housekeeping pads shall be coordinated with restraint vendor and sized to provide a minimum edge distance of ten (10) bolt diameters all around the outermost anchor bolt to allow development of full drill-in wedge anchor ratings. If cast-in anchors are to be used, the

housekeeping pads shall be sized to accommodate the ACI requirements for bolt page coverage and embedment.

B. Supplementary Support Steel

1. Contractor shall supply supplementary support steel for all equipment, piping, ductwork, etc. including roof mounted equipment, as required or specified.

C. Attachments

1. Contractor shall supply restraint attachment plates cast into housekeeping pads, concrete inserts, double sided beam clamps, etc. in accordance with the requirements of the vibration vendor's calculations.

1.7. SEISMIC FORCE LEVELS

A. The following force levels will be used on this project:

1. Minimum "G" Forces Equal to or Exceeding Building Code Listed in 1.3.

SEISMIC ZONE #2	BUILDING CODE	**"G" Forces for Life Safety Equipment either rigidly or flexibly Mounted**	
	NYC LL17/95 AS MODIFIED UBC SECTION 2312-1990	Horiz. 0.6	Vert. 0.2

1.8. INTENT

A. All vibration isolators and seismic restraints described in this section shall be the product of a single manufacturer. Mason Industry's products are the basis of these specifications. Submittals and certification sheets shall be in accordance with section 1.2.

B. Failure is defined as the discontinuance of any attachment point between equipment or structure, vertical permanent deformation greater than 1/8 inch and/or horizontal permanent deformation greater that 1/4 inch.

PART 2 - PRODUCTS

2.1. DESCRIPTIONS

A. Vibration Isolators and Seismic Restraints.

2.2. SPECIFICATION

A. Two layers of 3/4" thick neoprene pad consisting of 2" square waffle modules separated horizontally by a 16 gauge galvanized shim. Load distribution plates shall be used as required.

B. Bridge-bearing neoprene mountings shall have a minimum static deflection of 0.2" and all directional seismic capability. The mount shall consist of a ductile iron casting containing two separated and opposing molded neoprene elements. The elements shall prevent the central threaded sleeve and attachment bolt from contacting the casting during normal operation. The shock absorbing neoprene materials shall be compounded to bridge-bearing specifications. Mountings shall have an Anchorage Pre-approval "R" Number the NYC Seismic Code verifying the maximum certified horizontal and vertical load ratings.

C. Sheet metal panels shall be bolted to the walls or supporting structure by assemblies consisting of a neoprene bushing cushioned between 2 steel sleeves. The outer sleeve prevents the sheet metal from cutting into the neoprene. Enlarge panel holes as required. Neoprene elements pass over the bushing to cushion the back panel horizontally. A steel disc covers the inside neoprene element and the inner steel sleeve is elongated to act as a stop so tightening the anchor bolts does not interfere with panel isolation in 3 planes. Bushing assemblies can be applied to the ends of steel cross members where applicable. All neoprene shall be bridge bearing quality.

D. A one piece molded bridge bearing neoprene washer/bushing. The bushing shall surround the anchor bolt and have a flat washer face to avoid metal to metal contact.

E. Spring isolators shall be free standing and laterally stable without any housing and complete with a molded neoprene cup or 1/4" neoprene acoustical friction pad between the baseplate and the support. All mountings shall have leveling bolts that must be rigidly bolted to the equipment. Spring diameters shall be no less than 0.8 of the compressed height of the spring at rated load. Springs shall have a minimum additional travel to solid equal to 50% of the rated deflection. Submittals shall include spring diameters, deflection, compressed spring height and solid spring height.

F. Restrained spring mountings shall have an SLF mounting, within a rigid housing that includes vertical limit stops to prevent spring extension when weight is removed. The housing shall serve as blocking during erection. A steel spacer shall be removed after adjustment. Installed and operating heights are equal. A minimum clearance of 1/2" shall be maintained around restraining bolts and between the housing and the spring so as not to interfere with the spring action. Limit stops shall be out of contact during normal operation. Since housings will be bolted or welded in position there must be an internal isolation pad. Housing shall be designed to resist all seismic forces. Mountings shall have Anchorage Preapproval "R" Number the NYC Seismic Code certifying the maximum certified horizontal and vertical load ratings.

G. Spring mountings built into a ductile iron or steel housing to provide all directional seismic snubbing. The snubber shall be adjustable vertically and allow a maximum of 1/4 inch travel in all directions before contacting the resilient snubbing collars. Mountings shall have an Anchorage Pre-approval "R" number from the NYC Seismic Code verifying the maximum certified horizontal and vertical load ratings.

H. Air springs shall be manufactured with upper and lower steel sections connected by a replaceable flexible nylon reinforced neoprene element. Air spring configuration shall be multiple bellows to achieve a

maximum natural frequency of 3 Hz. Air Springs shall be designed for a burst pressure that is a minimum of three times the published maximum operating pressure. All air spring systems shall be connected to either the building control air or a supplementary air supply and equipped with three leveling valves to maintain leveling within plus or minus 1/8". Submittals shall include natural frequency, load and damping tests performed by an independent lab or acoustician.

I. Restrained air spring mountings shall have an MT air spring, within a rigid housing that includes vertical limit stops to prevent air spring extension when weight is removed. The housing shall serve as blocking during erection. A steel spacer shall be removed after adjustment. Installed and operating heights are equal. A minimum clearance of 1/2" shall be maintained around restraining bolts and between the housing and the air spring so as not to interfere with the air spring action. Limit stops shall be out of contact during normal operation. Housing shall be designed to resist all seismic forces.

J. Hangers shall consist of rigid steel frames containing minimum 1 1/4" thick neoprene elements at the top and a steel spring with general characteristics seated in a steel washer reinforced neoprene cup on the bottom. The neoprene element and the cup shall have neoprene bushings projecting through the steel box. To maintain stability the boxes shall not be articulated as clevis hangers nor the neoprene element stacked on top of the spring. Spring diameters and hanger box lower hole sizes shall be large enough to permit the hanger rod to swing through a 30**E** arc from side to side before contacting the rod bushing and short circuiting the spring. Submittals shall include a hanger drawing showing the 30**E** capability.

K. Hangers shall be as described in 10, but they shall be pre-compressed and locked at the rated deflection by means of a resilient seismic upstop to keep the piping or equipment at a fixed elevation during installation. The hangers shall be designed with a release mechanism to free the spring after the installation is complete and the hanger is subjected to its full load. Deflection shall be clearly indicated by means of a scale. Submittals shall include a drawing of the hanger showing the 30 degree capability.

L. Seismic Cable Restraints shall consist of galvanized steel aircraft cables sized to resist seismic loads with a minimum safety factor of two and arranged to provide all-directional restraint. Cable end connections shall be steel assemblies that swivel to final installation angle and utilize two clamping bolts to provide proper cable engagement. Cables must not be allowed to bend across sharp edges. Cable assemblies shall have an Anchorage Pre-approval "R" Number from the NYC Seismic Code verifying the maximum certified load ratings.

M. Seismic solid braces shall consist of steel angles or channels to resist seismic loads with a minimum safety factor of 2 and arranged to provide all directional restraint. Seismic solid brace end connectors shall be steel assemblies that swivel to the final installation angle and utilize two through bolts to provide proper attachment. Seismic solid brace assembly shall have anchorage pre-approval "R" number from the NYC Seismic Code verifying the maximum certified load ratings.

1. Note: At trapeze anchor locations piping must be shackled to the trapeze. Specifications apply to hanging equipment as well.

N. Steel angles, sized to prevent buckling, shall be clamped to pipe or equipment rods utilizing a minimum of three ductile iron clamps at each restraint location when required. Welding of support rods is not acceptable. Rod clamp assemblies shall have an Anchorage Preapproval "R" Number from the NYC Seismic Code.

O. Pipe clevis cross bolt braces are required in all restraint locations. They shall be special purpose preformed channels deep enough to be held in place by bolts passing over the cross bolt. Clevis cross braces shall have an Anchorage Preapproval "R" Number from the NYC Seismic Code.

P. All-directional seismic snubbers shall consist of interlocking steel members restrained by a one-piece molded neoprene bushing of bridge bearing neoprene. Bushing shall be replaceable and a minimum of 1/4 inch thick. Rated loadings shall not exceed 1000 psi. A minimum air gap of 1/8 inch shall be incorporated in the snubber design in all directions before contact is made between the rigid and resilient surfaces. Snubber end caps shall be removable to allow inspection of internal clearances. Neoprene bushings shall be rotated to insure no short circuits exist before systems are activated. Snubbers shall have an Anchorage Preapproval "R" Number from the NYC Seismic Code verifying the maximum certified horizontal and vertical load ratings.

Q. All directional seismic snubbers shall consist of interlocking steel members restrained by shock absorbent rubber materials compounded to bridge bearing specifications. Elastomeric materials shall be replaceable and a minimum of 3/4" thick. Rated loadings shall not exceed 1000 psi. Snubbers shall be manufactured with an air gap between hard and resilient material of not less than 1/8" or more that 1/4". Snubbers shall be installed with factory set clearances. The capacity of the seismic snubber at 3/8" deflection shall be equal or greater than the load assigned to the mounting grouping controlled by the snubber multiplied by the applicable "G" force. Submittals shall include the load deflection curves up to 1/2" deflection in the x, y and z planes. Snubbers shall have an anchorage preapproval "R" number from the NYC Seismic Code verifying the maximum certified horizontal and vertical load ratings.

R. Stud wedge anchors shall be manufactured from full diameter wire, not from undersized wire that is "rolled up" to create the thread. The stud anchor shall also have a safety shoulder, which fully supports the wedge ring under load. The stud anchors shall have an evaluation report number from the I.C.B.O Evaluation Service, Inc. verifying its allowable loads.

S. Female wedge anchors are preferred in floor locations so isolators or equipment can be slid into place after the anchors are installed. Anchors shall be manufactured from full diameter wire, and shall have a safety shoulder to fully support the wedge ring under load. Female wedge anchors shall have an evaluation report number from the I.C.B.O Evaluation Service, Inc. verifying to its allowable loads.

T. Vibration isolation manufacturer shall furnish integral structural steel bases. Rectangular bases are preferred for all equipment. Centrifugal refrigeration machines and pump bases may be T or L shaped where space is a problem. Pump bases for split case pump shall include supports for suction and discharge elbows. All perimeter members shall be steel beams with a minimum depth equal to 1/10 of the longest dimension of the base. Base depth need not exceed 14" provided that the deflection and misalignment is kept within acceptable limits as determined by the manufacturer. Height saving brackets shall be employed in all mounting locations to provide a base clearance of 1".

U. Vibration isolation manufacturer shall furnish rectangular steel concrete pouring forms for floating and inertia foundations. Bases for split case pumps shall be large enough to provide for suction and discharge elbows. Bases shall be a minimum of 1/12 of the longest dimension of the base but not less than 6". The base depth need not exceed 12" unless specifically recommended by the base manufacturer for mass or rigidity. Forms shall include minimum concrete reinforcing consisting of 1/2" bars welded in place on 6" centers running both ways in a layer 1 1/2" above the bottom. Forms shall be furnished with steel templates to hold the anchor bolts sleeves and anchors while concrete is being poured. Height saving

brackets shall be employed in all mounting locations to maintain a 1" clearance below the base. Wooden formed bases leaving a concrete rather then a steel finish are not acceptable.

V. Curb mounted rooftop equipment shall be mounted on spring isolation curbs. The lower member shall consist of a sheet metal Z section containing adjustable and removable steel springs that support the upper floating section. The upper frame must provide continuous support for the equipment and must be captive so as to resiliently resist wind and seismic forces. All directional neoprene snubber bushings shall be a minimum of 1/4" thick. Steel springs shall be laterally stable and rest on 1/4" thick neoprene acoustical pads. Hardware must be plated and the springs provided with a rust resistant finish. The curbs waterproofing shall consist of a continuous galvanized flexible counter flashing nailed over the lower curbs waterproofing and joined at the corners by EPDM bellows. All spring locations shall have access ports with removable waterproof covers. Lower curbs shall have provision for 2" of insulation. The roof curbs shall be built to seismically contain the rooftop unit. The unit must be solidly fastened to the top floating rail, and the lower Z section anchored to the roof structure. Curb shall have anchorage preapproval "R" from the NYC Seismic Code attesting to the maximum certified horizontal and vertical load ratings.

W. Flexible spherical expansion joints shall employ peroxide cured EPDM in the covers, liners and Dacron tire cord frictioning. Solid steel rings shall be used within the raised face rubber ends to prevent pullout. Flexible cable bead wire is not acceptable. Sizes 2" and larger shall have two spheres reinforced with a ring between spheres to maintain shape and complete with split ductile iron or steel flanges with hooked or similar interlocks. Sizes 16" to 24" may be single sphere. Sizes 3/4" to 1 1/2" may have threaded bolted flange assemblies, one sphere and cable retention. 14" and smaller connectors shall be rated at 250 psi up to 190F with a uniform drop in allowable pressure to 190 psi at 250F. 16" and larger connectors are rated 180 psi at 190F and 135 psi at 250F. Safety factors to burst and flange pullout shall be a minimum of 3/1. All joints must have permanent markings verifying a 5 minute factory test at twice the rated pressure. Concentric reducers to the above specifications may be substituted for equal ended expansion joints. Expansion joints shall be installed in piping gaps equal to the length of the expansion joints under pressure. Control rods need only be used in unanchored piping locations where the manufacturer determines the installation exceeds the pressure requirement without control rods, as control rods are not desirable in seismic work. If control rods are used, they must have 1/2" thick Neoprene washer bushings large enough in area to take the thrust at 1000 psi maximum on the washer area. Expansion joints shall be installed on the equipment side of the shut off valves. Submittals shall include two test reports by independent consultants showing minimum reductions of 20 DB in vibration accelerations and 10 DB in sound pressure levels at typical blade passage frequencies on this or a similar product by the same manufacturer. All expansion joints shall be installed on the equipment side of the shut off valves.

X. Flexible stainless steel hose shall have stainless steel braid and carbon steel fittings. Sizes 3" and larger shall be flanged. Smaller sizes shall have male nipples. Minimum lengths shall be as tabulated:

Flanged		Male Nipples	
3 x 14	10 x 26	1/2 x 9	1½ x 13
4 x 15	12 x 28	3/4 x 10	2 x 14
5 x 19	14 x 30	1 x 11	2½ x 18
6 x 20	16 x 32	1¼ x 12	8 x 22

Y. Hoses shall be installed on the equipment side of the shut-off valves horizontally and parallel to the equipment shafts wherever possible.

Z. All-directional acoustical pipe anchor, consisting of two sizes of steel tubing separated by a minimum 1/2" thick 60 durometer neoprene. Vertical restraint shall be provided by similar material arranged to prevent vertical travel in either direction. Allowable loads on the isolation material should not exceed 500 psi and the design shall be balanced for equal resistance in any direction.

AA. Pipe guides shall consist of a telescopic arrangement of two sizes of steel tubing separated by a minimum 1/2" thickness of 60 durometer neoprene. The height of the guides shall be preset with a shear pin to allow vertical motion due to pipe expansion or contraction. Shear pin shall be removable and re-insertable to allow for selection of pipe movement. Guides shall be capable of + 1 5/8" motion, or to meet location requirements.

BB. Split Wall Seals consist of two bolted pipe halves with minimum 3/4" thick neoprene sponge bonded to the inner faces. The seal shall be tightened around the pipe to eliminate clearance between the inner sponge face and the piping. Concrete may be packed around the seal to make it integral with the floor, wall or ceiling if the seal is not already in place around the pipe prior to the construction of the building member. Seals shall project a minimum of 1" past either face of the wall. Where temperatures exceed 240**E** F, 10# density fiberglass may be used in lieu of the sponge.

CC. The horizontal thrust restraint shall consist of a spring element in series with a neoprene molded cup with the same deflection as specified for the mountings or hangers. The spring element shall be designed so it can be preset for thrust at the factory and adjusted in the field to allow for a maximum of 1/4" movement at start and stop. The assembly shall be furnished with 1 rod and angle brackets for attachment to both the equipment and the ductwork or the equipment and the structure. Horizontal restraints shall be attached at the centerline of thrust and symmetrical on either side of the unit.

PART 3 - EXECUTION

3.1. EXECUTION REQUIREMENTS

A. Refer to DDC General Conditions for execution requirements.

3.2. GENERAL

A. All vibration isolators and seismic restraint systems must be installed in strict accordance with the manufacturers written instructions and all certified submittal data.

B. Installation of vibration isolators and seismic restraints must not cause any change of position of equipment, piping or ductwork resulting in stresses of misalignment.

C. No rigid connections between equipment and the building structure shall be made that degrades the noise and vibration control system herein specified.

D. The contractor shall not install any equipment, piping, duct or conduit which makes rigid connections with the building unless isolation is not specified. "Building" includes, but is not limited to, slabs, beams, columns, studs and walls.

E. Coordinate work with other trades to avoid rigid contact with the building.

F. Any conflicts with other trades which will result in rigid contact with equipment or piping due to inadequate space or other unforeseen conditions should be brought to the Commissioner's attention prior to installation.

G. Bring to the architects/engineers attention any discrepancies between the specifications and the field conditions or changes required due to specific equipment selection, prior to installation. Corrective work necessitated by discrepancies after installation shall be at the responsible contractors expense.

H. Correct, at no additional cost, all installations which are deemed defective in workmanship and materials at the contractor's expense.

I. Overstressing of the building structure must not occur because of overhead support of equipment. Contractor must submit loads to the Commissioner for approval. Generally bracing may occur from:

1. Flanges of structural beams.
2. Cast in place inserts or wedge type drill-in concrete anchors.

J. Cable restraints shall be installed slightly slack to avoid short circuiting the isolated suspended equipment, piping or conduit.

K. Cable assemblies are installed taut on non-isolated systems. Seismic solid braces may be used in place of cables on rigidly attached systems only.

L. At locations where restraints are located, the support rods must be braced when necessary to accept compressive loads with braces.

M. At all locations where restraints are attached to pipe clevis's, the clevis cross bolt must be reinforced with braces.

N. Drill-in concrete anchors for ceiling and wall installation, female wedge type for floor mounted equipment.

O. Vibration isolation manufacturer shall furnish integral structural steel bases as required. Independent steel rails are not permitted on this project.

P. Hand built elastomeric expansion joints may be used when pipe sizes exceed 24" or specified movements exceed capabilities.

Q. Where piping passes through walls, floors or ceilings the vibration isolation manufacturer shall provide wall seals.

R. Air handling equipment and centrifugal fans shall be protected against excessive displacement which results from high air thrust in relation to the equipment weight.

S. Locate isolation hangers as near to the overhead support structure as possible.

3.3. VIBRATION ISOLATION OF PIPING

A. Horizontal pipe isolation: The first three pipe hangers in the main lines near the mechanical equipment. Hangers must also be used in all transverse braced isolated locations. Brace hanger rods with SRC clamps. Horizontal runs in all other locations throughout the building shall be isolated by hangers. Floor supported piping shall rest on isolators. Heat exchanger's and expansion tanks are considered part of the piping run. The first three isolators from the isolated equipment will have the same static deflection as specified for the mountings under the connected equipment. If piping is connected to equipment located in basements and hangs from ceilings under occupied spaces the first three hangers shall have 0.75" deflection for pipe sizes up to and including 3", 1 1/2" deflection for pipe sizes up to and including 6", and 2 1/2" deflection thereafter. Hangers shall be located as close to the overhead structure as practical. Where piping connects to mechanical equipment install expansion joints or stainless hoses is not suitable for the service.

B. Riser isolation: Risers shall be suspended from hangers or supported by mountings, anchored with anchors, and guided with sliding guides. Steel springs shall be a minimum of 0.75" except in those expansion locations where additional deflection is required to limit load changes to + 25% of the initial load. Submittals must include riser diagrams and calculations showing anticipated expansion and contraction at each support point, initial and final loads on the building structure, spring deflection changes and seismic loads. Submittal data shall include certification that the riser system has been examined for excessive stresses and that none will exist in the proposed design.

C. Seismic Restraint of Piping

1. Seismically restrain all piping listed as a, b or c below. Use cables if isolated. Restraints may be used on unisolated piping.
   a. Piping located in boiler rooms, mechanical equipment rooms, 1 1/4" I.D. and larger.
   b. All other piping 2 1/2" diameter and larger.
2. Transverse piping restraints shall be at 40' maximum spacing for all pipe sizes, except where lesser spacing is required to limit anchorage loads.
3. Longitudinal restraints shall be at 80' maximum spacing for all pipe sizes, except where lesser spacing is required to limit anchorage loads.
4. Where thermal expansion is a consideration, guides and anchors may be used as transverse and longitudinal restraints provided they have a capacity equal to or greater than the restraint loads in addition to the loads induced by expansion or contraction.
6. Transverse restraint for one pipe section may also act as a longitudinal restraint for a pipe section of the same size connected perpendicular to it if the restraint is installed within 24" of the elbow or TEE or combined stresses are within allowable limits at longer distances.
7. Hold down clamps must be used to attach pipe to all trapeze members before applying restraints in a manner similar to clevis supports.
8. Branch lines may not be used to restrain main lines.

D. Vibration Isolation of Ductwork

1. All discharge runs for a distance of 50' from the connected equipment shall be isolated from the building structure by means of hangers or floor isolators. Spring deflection shall be a minimum of 0.75".

2. All duct runs having air velocity of 1000 fpm or more shall be isolated from the building structure by hangers or floor supports. Spring deflection shall be a minimum of 0.75".

E. Seismic restraint of ductwork

1. Seismically restrain all ductwork with restraints as listed below:

   a. Restrain rectangular ducts with cross sectional area of 6 sq. or larger.
   b. Restrain round ducts with diameters of 28" or larger.
   c. Restrain flat oval ducts the same as rectangular ducts of the same nominal size.

2. Transverse restraints shall occur at 30' intervals or at both ends of the duct run if less than the specified interval. Transverse restraints shall be installed at each duct turn and at each end of a duct run.
3. Longitudinal restraints shall occur at 60' intervals with at least one restraint per duct run. Transverse restraints for one duct section may also act as a longitudinal restraint for a duct section connected perpendicular to it if the restraints are installed within 4' of the intersection of the ducts and if the restraints are sized for the larger duct. Duct joints shall conform to SMACNA duct construction standards.
4. The ductwork must be reinforced at the restraint locations. Reinforcement shall consist of an additional angle on top of the ductwork that is attached to the support hanger rods. Ductwork is to be attached to both upper angle and lower trapeze.
5. A group of ducts may be combined in a larger frame so that the combined weights and dimensions of the ducts are less than or equal to the maximum weight and dimensions of the duct for which bracing details are selected.
6. Walls, including gypsum board non bearing partitions, which have ducts running through them, may replace a typical transverse brace. Provide channel framing around ducts and solid blocking between the duct and frame.

3.4. SEISMIC RESTRAINT EXCLUSIONS

A. Piping

1. Piping in boiler and mechanical rooms less than 1¼ " inside diameter.
2. All other piping less than 2½" inside diameter.
3. All piping suspended by individual hangers 12" or less as measured from the top of the pipe to the bottom of the support where the hanger is attached. However, if the 12" limit is exceeded by any hanger in the run, seismic bracing is required for the run. The 12" exemption applies for trapeze supported systems if the top of each item supported by the trapeze qualifies.

B. Ductwork

1. Rectangular and square and cuts that are less than 6 square feet in cross sectional area.
2. Oval ducts that are less than 6 square feet in cross sectional area based on nominal size.
3. Round duct less than 28" in diameter.
4. All duct suspended by hangers 12" or less in length as measured from the top of the duct to the point of attachment to the structure. Hangers must be attached within 2" of the top of the

duct with a minimum of two #10 sheet metal screws. If the 12" limit is exceeded by any hanger in the run, seismic bracing is required for the run.

C. Suspended Equipment

1. Fan powered equipment weighing less than 50 lbs. and rigidly connected to the supply side of the duct system and supported with a minimum of 4 hanger rods.

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SECTION 230553
Identification for HVAC Piping and Equipment

PART 1 - GENERAL

1.1. RELATED DOCUMENTS

A. The following documents apply to all required work for the Project: (1) the Contract Drawings, (2) the Specifications, (3) the General Conditions, (4) the Addendum and (5) the Contract (City of New York Standard Construction Contract).

1.2. SUMMARY

A. Work Included: The work includes, but is not necessarily limited to the following:

1. Provide all the mechanical identification for work indicated on the drawings and as specified in other Sections. The types of identification devices specified in this section included the following:

    a. Painted Identification Materials
    b. Plastic Pipe Markers
    c. Plastic Tape
    d. Plastic Duct Markers
    e. Valve Tags
    f. Valve Schedule Frames
    g. Engraved Plastic-laminate Signs
    h. Plastic Equipment Markers
    i. Plasticized Tags.

2. Mechanical identification furnished as part of factory-fabricated equipment, is specified as part of the equipment assembly.

B. Related Work: The following related items are specified in other sections of the specifications:

1.	Refrigerant Piping	Section 232300
2.	General-Duty Valves for HVAC Piping	Section 230523
3.	Piping Insulation	Section 230700
4.	Centrifugal HVAC Fans	Section 233416
5.	Metal Ducts	Section 233113

1.3. QUALITY ASSURANCE

A. Refer to DDC General Conditions Section 01 40 00 "Quality Requirements."

B. Manufacturer's Qualifications: Firms regularly engaged in manufacturer of identification devices of types and sizes required, whose products have been in satisfactory use in similar service for not less than three (3) years.

C. Codes and Standards:

1. ANSI Standards: Comply with ANSI A13.1 for lettering size, length of color field, colors, and viewing angles of identification devices.
2. NYC Building Code: Comply with NYC Building Code, for tag requirement of each valve.

1.4. SUBMITTALS

A. Refer to DDC General Conditions Section 01 33 00 "Submittal Procedures."

B. Product Data: Submit manufacturer's product data and installation instructions for each identification material and device required.

C. Samples: Submit samples of each color, lettering style and other graphic representation required for each identification material or system.

D. Schedules: Submit valve schedule for each piping system, typewritten and reproduced on 8 1/2" x 11" bond paper. Include valve number, piping system, system abbreviation (as shown on tag), location of valve (room or space), and variations for identification (if any). Mark valves which are intended for emergency shut-off and similar special uses, by special "flags", in margin of schedule. In addition to mounted copies, furnish extra copies for maintenance manuals.

E. Maintenance Data: Include product data and schedules in maintenance manuals in accordance with requirements of DDC General Conditions.

PART 2 - PRODUCTS

2.1. MATERIALS AND MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, manufacturers offering mechanical identification materials which may be incorporated in the work include the following:

1. Allen Systems, Inc.
2. Brady (W.H.) Co.
3. Signmark Div.
4. Industrial Safety Supply Co., Inc.
5. Seton Name Plate Corp.
6. Or approved equal.

B. Mechanical Identification Materials: Provide manufacturer's standard products of categories and types required for each application as referenced in other HVAC sections, indicated on the drawings and/or schedules. Where more than single type is specified for application, selections is the Commissioner's option, but provide single selection for each product category.

C. Painted Identification Materials:

1. Stencils: Standard fiberboard stencils, prepared for required applications with letter sizes generally complying with recommendations of ANSI A13.1 for piping and similar applications, but not less than 1 1/4" high letters for ductwork and not less than 3/4" high letters for access door signs and similar operational instructions.

a. Stencil Paint: Standard exterior type stenciling enamel except as otherwise indicated on the drawings; either brushing grade or pressurized spray-can form and grade.
b. Identification Paint: Standard identification enamel of colors indicated or, if not otherwise indicated for piping systems, comply with ANSI A13.1 for colors or selected by the Commissioner.

D. Plastic Pipe Markers:

1. Snap-On Type: Provide manufacturer's standard pre-printed, semi-rigid snap-on, color-coded pipe markers, complying with ANSI A13.1.

2. Pressure-Sensitive Type: Provide manufacturer's standard pre-printed, permanent adhesive, color-coded, pressure-sensitive vinyl pipe markers, complying with ANSI A13.1.

3. Insulation: Furnish 1" thick molded fiberglass insulation with jacket for each plastic pipe marker to be installed on uninsulated pipes subjected to fluid temperatures of 125 degrees F or greater. Cut length to extend 2" beyond each end of plastic pipe marker.

4. Small Pipes: For external diameters less than 6" (including insulation if any), provide full-band pipe markers, extending 360 degrees around pipe at each location, fastened by one of the following methods:

a. Snap-on application of pre-tensioned semi-rigid plastic pipe marker.
b. Adhesive lap joint in pipe marker overlap.
c. Laminated or bonded application of pipe marker to pipe (or insulation).
d. Taped to pipe (or insulation) with color-coded plastic adhesive tapes, not less than 3/4" wide; full circle at both ends of pipe marker, tape lapped 1 ½".

5. Large Pipes: For external diameters of 6" and larger (including insulation if any), provide either full-band or strip-type pipe markers, but not narrower than 3 times letter height (and of required length), fastened by one of the following methods:

a. Laminated or bonded application of pipe marker to pipe (or insulation).
b. Taped to pipe (or insulation) with color-coded plastic adhesive tape, not less than 1 1/2" wide; full circle at both ends of pipe marker, taped lapped 3".
c. Strapped-to-pipe (or insulation) application of semi-rigid type, with manufacturer's standard stainless steel bands.

6. Lettering: Manufacturer's standard pre-printed nomenclature which best describes piping system in each instance, as selected by the Commissioner in cases of variance with name as shown or specified.

a. Arrows: Print each pipe marker with arrows indicating direction of flow, either integrally with piping system service lettering (to accommodate both directions), or as separate unit of plastic.

E. Plastic Duct Markers:

1. Provide manufacturer's standard laminated plastic, color coded duct markers. Conform to the following color code if not specified:

   a. Green: Cold air.
   b. Yellow: Hot air.
   c. Yellow/Green: Supply air.
   d. Blue: Exhaust, outside, return and mixed air.

2. Nomenclature: Include the following:
   a. Direction of air flow.
   b. Duct service (supply, return, exhaust, etc.)
   c. Duct original (from).
   d. Duct destination (to).
   e. Design cfm.

F. Plastic Tape:

1. Provide manufacturer's standard color-coded pressure-sensitive (self-adhesive) vinyl tape, not less than 3 mils thick.

2. Width: Provide 1 1/2" wide tape markers on pipes with outside diameters (including insulation, if any) of less than 6", 2 1/2" wide tape for larger pipes.

3. Color: Comply with ANSI A13.1, except where another color selection is indicated on the drawings or in the schedules.

G. Valve Tags:

1. Brass Valve Tags: Provide 19-gauge polished brass valve tags with stamp-engraved piping system abbreviation in 1/4" high letters and sequenced valve numbers 1/2" high and with 5/32" hole for fastener.

   a. Provide 2" sq. tags except as otherwise shown on the drawings.
   b. Fill tag engraving with black enamel.

2. Plastic laminate valve tags: Provide manufacturer's standard 3/32" thick engraved plastic laminate valve tags, with piping system abbreviation in 1/4" high letters and sequenced valve numbers 1/2" high, and with 5/32" hole for fastener.

H. Valve Schedule Frames:

1. For each page valve schedule, provide single or double thick glass frame, with screws for mounting on masonry walls. Provide 1" wide oak picture molding frame with wood back finished with natural color.

I. Engraved Plastic-Laminate Signs:

1. Provide engraving stick melamine plastic laminate, complying with FS L-P-387, in the sized and thicknesses indicated, engraved with engraver's standard letter style of the sizes and wording indicated, black with white core (letter color) except as otherwise indicated on the drawings, punched for mechanical fastening except where adhesive mounting is necessary because of substrate.

   a. Thickness: 1/8", except as otherwise indicated on the drawings or schedules.
   b. Thickness: 1/6" for units up to 20 sq. in. or 8" length; 1/8" for larger units.
   c. Fasteners: Self-tapping stainless steel screws, except contact-type permanent adhesive where screws cannot or should not penetrate the substrate.

J. Plastic Equipment Markers:

1. Provide manufacturer's standard laminated plastic, color coded equipment markers. Conform to the following color code if not specified otherwise:

   a. Green: Cooling equipment and components.
   b. Yellow: Heating equipment and components.
   c. Yellow/Green: Combination cooling and heating equipment and components.
   d. Brown: Energy reclamation equipment and components.
   e. Blue: Equipment and components that do not meet any of the above criteria.

2. Nomenclature: Include the following matching terminology on schedules as closely as possible:

   a. Name and plan number.
   b. Equipment service.
   c. Design capacity.
   d. Other design parameters such as pressure drop, entering and leaving conditions, rpm, etc.

3. Size: Provide approximate 2 1/2" x 4" markers for control devices, dampers and valves; and 4 1/2" x 6" for equipment.

K. Plasticized Tags:

1. Manufacturer's standard pre-printed or partially pre-printed accident-prevention tags, of plasticized card stock with matt finish suitable for writing, approximately 3 1/4" x 5 5/8" with brass grommets and wire fasteners, and with appropriate pre-printed wording including large-size primary wording (as examples: DANGER, CAUTION, DO NOT OPERATE).

L. Lettering and Graphics:

1. Coordinate names, abbreviations and other designations used in mechanical identification work, with corresponding designations shown, specified or scheduled. Provide numbers, lettering and wording as indicated or, if not otherwise indicated, as recommended by manufacturers or as required for proper identification and operation/maintenance of mechanical systems and equipment.

2. Multiple Systems: Where multiple systems of same generic name are shown and specified, provide identification which indicates individual system number as well as service (as examples: Boiler No. 2, Air Supply No. 1).

PART 3 - EXECUTION

3.1. EXECUTION REQUIREMENTS

A. Refer to DDC General Conditions for execution requirements.

3.2. INSTALLATION

A. Coordination: Where identification is to be applied to surfaces which require insulation, painting or other covering or finishes, including valve tags in finished mechanical spaces, install identification after completion of covering and painting. Install identification prior to installation of acoustical ceilings and similar removable concealment.

B. Ductwork Identification:

1. Identify air supply, return, exhaust and intake ductwork with duct markers; or provide stenciled signs and arrows, showing ductwork service and direction of flow, in black or white (whichever provides most contrast with ductwork color)

2. Location: In each space where ductwork is exposed, or concealed only removable ceiling system, locate signs near points where ductwork originates or continues into concealed enclosures (shaft, underground or similar concealment), and 50' spacing along exposed runs.

3. Access Doors: Provide duct markers or stenciled signs on each access door in ductwork and housings, indicating purpose of access (to what equipment) and other maintenance and operating instructions, and appreciate, and appropriate safety and procedural information.

4. Concealed Doors: Where access doors are concealed above acoustical ceilings or similar concealment, plasticized tags may be installed for identification in lieu of specified signs at the Commissioner's option.

C. Piping System Identification:

1. Install pipe markers of one of the following types on each system indicated to receive identification, and include arrows to show normal direction of flow:

a. Stenciled markers, including color-coded background band or rectangle, and contrasting lettering of black or white. Extend color band or rectangle 2" beyond ends of lettering.

b. Plastic pipe markers, with application system as indicated under Materials in this section. Install on pipe insulation segment where required for hot non-insulated pipes.

2. Locate pipe markers and color bands as follows wherever piping is exposed to view in occupied spaces, machine rooms, accessible maintenance spaces (shafts, tunnels, plenums) and exterior non-concealed locations.

   a. Near each valve and control device. Near each branch mark each pipe at branch, where there could be question of flow pattern. Near locations where pipes pass through walls or floors/ceilings, or enter non-accessible enclosures. At access doors, manholes and similar access points which permit view of concealing piping near major equipment items and other points of origination and termination.
   b. Space intermediately at maximum spacing of 50' along each piping run, except reduce space to 25' in congested areas of piping and equipment.
   c. On piping above removable acoustical ceilings, except omit intermediately spaced markers.

D. Valve Identification:

1. Provide valve tag on every valve, cock and control device in each piping system; exclude check valves, valves within factory-fabricated equipment units, and shut-off valves at HVAC terminal devices and similar rough-in connections of units. List each tagged valve in valve schedule for each piping system.

   a. Tagging Schedule: Comply in requirements of "Valve Tagging Schedule" as end of this section.

2. Mount valve schedule frames and schedules in machine rooms where indicated or, if not otherwise indicated, where directed by the Commissioner.

3. Where more than one major machine room is shown on the Project, install mounted valve schedule in each major machine room, and repeat only main valves which are to be operated in conjunction with operations of more than single machine room.

E. Mechanical Equipment Identification:

1. Install engraved plastic laminate sign or plastic equipment marker on or near each major item of mechanical equipment and each operational device, as specified herein if not otherwise specified for each item or device. Provide signs for the following general categories of equipment and operational devices:

   a. Main control and operating valves, including safety devices.
   b. Meters, gages, thermometers and similar units.
   c. Pumps and similar motor-driven units.
   d. Coil heat exchangers and similar equipment.
   e. Fans, blowers and primary balancing dampers terminals.
   f. Package HVAC units and condensing units.
   g. Strainers, filters, water treatment systems and similar equipment.

2. Optional Sign Types: Where lettering larger than 1" height is needed for proper identification, stenciled signs may be provided in lieu of engraved plastic, at the City of New York's option.

3. Lettering Size: Minimum 1/4" high lettering for name of unit where viewing distance is less than 2', 1/2" for distances is less than proportionally larger lettering for greater distances. Provide secondary lettering 2/3 to 3/4 of size of principal lettering.

4. Text of Signs: In addition to name of identified unit, provide lettering to distinguish between multiple units, inform operator of operational requirements, indicate safety and emergency precautions, and warn of hazards and improper operations.

5. Optional Use of Plasticized Tags: At the Commissioner's option, where equipment to be identified is concealed above acoustical ceiling or similar concealment, plasticized tags may be installed within concealed space to reduce amount of text in exposed sign (outside concealment).

   a. Operational valves and similar minor equipment items located in non-occupied spaces (included machine rooms) may, at the Commissioner's option, be identified by installation of plasticized tags in lieu of engraved plastic signs.

3.3. ADJUSTING AND CLEANING

A. Adjusting: Relocate any mechanical identification device which has become visually blocked.

B. Cleaning: Clean face of identification devices, and glass frame of all charts.

3.4. VALVE TAGGING SCHEDULES

A. Numbers: Arrange the numbering of valves in the following manner:

1. In Ground Floor - No. 1 to No. 999.
2. Upper Floors - Floor No. followed by 000 thru 999.
3. Roof - No. R1 to R99.

B. In no case shall a number applying to one floor, be assigned to a valve located in another floor.

END OF SECTION 230553

SECTION 230593
Testing for HVAC

PART 1 - GENERAL

1.1. RELATED DOCUMENTS

A. The following documents apply to all required work for the Project: (1) the Contract Drawings, (2) the Specifications, (3) the General Conditions, (4) the Addendum and (5) the Contract (City of New York Standard Construction Contract).

1.2. SUMMARY

A. Work Included: The work includes, but is not necessarily limited to the following:

1. All the cleaning and testing for all the HVAC work done in this project, as specified herein, as indicated on the drawings, and as needed for complete and proper installation.

B. Related Work: The following major related items are specified in other sections of the specifications.

1.	Hydronic Piping	Section 232113
2.	Centrifugal HVAC Fans	Section 233416
3.	Hydronic Pumps	Section 232123
4.	Diffuser, Registers, Grilles	Section 233713
5.	Balancing for HVAC	Section 230594
6.	Air Duct Accessories	Section 233300

1.3. QUALITY ASSURANCE

A. Refer to DDC General Conditions Section 01 33 00 "Submittal Procedures."

B. Regulatory Requirements:

1. Perform factory testing of factory fabricated equipment in complete accordance with the NYC Department of Buildings.
2. Perform field testing of piping systems in complete accordance with all the NYC Department of Buildings and as specified.

1.4. SUBMITTALS

A. Refer to DDC General Conditions Section 01 33 00 "Submittal Procedures."

B. Quality Control Submittals

1. Test Reports (Field Tests):
2. Refrigeration Systems: Submit test results on Refrigeration Systems Pressure.

1.5. PROJECT CONDITIONS

A. Protection

1. During test work, protect controls, gauges and accessories, which are not designed to withstand test pressure. Do not utilize permanently installed gauges for field testing of systems.

1.6. SEQUENCING AND SCHEDULING

A. Transmit written notification of proposed date and time of operational tests to the Commissioner at least 5 days in advance of such tests.

B. Perform cleaning and testing work in the presence of the Commissioner

C. Pressure test piping systems inside building, at the roughing-in stage of installation, before piping is enclosed by construction work, and at other times as directed. Perform test operations in sections as required and directed, to progress the work in a satisfactory manner and not delay the general construction of the building. Valve or cap-off sections of piping to be tested, utilizing valves required to be installed in the permanent piping systems, or temporary valves or caps as required performing the work.

PART 2 - PRODUCTS

2.1. MATERIALS

A. Test Equipment and Instruments

B. Type and kind as required for the particular system under test.

C. Test Media (air, gas, refrigerant, vacuum, water)

PART 3 - EXECUTION

3.1. EXECUTION REQUIREMENTS

A. Refer to DDC General Conditions for execution requirements.

3.2. PRELIMINARY WORK

A. Thoroughly clean pipe and tubing prior to installation. During installation, prevent foreign matter from entering systems. Prevent if possible and remove stoppages or obstructions form piping and systems.

3.3. TESTING OF EQUIPMENT, APPARATUS AND APPURTENANCES

A. Damper

1. The dampers, deflectors, etc., shall be tested and adjusted during the balancing of systems work, but this work must be carried out by parties other than the person delegated to supervise the operation of the work and instruct the personnel. For details of damper adjustment, see Section 230594: Balancing for HVAC.

B. Heating, Ventilating and Air Conditioning Systems - Cleaning and Operational Testing:

1. Test and balance all HVAC equipment in accordance with manufacturer installation instruction manual to perform as per specifications.

END OF SECTION 230593

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SECTION 230594
Balancing For HVAC

PART 1 - GENERAL

1.1. RELATED DOCUMENTS

A. The following documents apply to all required work for the Project: (1) the Contract Drawings, (2) the Specifications, (3) the General Conditions, (4) the Addendum and (5) the Contract (City of New York Standard Construction Contract).

1.2. SUMMARY

A. Work Included: The work includes, but is not necessarily limited to, the following:

1. Requirements for adjusting and balancing of all air distribution systems, including the equipment and devices associated with each system.

2. The work includes setting speed and flow, adjusting equipment and devices installed for systems, recording data, preparing and submitting reports, and recommending modifications to the mechanical installation specified in other Sections of the Specifications.

B. Related Work: The following related work is specified in other sections of the specifications, and is not part of the Work of this Section:

1. Installation and start-up of equipment and devices to be adjusted and balanced.

2. Pressure testing of ductwork systems.

3. Electrical hook-up and wiring of equipment and devices to be adjusted and balanced.

C. The Contractor shall engage an independent testing, adjusting, and balancing agency meeting the qualifications as specified, to be the single source of responsibility to test, adjust, and balance the building mechanical systems identified in this project to produce the design objectives. Services shall include checking installations for conformity to design, measurement and establishment of the fluid quantities of the mechanical systems as required to meet design specifications, and recording and reporting the results.

1.3. QUALITY ASSURANCE

A. Refer to DDC General Conditions Section 01 40 00 "Quality Requirements."

1.4. SUBMITTALS

A. Refer to DDC General Conditions Section 01 33 00 "Submittal Procedures."

B. Submit blank forms of reports indicating all data to be included.

C. Submit certified reports, signed by the balancing specialist. Submit final testing and balancing results on applicable report forms, which is certifying the independent member agency performing the work,

required by this Section. Each final systems report form shall bear the signature of the person performing the work and recording the data and the signature of the certified supervisor for the performing agency.

1.5. PERFORMANCE REQUIREMENTS

A. Procedures, measurements, instruments and reports for adjusting and balancing work shall comply with the applicable provisions of the codes, standards, recommendations of the entities listed below.

1. American Society of Heating, Refrigerating and Air Conditioning Engineers (ASHRAE).
2. Sheet Metal and Air Conditioning Contractors National Association (SMACNA).
3. National Environmental Balancing Bureau (NEBB).
4. Associated Air Balance Council (ABBC).
5. New York City Building Code.

B. The air delivery or intake of each diffuser, grille and register shall be as designed or within five percent of the air flow rates shown on the drawings.

C. The fan air flow rate and static pressure rise across the fan shall be within 10 percent above the design value at design speed.

1.6. JOB CONDITIONS

A. The Contractor shall have the balancing agency review their work with the respective manufacturers of the equipment and devices involved, and shall coordinate and schedule all Work.

B. Furnish and install balancing dampers, pressure taps, gauges, valves, and other components as required for a properly balanced system, whether or not specified herein or shown on the drawings, all at no additional cost to the City of New York. Adjustment or replacement of parts recommended by the balancing specialist shall be made in strict accordance with the respective equipment manufacturer's recommendations.

C. Control manufacturer's representative shall see the adjustment of the automatically operated dampers and control valves to operate as required.

PART 2 - PRODUCTS

2.1. PATCHING MATERIALS

A. Unless otherwise indicated on the drawings, use same products as originally installed for patching holes in insulation, ductwork and housings which have been cut or drilled for test purpose, including access for test instruments, attaching jigs, and similar purposes.

PART 3 - EXECUTION

3.1. EXECUTION REQUIREMENTS

A. Refer to DDC General Conditions for execution requirements.

3.2. INSPECTION

A. Do not proceed with adjusting and balancing until unsatisfactory conditions have been corrected in a manner approved by the Commissioner.

B. Examine the air systems to see that they are free from obstructions. Determine that all dampers, grilles and registers are open, that moving equipment is lubricated, that filters are installed, pneumatic and automatic controls are functioning, and perform other inspection and maintenance activities necessary for proper operation of the systems.

3.3. BALANCING AND ADJUSTING

A. Balancing agency shall perform all the procedures and comply all the data for all air systems.

B. Data shall include a schematic diagram locating the air inlets, outlets, fans, equipment, dampers and regulating devices for air systems.

C. All instruments used shall be accurately calibrated and maintained in good working order.

D. Air Systems

The adjusting and balancing of air systems shall include but not be limited to the following:

1. Record and adjust fan rpm to design requirements.
2. Record motor full load amperes.
3. Make Pitot tube traverse of main supply ducts and obtain design flow rate at fans.
4. Record system static pressure, velocity pressure and total pressure.
5. Adjust system for design supply, transfer and return air flow rate.
6. Adjust system for minimum and maximum design flow rates of outside air.
7. Record return air temperatures.
8. Record entering mix air temperatures.
9. Record leaving air temperatures.
10. Adjust all main supply, return, relief and exhaust air ducts to proper design flow rate.
11. Adjust each diffuser, grille and register.
12. Each grille, diffuser and register shall be identified as to location and area on the schematic diagram.
13. Size, type and manufacturer of diffusers, grilles and registers and all tested equipment shall be identified and listed in the final report. Manufacturer's data on all equipment shall be used to make required calculations for adjusting and balancing. Readings of diffusers, grilles and registers shall include design required velocity and resultant velocity, required flow rate and resultant flow rate after adjustments.
14. All diffusers, grilles and registers shall be adjusted to minimize drafts in all areas.
15. Dampers shall be permanently marked after air balance is complete so that they can be restored to their correct position, if disturbed later.
16. Openings in ductwork for Pitot tube insertion shall be sealed with snap-in plugs after air balance is complete.

E. Final adjusting and balancing shall be performed during summer season for air conditioning systems and during winter season for heating systems, including operation when outside conditions are within 5 degrees F wet bulb temperature of maximum summer design condition, and within 10 degrees F dry bulb temperature of minimum winter design condition.

F. Retest, adjust and balance systems subsequent to system modifications. Resubmit test results.

3.4. SAMPLE OF REPORT FORMS

A. Submit reports on ABBC National Standards for Total System Balance forms.

B. Forms shall include but not be limited to the following information:

1. Title Page:

   a. Company name
   b. Company address
   c. Company telephone number
   d. Project name
   e. Project location
   f. Project Architect
   g. Project Engineer
   h. Project Contractor

2. Instrument List:

   a. Instrument
   b. Manufacturer
   c. Model
   d. Serial number
   e. Range
   f. Calibration date

3. Air Moving Equipment:

   a. Location
   b. Manufacturer
   c. Model
   d. Air flow, specified and actual
   e. Return air flow, specified and actual
   f. Outside air flow, specified and actual
   g. Total static pressure (total external), specified and actual
   h. Inlet pressure
   i. Discharge pressure
   j. Fan RPM

4. Exhaust Fan Data:

   a. Location
   b. Manufacturer
   c. Model
   d. Air flow, specified and actual
   e. Total static pressure (total external) specified and actual
   f. Inlet pressure
   g. Discharge pressure

h. Fan RPM

5. Return Air/Outside Air Data:

a. Identification/Location
b. Design air flow
c. Actual air flow
d. Design return air flow
e. Actual return air flow
f. Design outside air flow
g. Actual outside air flow
h. Return air temperature
i. Outside air temperature
j. Required mixed air temperature
k. Actual mixed air temperature
l. Design outside/return air ratio
m. Actual outside/return air ratio

6. Electric Motors:

a. Manufacturer
b. HP/BHP
c. Phase, voltage, amperage; nameplate, actual no load
d. RPM
e. Service factor
f. Starter size, rating, heater elements

7. V-Belt Drive:

a. Identification/location
b. Required driven RPM
c. Driven sheave, diameter and RPM
d. Belt, size and quantity
e. Motor sheave, diameter and RPM
f. Center to center distance, maximum, minimum and actual

8. Duct Traverse:

a. System zone/branch
b. Duct size
c. Area
d. Design velocity
e. Design air flow
f. Test velocity
g. Test air flow
h. Duct Static pressure
i. Air Temperature
j. Air correction factor

9. Air Distribution Test Sheet:

   a. Air outlets and inlets number
   b. Room number/location
   c. Outlets and inlets type
   d. Outlets and inlets size
   e. Area factor
   f. Design velocity
   g. Design air flow
   h. Test (final) velocity
   i. Test (final) air flow
   j. Percent of design air flow

10. Outlets and Inlets Unit Data:

   a. Manufacturer
   b. Type, constant, variable, single duct
   c. Identification/number
   d. Location
   e. Model
   f. Size
   g. Minimum static pressure
   h. Minimum design air flow
   i. Maximum design air flow
   j. Maximum actual air flow
   k. Inlet static pressure

11. Duct Leak Test (as described in SMACNA):

   a. Description of ductwork under test
   b. Duct design operating pressure
   c. Duct design test static pressure
   d. Duct capacity, air flow
   e. Maximum allowable leakage duct capacity times leak factor
   f. Test apparatus:
      i. Blower
      ii. Orifice, tube size
      iii. Orifice size
      iv. Calibrated
   g. Test static pressure
   h. Test orifice differential pressure
   i. Leakage rate
   j. Leakage shall not exceed 5 percent of total air flow.

END OF SECTION 230594

SECTION 230700
Piping Insulation

PART 1 - GENERAL

1.1. RELATED DOCUMENTS

A. The following documents apply to all required work for the Project: (1) the Contract Drawings, (2) the Specifications, (3) the General Conditions, (4) the Addendum and (5) the Contract (City of New York Standard Construction Contract).

B. LEED General Requirements:

1. Refer to DDC General Conditions.
   a. Section 01 33 00 "Submittal Procedures."
   b. Section 01 81 13.04 "Sustainable Design Requirements for LEED v4 Buildings."

1.2. SUMMARY

A. Work Included: The work includes, but is not necessarily limited to the following:

1. Thermal insulation on the piping required on this project as indicated on the drawings, as specified herein and as needed for a complete and proper installation. The types of Piping System insulation specified in this Section include the following: Fiberglass, Cellular Glass, Calcium Silicate, and Flexible Unicellular.

2. Note: All insulation materials shall be free of asbestos.

B. Related Work: The following related items are specified in other sections of the specifications.

1.	Hydronic Piping	Section 232113
2.	Refrigerant Piping	Section 232300
3.	General-Duty Valves for HVAC Piping	Section 230523
4.	Hangers and Supports for HVAC Piping and Equipment	Section 230529
5.	Identification for HVAC Piping and Equipment	Section 230553

1.3. QUALITY ASSURANCE

A. Refer to DDC General Conditions Section 01 40 00 "Quality Requirements."

B. Manufacturer's Qualifications: Firms regularly engaged in manufacture of mechanical insulation products, of types and sizes required, whose products have been in satisfactory use in similar service for not less than three (3) years.

C. Installer's Qualifications: Firm with at least three (3) years successful installation experience on projects with mechanical insulations similar to that required for this Project.

D. Flame/Smoke Ratings: Provide mechanical insulation with flame spread index of 25 or less, and smoke developed index of 50 or less, as tested by ASTM E 84 method and as defined by N.Y. City Building Code.

E. Code and Standards:

1. Flame spread rating and smoke developed rating shall be as defined in the N.Y.C. Building Code. The entire installation of these materials shall meet all requirements of that Code. Adhesives and coatings shall be fire retardant type.

   a. All insulation material shall have BSA numbers as required.

   b. Comply with ASHRAE Standard and New York State Energy Code Standard.

1.4. SUBMITTALS

A. Refer to DDC General Conditions Section 01 33 00 "Submittal Procedures."

B. Product Data: Submit manufacturer's product data and installation instructions for each type of pipe system insulation. Submit schedule showing manufacturer's product number, k-value, thickness, and furnished accessories for each piping system requiring insulation.

C. Maintenance Data: Submit maintenance data and replacement material lists for each type of pipe system insulation. Include this data and product data in maintenance manual in accordance with the requirement of DDC General Conditions.

D. Samples: Submit manufacturer's sample of each piping insulation type required. Affix label to sample completely describing product.

1.5. DELIVERY, STORAGE AND HANDLING

A. Deliver insulation, coverings, cements, adhesives, and coatings to site in containers with manufacturer's stamp or label, affixed showing fire hazard indexes of products.

B. Protect insulation against dirt, water, and chemical and mechanical damage. Do not install damaged or wet insulation; remove from project site.

1.6. TEMPERATURE REQUIREMENT

A. Apply adhesive, sealers, coating, etc., at the proper temperature as recommended by the manufacturer. If ambient conditions are not acceptable, provide temporary heat as required for proper installation without any delay to the project completion.

PART 2 - PRODUCTS

2.1. MANUFACTURERS

A. Subject to compliance with requirements, manufacturer's offering products which may be incorporated in the work include the following:

1. Armstrong World Industries, Inc.
2. Certain Teed Corp.
3. Knauf Fiber Glass
4. Manville Products Corp.
5. Owens-Corning Fiberglass Corp.
6. Pittsburgh Corning Corp.
7. Benjamin Foster Co.
8. Or approved equal.

2.2. MATERIALS

A. Pipes

1. Fiberglass Piping Insulation: ASTM C547, Class 1 for use to 450 degrees F, one piece molded with a nominal 4 pound density, a thermal conductivity of 0.23 at 75 degrees F mean temperature.

2. Cellular Glass Piping Insulation: ASTM C 552, Type II, Class 2 (Type II - Pipe and Tubing Class 2-Jacketed).

3. Calcium Silicate Piping Insulation: ASTM C 533, Type I, for use to 1200 degrees F.

4. Flexible Unicellular Piping Insulation: ASTM C 534, Type I-Tubular for use between -40 degrees F and 200 degrees F only.

B. Jackets

1. Jackets for Piping Insulation: ASTM C 921, Type I for piping with temperatures below ambient, Type II for piping with temperatures above ambient. Type I may be used for all piping at the City of New York's option. Type -vapor barrier, - Type II-water vapor permeable.

2. Encase pipe fittings insulation with one-piece premolded PVA fitting covers, fastened as per manufacturer's recommendations.

3. Encase exterior piping insulation with aluminum jacket with weather-proof construction.

C. Staples, Bands, Wires and Cement

1. As recommended by insulation manufacturer for applications indicated.

D. Adhesives, Sealers, and Protective Finishes

1. As recommended by insulation manufacturer for applications indicated.

PART 3 - EXECUTION

3.1. EXECUTION REQUIREMENTS

A. Refer to DDC General Conditions for execution requirements.

3.2. EXAMINATION

A. Examine areas and condition under which the pipe insulation is to be installed. Before applying the insulation, all tests specified in DDC General Conditions and other sections should have been completed. Do not proceed with work until satisfactory conditions have been corrected in a manner acceptable to the Commissioner. However, thermal insulation can be applied to pipes prior to these tests providing that all fittings are left bare to permit detection of possible leaks.

3.3. APPLICATION

A. Insulation Omitted: Omit installation on hot piping within radiation enclosure or unit cabinets, on unions, flanges and strainers.

B. Insulation of Refrigerant Piping

C. Insulation of Piping Exposed to Weather

D. Protect outdoor insulation from weather by installing 0.016 gauge aluminum jacket over insulation as specified herein.

3.4. INSTALLATION

A. Install insulation products in accordance with manufacturer's written instructions, and in accordance with manufacturer's written instructions, and in accordance with recognized industry practices to ensure that insulation services its intended purpose.

B. Install insulation on pipe systems subsequent to installation of heat tracing, painting, testing, and acceptance of tests.

C. Install insulation materials with smooth and even surfaces. Insulate each continuous run of piping with full-length units of insulation, with single cut piece to complete run. Do not use cut pieces or scraps abutting each other.

D. Clean and dry pipe surfaces prior to insulating.

E. Maintain integrity of vapor-barrier jackets on pipe insulation, and protect to prevent puncture or other damage.

F. Cover valves, fittings and similar items in each piping system with equivalent thickness and composition of insulation as applied to adjoining pipe run. Install factory molded, precut or job fabricated units except where specific form or type is indicated on the drawings.

G. Extend piping insulation without interruption through walls, floors and similar piping penetrations, except where otherwise indicated on the drawings.

3.5. PROTECTION AND REPLACEMENT

A. Replace insulation which cannot be restored satisfactorily, including units with vapor barrier damage and moisture saturated units.

B. Protection

1. Insulation worker shall advise contractor of required protection for insulation work during remainder of construction period, to avoid damage and deterioration.

C. Frost-proofing

1. Water piping installed in a location exposed to freezing weather shall be frost proofed.

2. Piping to be frost proofed shall be insulated with two layers (thickness) of molded fiberglass insulation. The outer layer shall have a vapor barrier jacket of white kraft paper outer surface bonded to aluminum foil and reinforced with fiberglass yarn. Longitudinal laps and butt strips shall be smoothly secured with insulation adhesive. The use of pipe insulation having a "self-sealing" lap, and "self-sealing" lap strips is also acceptable. The final insulation shall be protected with a casing of 0.016 minimum thickness aluminum.

END OF SECTION 230700

SECTION 230701
Ductwork Insulation

PART 1 - GENERAL

1.1. RELATED DOCUMENTS

A. The following documents apply to all required work for the Project: (1) the Contract Drawings, (2) the Specifications, (3) the General Conditions, (4) the Addendum and (5) the Contract (City of New York Standard Construction Contract).

B. LEED General Requirements.

1. Refer to DDC General Conditions.
   a. Section 01 33 00 "Submittal Procedures."
   b. Section 01 81 13.04 "Sustainable Design Requirements for LEED v4 Buildings."

1.2. SUMMARY

A. Work Included: The work includes, but is not necessarily limited to, the following:

1. Thermal insulation on the ductwork installed and required on this Project as shown on the drawings, as specified herein and as needed for a complete and proper installation. The types of ductwork insulation specified in this Section include the following: Fiberglass, Cellular Glass, Flexible Unicellular.

2. Note: All insulation materials shall be free of asbestos.

B. Related Work: The following related items are specified in other sections of the specifications:

1.	Hangers and Supports for HVAC Piping and Equipment	Section 230529
2.	Identification for HVAC Piping and Equipment	Section 230553
3.	Metal Ducts	Section 233113

1.3. QUALITY ASSURANCE

A. Refer to DDC General Conditions Section 01 40 00 "Quality Requirements."

B. Manufacturer's Qualifications: Firms regularly engaged in manufacturer of mechanical insulation products, of types and sizes required, whose products have been in satisfactory use in similar service for not less than three (3) years.

C. Installer's Qualifications: Firm with at least three (3) years successful installation experience on projects with mechanical insulations similar to that required for Project.

D. Flame/Smoke Ratings: Provide mechanical insulation with flame spread index of 25 or less and smoke developed index of 50 or less, as tested by ASTM E 84 method and as defined in the N.Y. City Building Code.

E. Code and Standards; Comply with New York City Building Code, New York State Energy Code and ASHRAE Standards.

1.4. SUBMITTALS

A. Refer to DDC General Conditions Section 01 33 00 "Submittal Procedures."

B. Product Data: Submit manufacturer's product data and installation instructions for each type of duct insulation. Submit schedule showing manufacturer's product number, k-value, thickness and furnished accessories for each duct system requiring insulation.

C. Maintenance Data: Submit maintenance data and replacement material lists for each type of duct insulation. Include this data and product data in maintenance manual in accordance with the requirement of DDC General Conditions.

D. Samples: Submit manufacturer's sample of each duct insulation type required.

1. Affix label to sample completely describing product.

1.5. DELIVERY, STORAGE AND HANDLING

A. Deliver insulation, coverings, cements, adhesives and coatings to site in containers with manufacturer's stamp or label affixed showing fire hazard indexes of products.

B. Protect insulation against dirt, water and chemical and mechanical damages. Do not install damaged or wet insulation; remove from site.

PART 2 - PRODUCTS

2.1. MANUFACTURERS

A. Subject to compliance with requirements, manufacturer offering products which may be incorporated in the work include the following:

1. Armstrong World Industries, Inc.
2. Certain Teed Corp.
3. Knauf Fiber Glass
4. Owens-Corning Fiberglass Corp.
5. Or approved equal.

2.2. MATERIALS

A. Rigid Fiberglass Ductwork Insulation: ASTM C612; Class 1, 400 degrees F; 4.2 pound per cubic feet density glass fiber with a thermal conductivity (k) of .24 at 75 degrees F mean temperature.

B. Flexible Fiberglass Ductwork Insulation: ASTM C553; Type I - Resilient, Flexible; 1 pound per cubic feet density glass fiber with at thermal conductivity (k) of 0.29 at 75 degrees F mean temperature.

C. Cellular Glass Ductwork Insulation: ASTM C 552; Type I, Flat block; Type III, Special Shapes.

D. Flexible Unicellular Ductwork Insulation: ASTM C 534; Type II - Sheet for use between -40 degrees F and 200 degrees F only.

E. Jackets for Ductwork Insulation: ASTM C 921; Type I for ductwork with temperatures below ambient; Type II for ductwork with temperatures above ambient. (Type I - Vapor Barrier, Type II - Water Vapor Permeable).

F. Ductwork Insulation Accessories: Provide staples, bands, wires, tape, anchors, corner angles and similar accessories as recommended by insulation manufacturer for applications indicated.

G. Ductwork Insulation Compounds: Provide cements, adhesives, coatings, sealers, protective finished and similar compounds as recommended by insulation manufacturer for applications indicated.

PART 3 - EXECUTION

3.1. EXECUTION REQUIREMENTS

A. Refer to DDC General Conditions for execution requirements.

3.2. EXAMINATION

A. Examine areas and conditions under which the duct insulation is to be installed. Before applying the insulation, all tests specified in DDC General Conditions should have been completed. Do not proceed with work until unsatisfactory conditions have been corrected in a manner acceptable to the Commissioner.

3.3. APPLICATION

A. Ductwork System Insulation

1. Insulation Omitted: Do not insulate lined ductwork, except outdoor installed ductwork.

2. Cold Ductwork (Below Ambient Temperature):

a. Application Requirements: Insulate the following cold ductwork:

1. Outdoor air intake ductwork between air entrance and fan inlet or HVAC unit inlet.

2. HVAC supply ductwork between fan discharge, or HVAC unit discharge, and room terminal outlet except ductwork exposed in the room it supplies.

3. HVAC return ductwork between room terminal inlet and return fan inlet, or HVAC unit inlet; except omit insulation on return ductwork located in return air ceiling plenums. Ductwork under roofs shall be insulated even though ductwork runs in plenum.

4. HVAC plenums and unit housings not pre-insulated at factory or lined.

b. Insulate each ductwork system specified above with one of the following types:

1. Rigid Fiberglass: 2" thick also in fan and equipment rooms and exposed on roofs.

2. Flexible Fiberglass: 2" thick, application limited to concealed locations.

3. Ductwork Exposed to Outdoors:

   a. Insulate ductwork with rigid fiberglass with Foil-Skim-Kraft (FSK) jacket 2 inch thick with corner angles on all corners.

   b. Cover insulation with two (2) layers of roofing felt, each held in place by fiberglass cloth.

   c. Impregnate roofing felt and glass cloth with bitumastic applied in two (2) 1/4 inch layers each applied separately.

   d. Seal all openings at roof support points watertight.

3.4. INSTALLATION

A. Install insulation products in accordance with manufacturer's written instructions, and in accordance with recognized industry practices to ensure that insulation serves its intended purpose.

B. Install insulation materials with smooth and even surfaces.

C. Clean and dry ductwork prior to insulating. Butt insulation joints firmly together to ensure complete and tight fit over surfaces to be covered.

D. Maintain integrity of vapor-barrier on ductwork insulation, and protect it to prevent puncture and other damage.

E. Extend ductwork insulation without interruption through walls, floors and similar ductwork penetrations, except where otherwise indicated.

F. Lined Ductwork: Except as otherwise indicated, omit insulation on ductwork where internal insulation or sound absorbing linings have been installed.

3.5. PROTECTION AND REPLACEMENT

A. Replace damaged insulation which cannot be restored satisfactorily, including units with vapor barrier damage and moisture saturated units.

B. Protection: Insulation Worker shall advise Contractor of required protection for insulation work during remainder of construction period, to avoid damage and deterioration.

END OF SECTION 230701

SECTION 23 08 00
COMMISSIONING OF HVAC SYSTEMS

PART I - GENERAL

1.1 RELATED DOCUMENTS

A. The following documents apply to all required work for the project: (1) the contract drawings, (2) the Specifications, (3) the General Conditions, (4) the Addendum and (5) the Contract (City of New York Standard Construction Contract).

1.2 SUMMARY

A. This section includes commissioning process requirements for HVAC&R systems, assemblies, and equipment.

B. Related Sections:

1. DDC General Conditions for general commissioning process requirements.

1.3 DESCRIPTION

A. Commissioning: Commissioning is a systematic process of verifying that all building systems, including the mechanical and electrical systems, have been installed in the prescribed manner, are functionally checked and capable of being operated and maintained to perform with the design intent and have documentation to support proper installation and operation. The Commissioning Agent (CxA) shall provide the City of New York with an unbiased, objective view of the system's installation, operation and performance. This process does not eliminate or reduce the responsibility of the Contractor to provide a complete design or installing Sub-Contractors to provide a finished product. Commissioning is intended to enhance the quality of each system installation, startup and transfer to beneficial use by the City of New York.

B. Commissioning during the construction phase is intended to achieve the following specific objectives, according to the Contract Documents:

1. Verify that applicable equipment and systems are installed according to the manufacturer's recommendations and to industry accepted minimum standards and that they receive adequate operational checkout by installing Sub-Contractors.
2. Verify and document proper performance of equipment and systems as per the written procedures.
3. Verify that Operation & Maintenance documentation is complete and transferred to City of New York.
4. Verify that proper orientation program has been implemented for the City of New York's operating personnel.
5. Provide a post occupancy review with O&M staff within 10 months after Substantial Completion.

C. The Commissioning process shall be a team effort and encompass, as well as coordinate, the traditionally separate functions of system documentation, system installation, equipment startup, control system calibration, testing, balancing and verification and performance checkouts.

D. The CxA will work closely with the construction team, cooperating on and coordinating all Cx activities with the City of New York, Contractor, Sub-Contractors, manufacturers and equipment suppliers.

E. The Cx process shall not reduce the responsibility of the Contractor to comply with the Contract Documents.

1.4 DEFINITIONS

A. Refer to DDC General Conditions for definitions.

1.5 SUBMITTALS

A. Refer to DDC General Conditions for CxA's role.

B. Refer to DDC General Conditions for specific submittal requirements. In addition, provide the following:

1. Certificates of readiness
2. Certificates of completion of installation, pre-start, and startup activities.
3. O&M manuals
4. Field / factory test reports

C. Control Drawings Submittal

1. The control drawings shall have a key to all abbreviations.
2. The control drawings shall contain graphic schematic depictions of the systems and each component.
3. The schematics will include the system and component layout of any equipment that the control system monitors, enables or controls, even if the equipment is primarily controlled by packaged or integral controls.
4. Provide a full points list with at least the following included for each point, as applicable:
   a. Controlled system
   b. Point abbreviation
   c. Point description
   d. Display unit
   e. Control point or set point
   f. Monitoring point
   g. Intermediate point
   h. Calculated point

1.6 QUALITY ASSURANCE

A. Test Equipment Calibration Requirements: The Contractor will comply with test manufacturer's calibration procedures and intervals. Recalibrate test instruments immediately after instruments have been repaired resulting from being dropped or damaged. Affix calibration tags to test instruments. Furnish calibration records to CxA upon request.

1.7 COORDINATION

A. Refer to DDC General Conditions for requirements pertaining to coordination during the commissioning process.

PART II - PRODUCTS

2.1 TEST EQUIPMENT

A. The Contractor shall ensure that the equipment and system perform startup, initial checkout and functional performance testing as outlined in the DDC General Conditions, except for equipment specific to and used by the Contractor in their commissioning responsibilities. A sufficient quantity of two-way radios shall be provided by the Contractor, as necessary.

B. Special equipment, tools and instruments (specific to a piece of equipment and only available from vendor) required for testing shall be included in the price to the City of New York and left on site, except for stand-alone data logging equipment that may be used by the CxA.

C. Test equipment and software required by any equipment manufacturer for programming and/or start-up, whether specified or not, shall be provided by the manufacturer of the equipment. The Contractor shall ensure that the manufacturer provide the test equipment, demonstrate its use, and assist in the commissioning process as needed. Test equipment (and software) shall become the property of the City of New York upon completion of the commissioning process.

D. If required and necessary, data logging equipment and software required for testing will be provided by the CxA, but shall not become the property of the City of New York.

E. All testing equipment shall be of sufficient quality and accuracy to test and/or measure system performance with the tolerances specified in the Specifications. If not otherwise noted, the following minimum requirements apply: Temperature sensors and digital thermometers shall have a certified calibration within the past year to accuracy of 0.5°F and a resolution of ±0.1°F. Pressure sensors shall have an accuracy of ±2.0% of the value range being measured (not full range of meter) and have been calibrated within the last year.

PART III - EXECUTION

3.1 GENERAL DOCUMENTATION REQUIREMENTS

A. With assistance from the Contractor, the CxA will prepare Pre-Functional/ Installation Checklists for commissioned components, equipment, and systems

B. The Contractor shall cause Sub-Contractor(s) to create red-lined Drawings:

1. The Contractor will verify all equipment, systems, instrumentation, wiring and components are shown correctly on red-lined drawings.
2. Preliminary red-lined drawings will be made available to the Commissioning Team for use prior to the start of Functional Performance Testing.
3. Changes, as a result of Functional Testing, must be incorporated into the final as-built drawings, which will be created from the red-lined drawings.
4. The Contractor will create the as-built drawings.

C. Operation and Maintenance Data:

1. The Contractor shall cause the Sub-Contractor(s) to provide a copy of O&M literature within 45 days of each submittal acceptance for use during the commissioning process for all commissioned equipment and systems.
2. The CxA will review the O&M literature once for conformance to project requirements.
3. The CxA will receive a copy of the final approved O&M literature once corrections have been made by the Contractor.

D. Testing, Demonstration and Orientation:

1. The Contractor shall cause the Sub-Contractor(s) to provide demonstration and operator's orientation program as required by the specifications.
2. A complete orientation program and schedule must be submitted by the Contractor to the CxA four weeks (4) prior to any such event.
3. Agenda for each orientation session shall be submitted to the CxA at least one (1) week prior to the session.
4. The CxA shall be notified at least 72 hours in advance of scheduled tests so that testing may be observed by the CxA. A copy of the test record shall be provided to the CxA and Commissioner.
5. Engage a Factory-authorized service representative to demonstrate City of New York's service personnel to adjust, operate, and maintain specific equipment.
6. Instruct City of New York service personnel on procedures and schedules for starting and stopping, trouble shooting, servicing, and maintaining equipment.
7. Review and update data in O&M Manuals.

3.2 CONTRACTOR RESPONSIBILITIES FOR SUB-CONTRACTOR PERFORMANCE

A. The Contractor shall cause the Sub-Contractor to have the following instruction responsibilities in performing Mechanical, Controls and TAB work. The commissioning responsibilities are as follows (all references apply to commissioned equipment/systems only):

1. Perform commissioning tests at the direction of the CxA.
2. Attend construction phase controls coordination meetings.
3. Attend testing, adjusting, and balancing review and coordination meetings.
4. Participate in HVAC&R systems, assemblies, equipment, and component service orientation and inspection as directed by the CxA.
5. Provide information requested by the CxA for final commissioning documentation.
6. Include requirements for submittal data, operation and maintenance data, and instruction in each purchase order or sub-contract written.
7. Prepare preliminary schedule for Mechanical system orientations and inspections, operation and maintenance manual submissions, instruction sessions, pipe and duct system testing, flushing and cleaning, equipment start-up, testing and balancing and task completion for the City of New York. Distribute preliminary schedule to commissioning team members.

8. Update schedule as required throughout the construction period.
9. During the startup and initial checkout process, execute the related portions of the Prefunctional/installation checklists for all commissioned equipment so they can be documented by the CxA.
10. Assist the CxA in all verification and functional performance tests.
11. Provide measuring instruments and logging devices to record test data, and provide data acquisition equipment to record data for the complete range of testing for the required test period.
12. Gather operation and maintenance literature on all equipment, and assemble in binders as required by the specifications. Submit to CxA (45) days after submittal acceptance.
13. Coordinate with the CxA to provide (72) hour advance notice so that the witnessing of equipment and system start-up and testing can begin.
14. Notify the CxA a minimum of (2) weeks in advance of the time for start of the testing and balancing work. Attend the initial testing and balancing meeting for review of the official testing and balancing procedures.
15. Participate in, and schedule vendors and Sub-Contractors to participate in the operator's orientation sessions.
16. Provide written notification to the CxA that the following work has been completed in accordance with the contract documents, and that the equipment, systems, and sub-system are operating as required.
    a. HVAC&R equipment including all fans, air handling units, piping, ductwork, dampers, terminals, and all other equipment furnished under this Division.
    b. Controls system used for equipment monitoring and manipulation
    c. Fire stopping in the fire rated construction, including fire and smoke damper installation, caulking, gasketing and sealing of smoke barriers.
    d. Fire detection and smoke detection devices furnished under other divisions of the specification.
17. The Contractor shall ensure that the equipment suppliers document the performance of their equipment.
18. The Contractor shall ensure that the Sub-Contractor perform Test, Adjust and Balance work:
    a. Attend initial commissioning coordination meeting scheduled by the CxA.
    b. Submit the site specific testing and balancing plan to the CxA and Commissioner for review and acceptance.
    c. Attend the testing and balancing review meeting scheduled by the CxA. Be prepared to discuss the procedures that shall be followed in testing, adjusting, and balancing the HVAC&R system.
    d. At the completion of the testing and balancing work, and the submittal of the final testing and balancing report, notify the Commissioner.
    e. Participate in verification of the testing and balancing report, which will consist of repeating measurements contained in the testing and balancing reports. Assist in diagnostic purposes when directed.

19. The Contractor shall ensure equipment Suppliers perform the following tasks:
    a. Provide all requested submittal data, including detailed start-up procedures and specific responsibilities of the City of New York, to keep warranties validated.
    b. Assist in equipment testing per agreements with Sub-Contractors.
    c. Provide information requested by CxA regarding equipment sequence of operation and testing procedures.
20. Provide instruction of the City of New York service personnel using qualified personnel, as specified.
21. Refer to DDC General Conditions for additional responsibilities.

3.3 CxA RESPONSIBILITIES

A. Refer to DDC General Conditions for CxA's Responsibilities.

3.4 TESTING PREPARATION

A. Certify in writing to the CxA that HVAC&R systems, subsystems, and equipment have been installed, calibrated, and started and are operating according to the Contract Documents.

B. Certify in writing to the CxA that HVAC&R instrumentation and control systems have been completed and calibrated, that they are operating according to the Contract Documents, and that pretest set points have been recorded.

C. Certify in writing that testing, adjusting, and balancing procedures have been completed and that testing, adjusting, and balancing reports have been submitted, discrepancies corrected, and corrective work approved.

D. Set systems, subsystems, and equipment into operating mode to be tested (e.g., normal shutdown, normal auto position, normal manual position, unoccupied cycle, emergency power, and alarm conditions).

E. Inspect and verify the position of each device and interlock identified on checklists.

F. Check safety cutouts, alarms, and interlocks with smoke control and life-safety systems during each mode of operation.

G. Testing Instrumentation: Install measuring instruments and logging devices to record test data as directed by the CxA.

3.5 TESTING, ADJUSTING AND BALANCING VERIFICATION

A. Air and water testing, balancing and equipment performance verification shall be accomplished by an independent test and balance firm. The CxA shall spot check this work to verify accuracy of results.

B. Prior to performance of Testing, Adjusting and Balancing work, provide copies of reports, sample forms, checklists, and certificates to the CxA.

C. Notify the CxA at least ten (10) days in advance of testing and balancing work, and provide access for the CxA to witness testing and balancing work.

D. Provide technicians, instrumentation, and tools to verify testing and balancing of HVAC&R systems at the direction of the CxA.

1. The CxA will notify the Contractor and Sub-Contractor performing balancing work ten (10) days in advance of the date of field verification. Notice will not include data points to be verified.
2. The Contractor shall cause Sub-Contractor performing balancing work shall use the same instruments (by model and serial number) that were used when original data were collected.
3. Failure of an item includes a deviation of more than 10 percent. Failure of more than 10 percent of selected items shall result in rejection of final balancing report.
4. Remedy the deficiency and notify the CxA so verification of failed portions can be performed.

3.6 GENERAL TESTING REQUIREMENTS

A. Provide technicians, instrumentation, and tools to perform commissioning test at the direction of the CxA.

B. Scope of HVAC&R testing shall include entire HVAC&R installation, from central equipment for heat generation and refrigeration through distribution systems to each conditioned space. Testing shall include verification of dynamic operation of the system.

C. Test all operating modes, interlocks, control responses, and responses to abnormal or emergency conditions, and verify proper response of building automation system controllers and sensors.

D. The CxA along with the Sub-Contractor performing HVAC&R, testing and balancing, and HVAC&R Instrumentation and Control work shall prepare detailed testing plans, procedures, and checklists for HVAC&R systems, subsystems, and equipment.

E. Tests will be performed using design conditions whenever possible.

F. Simulated conditions may need to be imposed using an artificial load when it is not practical to test under design conditions. Before simulating conditions, calibrate testing instruments. Provide equipment to simulate loads. Set simulated conditions as directed by the CxA and document simulated conditions and methods of simulation. After tests, return settings to normal operating conditions.

G. The CxA may direct to alter set points when simulating conditions is not practical.

H. The CxA may direct that sensor values be altered with a signal generator when design or simulating conditions and altering set points are not practical.

I. If tests cannot be completed because of a deficiency outside the scope of the HVAC&R system, document the deficiency and report it to the Commissioner. After deficiencies are resolved, reschedule tests.

J. If the testing plan indicates specific seasonal testing, complete appropriate initial performance tests and documentation and schedule seasonal tests.

3.7 HVAC&R SYSTEMS, SUBSYSTEMS, AND EQUIPMENT TESTING PROCEDURES

A. Equipment Testing and Acceptance Procedures: Testing requirements are specified in individual Division 23 sections. Provide submittals, test data, inspector record, and certifications to the CxA.

B. HVAC&R Instrumentation and Control System Testing: Field testing plans and testing requirements are specified in Division 23 Sections. Assist the CxA with preparation of testing plans.

C. Pipe system cleaning: flushing, hydrostatic tests, and chemical treatment: Test requirements are specified in Division 23 piping Sections. Sub-Contractor performing HVAC&R work shall prepare a pipe system cleaning, flushing, and hydrostatic testing plan. Provide cleaning, flushing, testing, and treating plan and final reports to the CxA. Plan shall include but not limited to the following:

1. Sequence of testing and testing procedures for each section of pipe to be tested, identified by pipe zone or sector identification marker. Markers shall be keyed to Drawings for each pipe sector, showing the physical location of each designated pipe test section. Drawings keyed to pipe zones or sectors shall be formatted to allow each section of piping to be physically located and identified when referred to in pipe system cleaning, flushing, hydrostatic testing, and chemical treatment plan.
2. Description of equipment for flushing operations.
3. Minimum flushing water velocity.
4. Tracking checklist for managing and ensuring that all pipe sections have been cleaned, flushed, hydrostatically tested, and chemically treated.

D. Refrigeration System Testing: The Contractor shall provide technicians, instrumentation, tools, and equipment to test performance of chillers, cooling towers, refrigerant compressors and condensers, heat pumps, and other refrigeration systems. The CxA shall determine the sequence of testing and testing procedures for each equipment item and pipe section to be tested.

E. HVAC&R Distribution System Testing: The Contractor shall provide technicians, instrumentation, tools, and equipment to test performance of air, steam, and hydronic distribution systems; special exhaust and other distribution systems, including HVAC&R terminal equipment and unitary equipment.

F. Vibration and Sound Tests: The Contractor shall provide technicians, instrumentation, tools, and equipment to test performance of vibration isolation and seismic controls.

G. Vibration Analysis and Sound Level Testing: Sub-Contractor to prepare a vibration analysis and sound level testing plan for identified rotating equipment. The Contractor to coordinate witnessing of testing with CxA.

H. The work included in the commissioning process involves a complete and thorough evaluation of the operation and performance of all components, systems and sub-systems. The equipment and systems shall be evaluated shall include, but not limited to:

1. HVAC systems
2. Boilers
3. Building Automation System
4. Ductwork and accessories
5. Heating Hot Water System
6. Testing, Adjusting and Balancing
7. Ventilating Fans
8. Monitoring Base Commissioning System

3.8 SEASONAL TESTING

A. Refer to DDC General Conditions for requirements for seasonal testing procedures.

3.9 OPERATION AND MAINTENANCE MANUALS

A. The Operation and Maintenance Manuals shall conform to Contract Document requirements.

B. Refer to the DDC General Conditions for the Contractor and CxA's role in the Operation and Maintenance Manual contribution, review and approval process.

C. An updated as-built version of the control drawings and sequences of operation shall be included in the final controls O&M manual submittal.

3.10 CITY OF NEW YORK'S SERVICE PERSONNEL ORIENTATION

A. Refer to the DDC General Conditions for requirements pertaining to instruction.

B. The Contractor shall cause the respective Sub-Contractor to have the following instruction responsibilities:

1. Provide the CxA with an instruction plan two weeks before the planned instruction.
2. Provide the City of New York service personnel with comprehensive orientation and instruction in the understanding of the systems and the operation and service of each piece of HVAC equipment including, but not limited to, all HVAC equipment (ex. pumps, heat exchangers, chillers, heat rejection equipment, air conditioning units, air handling units, fans, terminal units, controls and water treatment systems, etc.)
3. Instruction shall normally start with classroom sessions followed by hands-on instruction on each piece of equipment, which shall illustrate the various modes of operation, including startup, shutdown, fire/smoke alarm, power failure, etc.
4. During any demonstration, should the system fail to perform in accordance with the requirements of the O&M manual or sequence of operations, the system will be repaired or adjusted as necessary and the demonstration repeated.
5. The appropriate trade or manufacturer's representative shall provide the instructions on each major piece of equipment. This person may be the start-up technician for the piece of equipment, the installer or manufacturer's representative. Practical building operating expertise as well as in-depth knowledge of all modes of operation of the specific piece of equipment is required. More than one party may be required to execute the instruction.
6. Sub-Contractor shall attend instruction sessions other than their respective instruction sessions, as requested, to discuss the interaction of various systems as it relates to the equipment being covered in the instruction session.
7. The instruction sessions shall follow the outline in the Table of Contents of the operation and maintenance manual and illustrate whenever possible the use of the O&M manuals for reference. Instruction shall include but not limited to:
   a. Use of the printed installation, operation and service instruction material included in the O&M manuals.
   b. Include a review of the written O&M instructions emphasizing safe and proper operating requirements, preventative maintenance, special tools needed and spare parts inventory suggestions. The instruction shall include start-up, operation in all modes possible, shut-down, seasonal changeover and any emergency procedures.
   c. Discussion of relevant health and safety issues and concerns.

d. Discussion of warranties and guarantees.

e. Common troubleshooting problems and solutions.

f. Explanatory information included in the O&M manuals and the location of all plans and manuals in the facility.

g. Discussion of any peculiarities of equipment installation or operation.

h. The format and instruction agenda in The HVAC Commissioning Process, ASHRAE Guideline 1-2007, is recommended.

8. Hands-on instruction shall include start-up, operation in all modes possible, including manual, shut-down and any emergency procedures and preventative maintenance for all pieces of equipment.

9. Fully explain and demonstrate the operation, function and overrides of any local packaged controls, not controlled by the central control system.

10. Instruction shall occur after functional testing is complete, unless approved otherwise by the Commissioner.

C. Control System Work: The Contractor shall have the following instruction responsibilities:

1. Provide the CxA and the Commissioner with an instruction plan four weeks before the planned instruction.

2. Provide designated City of New York service personnel instruction on the control system in this facility. The intent is to clearly and completely instruct the City of New York on all the capabilities of the control system.

3. Instruction manuals: The standard operating manual for the control system and any special instruction manuals will be provided for each employee, with three extra copies left for the O&M manuals. In addition, copies of the control system technical manual will be demonstrated during instruction and three copies submitted with the O&M manuals. Manuals shall include detailed description of the subject matter for each session. The manuals will cover all control sequences and have a definitions section that fully describes all relevant words used in the manuals and in all software displays. Manuals will be approved by the CxA. Copies of audiovisuals shall be delivered to the City of New York.

4. The instruction sessions will be tailored to the needs and skill-level of the instructees.

5. The instructors will be knowledgeable on the system and its use in buildings. For the on-site sessions, the most qualified instructor(s) will be used. The Commissioner shall approve the instructor prior to scheduling the instruction.

6. During any demonstration, should the system fail to perform in accordance with the requirements of the O&M manual or sequence of operations, the system will be repaired or adjusted as necessary and the demonstration repeated.

7. Sub-Contractor shall attend sessions other than the controls instruction, as requested, to discuss the interaction of the controls system as it relates to the equipment being discussed.

8. Three (3) instruction sessions shall be provided:

a. Instruction Session I, Control System: The first instruction session shall consist of 8 hours of actual instruction. This instruction may be held on-site or in the supplier's facility. If held off-site, the instruction may occur prior to final completion of the system installation. Upon completion, each employee, using appropriate documentation, should be able to perform elementary operations and describe general hardware architecture and functionality of the system.

b. Instruction Session II, Building Systems: The second session shall be held on-site for a period of 8 hours of actual hands-on instruction after the completion of system commissioning. The session shall include instruction on:

1) Specific hardware configuration of installed systems in this building and specific instruction for operating the installed system, including HVAC systems, lighting controls and any interface with security and communication systems.

2) Security levels, alarms, system start-up, shut-down, power outage and restart routines, changing set points and alarms and other typical changed parameters, overrides, freeze protection, manual operation of equipment, optional control strategies that can be considered, energy savings strategies and set points that if changed will adversely affect energy consumption, energy accounting, procedures for obtaining vendor assistance, etc.

3) All trending and monitoring features (values, change of state, totalization, etc.), including setting up, executing, downloading, viewing both tabular and graphically and printing trends. Employees will actually set-up trends in the presence of the instructor.

4) Every display screen shall be completely discussed, allowing time for questions.

5) Use of keypad or plug-in laptop computer at the zone level.

6) Use of remote access to the system via phone lines or networks.

7) Setting up and changing an air terminal unit controller.

8) Graphics generation.

9) Point database entry and modifications.

10) Understanding of field control panel operating programming (when applicable)

c. Instruction Session III, Operational Q&A: The third instruction session shall be conducted on-site six months after occupancy and consist of 8 hours of instruction. The session will be structured to address specific topics that employees need to discuss and to answer questions concerning operation of the system.

D. Test, Adjust and Balance Work: The Contractor shall have the following instruction responsibilities:

1. Meet with facility staff after completion of Test, Adjust and Balance work and instruct them on the following:

a. Review the final Test, Adjust and Balance report, explaining the layout and meanings of each data type.

b. Discuss any outstanding deficient items in control, ducting or design that may affect the proper delivery of air or water.

c. Identify and discuss any terminal units, duct runs, diffusers, coils, fans and pumps that are not meeting their design capacity.

d. Discuss any temporary settings for any areas that are not finished, and plans to finish the areas.

e. Other salient information that may be useful for facility operations, relative to Test, Adjust and Balance work.

END OF SECTION 23 08 00

SECTION 230900
Instrumentation and Control for HVAC

PART 1 - GENERAL

1.1. RELATED DOCUMENTS

A. The following documents apply to all required work for the Project: (1) the Contract Drawings, (2) the Specifications, (3) the General Conditions, (4) the Addendum and (5) the Contract (City of New York Standard Construction Contract).

1.2. SUMMARY

A. This Section includes control equipment and installation for HVAC systems and components, including control components for terminal heating and cooling units not supplied with factory-furnished controls.

B. See Section 230993 Sequences of Operation for requirements that relate to this section.

C. Related Work: The following related items are specified in other sections of the specifications:

1. Section 23 08 00 – Commissioning of HVAC
2. Section 23 05 00 – Common Work Results for HVAC
3. Section 23 05 93 – Testing for HVAC
4. Section 26 05 00 – Common Work Results for Electrical
5. Section 26 05 19 – Low Voltage Electrical Power Conductors and Cables
6. Section 26 05 29 – Hangers and Supports for Electrical Systems
7. Section 26 05 33 – Raceway and Boxes for Electrical Systems
8. Section 26 05 53 – Identification for Electrical Systems
9. Section 26 27 26 – Wiring Devices

1.3. DEFINITIONS

A. DDC: Direct digital controls

B. IP: Internet Protocol

C. I/O: Input/Output

D. LAN: Local area network.

E. MS/TP: Master-slave/token-passing. Refer to AHSRAE standard 135-2010

F. TCP: Transfer Control Protocol

G. Scope Terminology

1. Mount = securely fasten or pipe
2. Install = mount and wire
3. Wire = wire only

1.4. SYSTEM DESCRIPTION

A. Furnish and install a networked system of HVAC controls. Incorporate direct digital control (DDC) for central plant equipment, building ventilation equipment, supplemental heating and cooling equipment, unit heaters and terminal units.

B. Provide networking to new direct digital controls equipment using communication standards. System shall be capable of building automation and control networks communication according to ASHRAE standard ANSI/ASHRAE 135-2014 or later for interoperability with smart equipment and for the main IP communication trunk to the BAS Server. The system shall not be limited to only standard protocols, but shall also be able to integrate to a wide variety of third-party devices and applications via drivers and gateways.

C. Provide standalone controls where called for on the drawings or sequences.

1.5. WORK INCLUDED

A. The installation of the control system shall be performed under the direct supervision of the controls manufacturer with the shop drawings, flow diagrams, bill of materials, component designation, or identification number and sequence of operation all bearing the name of the manufacturer.

B. Furnish a complete distributed direct digital control system in accordance with this specification section. This includes all system controllers, logic controllers, and all input/output devices. Items of work included are as follows:

1. Provide a submittal that meets the requirements below for approval.
2. Coordinate installation schedule with the mechanical subcontractor.
3. Provide installation of all panels and devices unless otherwise stated.
4. Coordinate with Electrical Subcontractor for power to be provided to BMS panels and control devices if required voltage above 24 V.
5. Provide all low voltage control wiring and terminations for the direct digital controls system.
6. Provide miscellaneous control wiring for HVAC and related systems regardless of voltage.
7. Provide engineering and technician labor to program and commission software for each system and operator interface. Submit commissioning reports for approval.
8. Participate in commissioning for all equipment that is integrated into the BAS (Refer to Commissioning sections of the equipment or systems in other parts of this specification.)
9. Provide testing, demonstration and instruction as specified in this section.

1.6. SYSTEM PERFORMANCE

A. Comply with the following performance requirements:

1. Graphic Display: Display graphic with minimum 20 dynamic points with current data within 5 seconds.
2. Graphic Refresh: Update graphic with minimum 20 dynamic points with current data within 5 seconds.
3. Object Command: Reaction time of less than 5 seconds between operator command of a binary object and device reaction.
4. Object Scan: Transmit change of state and change of analog values to control units or workstation within 5 seconds.
5. Alarm Response Time: Annunciate alarm at workstation within 2 seconds. Multiple workstations must receive alarms within five seconds of each other.
6. Program Execution Frequency: Programmable controllers shall execute direct digital controls PI control loops, and scan and update process values and outputs at least once per second.
7. Reporting Accuracy and Stability of Control: Report values and maintain measured variables within tolerances as follows:

a. Space Temperature: Plus or minus 1 deg F.
b. Ducted Air Temperature: Plus or minus 1 deg F.
c. Outside Air Temperature: Plus or minus 2 deg F.
d. Dew Point Temperature: Plus or minus 3 deg F.
e. Temperature Differential: Plus or minus 0.25 deg F.
f. Relative Humidity: Plus or minus 2 percent.
g. Airflow (Pressurized Spaces): Plus or minus 3 percent of full scale.
h. Airflow (Measuring Stations): Plus or minus 5 percent of full scale.
i. Airflow (Terminal): Plus or minus 10 percent of full scale.
j. Air Pressure (Space): Plus or minus 0.01-inch wg.
k. Air Pressure (Ducts): Plus or minus 0.1-inch wg.
l. Carbon Monoxide: Plus or minus 5 percent of reading.
m. Carbon Dioxide: Plus or minus 50 ppm.
n. Electrical: Plus or minus 5 percent of reading.

1.7. SUBMITTALS

A. Refer to DDC General Conditions Section 01 33 00 "Submittal Procedures."

B. Provide submittals for fast track items that need to be approved and released to meet the schedule of the project. Provide submissions for the following items separately:

1. Valve schedule and cut sheets
2. Factory mounting and wiring diagrams and cut sheets
3. Thermostat and/or Temperature sensor locations

C. Provide a complete submittal with all controls system information for approval before construction starts. Include the following:

1. Schematic flow diagrams showing fans, pumps, coils, dampers, valves, and control devices.
2. Wiring Diagrams: Power, signal, and control wiring.
3. Details of control panel faces, including sizes, controls, instruments, and labeling.
4. Schedule of dampers and actuators including size, leakage, and flow characteristics.
5. If dampers are furnished by other, submit a damper actuator schedule coordinating actuator sizes with the damper schedule.
6. Schedule of valves including leakage and flow characteristics.
7. Written description of the Sequence of Operations.
8. Network riser diagram showing wiring types, network protocols, locations of floor penetrations and number of control panels. Label control panels with network addresses and device instance numbers. Show all routers, switches, hubs and repeaters.
9. Point list for each system controller including both inputs and outputs (I/O), point numbers, controlled device associated with each I/O point, and location of I/O device.
10. Starter and variable frequency drive wiring details of all automatically controlled motors.
11. Reduced size floor plan drawings showing locations of control panels, thermostats/temperature and air quality sensors, ductwork, piping sensors, and any devices mounted in occupied space.

D. Product Data: Include manufacturer's technical literature for each control device indicated, labeled with setting or adjustable range of control. Indicate dimensions, capacities, performance characteristics, electrical characteristics, finishes for materials, and installation and startup instructions for each type of product

indicated. Submit a write-up of the application software that will be used on the operator workstation including revision level, functionality and software applications required to meet the specifications.

E. Submit PICS statements for all direct digital controllers and interfaces.

F. Submit a description of the application software that will be used on the operator workstation including revision level, functionality and software applications required to meet the specifications.

G. Wiring Diagrams: Detail the wiring of the control devices and the panels. Show point-to-point wiring from field devices to the control panel. Show point-to-point wiring of hardwired interlocks. Show a ladder diagram or schematic of wiring internal to the panels, including numbered terminals. Clearly designate wiring that is done at a factory, at a panel shop or in the field.

H. Submit blank field check-out and commissioning test reports, customized for each panel or system, which will be filled out by the technician during start-up.

I. Submit sample graphics for approval before starting system commissioning.

J. Variance letter: Submit a letter detailing each item in the submission that varies from the contract specification or sequence of operation in any way.

K. After the BAS system is approved for construction, submit sample operator workstation graphics for typical systems for approval and/or meet at BMS vendor's branch office to review and approve system graphics. Print and submit the graphics that the operator will use to view the systems, change setpoints, modify parameters and issue manual commands. Programming shall not commence until typical graphics are approved.

1.8. QUALITY ASSURANCE

A. Refer to DDC General Conditions Section 01 40 00 "Quality Requirements."

B. Codes

1. Perform all wiring in accordance with Electrical Sections, NEC, and 2014 New York City building code requirements.
2. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to Commissioner, and marked for intended use.
3. Comply with NFPA 90A, "Installation of Air Conditioning and Ventilation Systems."
4. Comply with ASHRAE 135-2014
5. All equipment shall be UL listed and approved and shall meet with all applicable NFPA standards, including UL 916 - PAZX Energy Management Systems,
6. Provide UL 864 – UUKL Smoke Control, where controllers and networks are used for that purpose.
   a. Provide written approvals and certifications after installation has been completed.
7. All electronic equipment shall conform to the requirements of FCC Regulation, Part 15, Governing Radio Frequency Electromagnetic Interference and be so labeled.
8. The manufacturer of the building automation system shall provide documentation supporting compliance with ISO-9002 (Model for Quality Assurance in Production, Installation, and Servicing) and ISO-140001 (The application of well-accepted business management principles to the environment). The intent of this specification requirement is to ensure that the products from the manufacturer are delivered through a Quality System and Framework that will assure consistency in the products delivered for this project.

C. Qualifications

1. The Building Management System (BMS) contractor shall have full service facility within proximity of the project that is staffed with engineers trained and certified by the manufacturer in the configuration, programming and service of the automation system. The contractor's technicians shall be fully capable of providing instructions and routine emergency maintenance on all system components.

D. Final determination of compliance with these specifications shall rest solely with the Commissioner.

E. For any BAS system and equipment submitted for approval, the BAS installer shall state what, if any, specific points of system operation differ from these specifications.

1.9. DELIVERY, STORAGE, AND HANDLING

A. Factory-Mounted Components: Where control devices specified in this Section are indicated to be factory mounted on equipment, arrange for shipping of control devices to unit manufacturer.

1.10. COORDINATION

A. Coordinate location of thermostats, temperature sensors, humidistats, panels, and other exposed control components with plans and room details before installation.

B. Coordinate equipment with Section 28 31 11 "Digital, Addressable Fire Alarm" to achieve compatibility with equipment that interfaces with that system.

C. Coordinate power for control units and operator workstation with electrical subcontractor.

D. Coordinate equipment with provider of starters and drives to achieve compatibility with motor starter control coils and VFD control wiring.

E. Coordinate scheduling with the mechanical contractor. Submit a schedule for approval based upon the installation schedule of the mechanical equipment.

F. Integrate to equipment as called for in the sequence of operations.

1.11. WARRANTY

A. Failure of items that are critical for system operation shall be provided within 4 hours of notification from the Commissioner during normal building occupied hours.

B. This warranty shall be 12-months from date of Substantial Completion and apply equally to both hardware and software.

PART 2 - PRODUCTS

2.1. BAS NETWORK

A. All networked control products provided for this project shall be comprised of an industry standard open protocol internetwork. Communication involving control components (i.e. all types of controllers and operator interfaces) shall conform to ASHRAE 135-2014 standard. Networks and protocols proprietary to one company or distributed by one company are prohibited.

B. Access to system data shall not be restricted by the hardware configuration of the building management system. The hardware configuration of the BMS network shall be totally transparent to the user when accessing data or developing control programs.

1. Software applications, features, and functionality, including administrative configurations, shall not be separated into several network control engines working together.

C. The operator interface shall be served up by a Web Server imbedded in a controller field panel.

D. The network architecture shall consist of three levels of networks:

1. Subcontractor furnished network with 1 connection the Field Panel Web Server. All operator interfaces shall be on the City of New York's network.
2. The Automation level network shall be for Building Automation and Control Networks /IP over Ethernet. It shall network the Automation Server, Operator workstations, and BC level controllers. Provide network media converters, routers and switches as necessary for a complete network.
3. The Floor level network shall be for Building Automation and Control Networks over MS/TP. It shall network to all of the direct digital control equipment on a floor or in a system and network to a router that connects to the Automaton level BAS backbone. Controllers for the central plant and large infrastructure air handlers or where applicable shall reside on the backbone IP network.

E. The primary backbone network between the building level controllers shall be based upon IP. Ethernet Network switches shall be strategically placed through the building to cover several floors or several mechanical rooms that are within 300 ft wiring-feet of each other.

F. Application specific controllers for smaller single zone, supplemental or special systems can reside on the IP network or on a subnetwork.

G. Floor level controllers, package AC units, auxiliary equipment, VFDs, meters shall reside on one of the subnetworks above.

H. Use fiber optic cabling for all Ethernet runs longer than 300 ft.

I. Controllers and software shall be listed at the time of installation.

J. Provide all communication media, collectors, connectors, repeaters, bridges, switches, and routers necessary for the internetwork.

K. The system shall meet peer-to-peer communication services such that the values in any one BC or AAC level controller can be read or changed from all other controllers with the need for intermediary devices.

L. The software shall provide transparent transfer of all data, control programs, schedules, trends, and alarms from any one controller through the internetwork to any other controller, regardless of subnetwork routers.

M. Systems that use Point-to-Point (PTP) between controllers, gateways, bridges or networks that are not peer-to-peer are not allowed.

N. Remote Communications: Provide a TCP/IP compatible communication port for connection to the City of New York's network for remote communications. Provide coordination with the Commissioner for addressing and router configuration on both ends of the remote network.

O. Where a smoke control application is required, provide UUKL listed network switches, and NFPA approved cabling, enclosures and installation methods.

P. The system shall be installed with a 10% spare capacity on each subnetwork for the addition of future controllers.

2.2. DISTRIBUTED CONTROL REQUIREMENTS

A. The loss of any one direct digital control shall not affect the operation of other HVAC systems, only for the points connected to the direct digital controller.

B. The system shall be scalable in nature and shall permit expansion of both capacity and functionality through the addition of sensors, actuators, direct digital controllers, and operator devices.

C. System architectural design shall eliminate dependence upon any single device for alarm reporting and control execution. Each direct digital control shall operate independently by performing its own specified control, alarm management, operator I/O, and data collection. The failure of any single component or network connection shall not interrupt the execution of any control strategy, reporting, alarming and trending function, or any function at any operator interface device.

D. Direct digital controls shall be able to access any data from, or send control commands and alarm reports directly to, any other direct digital control on the network without dependence upon a central processing device. Direct digital controls Controllers shall also be able to send alarms to multiple operator workstations without dependence upon a central or intermediate processing device.

E. The direct digital controls control panel shall be mounted in the same mechanical room as the equipment being controlled, or an adjacent utility room.

F. Multiple systems can be programmed on the same controller as long as they are in the same room. Systems on separate floors shall have separate controllers.

G. Remote sensors shall be wired to the control panel of the equipment it is controlling, not across the network.

H. Signals to remote motor control centers shall be hard wired to the control panel, not across the network.

I. Terminal units shall each have their own controller. Only exceptions to sharing a controller are:

1. Groups of reheat coils
2. Groups of exhaust fans

2.3. WEB BASED OPERATOR INTERFACE SOFTWARE

A. Provide a Web-based graphical interface that allows users to access the BAS data via the Internet, extranet, or Intranet (TCP/IP). The Web-based graphical interface shall use HTML-based pages to send and receive data directly from a network of BAS Field Panels to a Web browser.

B. The web server shall support browser access.

C. Cookies are allowed for compatibility

D. The web server shall support access via handheld, web enabled devices through apps.

E. If a field panel cannot serve up the graphics, then dedicated PC-based Web servers or separate "Web Appliance" devices may be allowed for this purpose.

F. The Web server shall allow monitor and control of data in any field panels networked together on the same automation level TCP/IP Ethernet network.

1. The Web server must provide a common alarm display that shows alarms in all field panels on the network.

2. The Web server must be able to provide common graphics that simultaneously display the current value and status for points residing in multiple field panels.
3. The Web server must be able to display daily mode schedules for points from multiple field panels simultaneously.

G. Access to the Web interface shall be username and password protected. A user's rights and privileges to database objects within the BAS shall be configurable on a per-user basis. An option shall exist to only allow users "read" access to BAS objects via the Web browser. Operator sessions shall be configurable for "auto-logoff" after a designated period of user inactivity.

1. A graphic selector list shall allow or limit the graphic displays that a user account has access to.
2. The embedded Web server shall support an unlimited number of user accounts. A minimum of five concurrent user sessions shall be available for simultaneous operator access to the Web server's pages.
3. The embedded Web server shall be compatible with and allow coexistence within standard IT security policies and tools (e.g., Firewall protection).

H. The embedded Web server shall provide the following functionality to users via Web browser, based on their access and privilege rights:

1. Point Navigation – Provide a screen that allows users to see all of the points that are active in the system. The points shall include hardwired, software, schedules, trends, alarms and network setup.
   a. The point navigation shall display the point name, descriptor, command priority, alarm status, and current value.
   b. The user shall be able to run and print a pre-configured point log report through a web interface client that shows the point name, descriptor, command priority, alarm status, and current value.
   c. The interface and report shall allow selection filter such that the operator can select or deselect the types of point that are visible.

2. Alarm Display –displays current BAS alarms to which the user has access will be displayed. Users will be able to acknowledge active alarms, erase resolved alarms, and directly link to the Point Commanding feature.
   a. The alarm display must provide a filter that displays all alarms whether acknowledged or not.
   b. The alarm display must provide a filter that displays only alarms that have not yet been acknowledged.
   c. The alarm display must provide a persistent indication whenever there is one or more unacknowledged alarm in any connected field panel.

3. Point details – users will have access to point detail information including operational status, operational priority, physical address, and alarm limits, for point objects to which they have access rights.
4. Point Commanding – users will be able to override and command points they have access to via the Web browser interface.
5. Scheduling – allows operators, depending on their current user privileges, to override schedules selected by date, and to modify the properties of a selected schedule.
   a. The scheduler display must be able to represent facility mode schedules in a graphical format.
6. Trend Data Report – allows users to run and print a pre-configured trend data report for historical data reporting, including a representation of the alarm status of the each point for each Trend sample. The report shall allow selection of individual points or wildcard selection of points.
   a. Trend data shall be exportable to a data file, such as .csv or other comparable.

7. Network navigation - Provide a screen that allows users to navigate to the panels and terminal units via the network architecture.

I. Graphic Displays – The BAS subcontractor shall provide a graphical display for each system that is controlled.

8. Display of system graphics shall be available for viewing over the Web browser. Graphic displays will automatically refresh with the latest change of values. Users shall have the ability to command and override points directly from the graphic display as determined by their user accounts rights. The Graphic Display shall accommodate a minimum of 10 customized graphics.
9. The Graphic Display shall accommodate the terminal unit graphics related to the Application Specific Controllers tied in to the Field Panels within the system.

J. The web server shall be able to send SMTP text messages to notify users of alarm status. The City of New York shall provide a mail server and a connection port. SSL shall not be required.

K. The operator shall be able to add modify and delete controller database program, including points, schedules, alarms, and trends.

1. The operator shall be able to edit the custom program in the field panel that executes the sequences of operations, control loops and logic for the systems controlled.
2. The operator shall be able to add terminal unit controllers that reside on field panel subnetworks.

L. Internet connections, ISP services, as well as necessary firewalls or proxy servers shall be provided by the City of New York as required to support the Web access feature.

2.4. ELECTRONIC DOCUMENTATION

A. Provide software applications and files to view documentation through the GUI.

B. Provide all controls cut sheets in PDF format. Make them available to any user accessing the system over the Internet.

C. Provide a text version of the sequence of operation. Make the written sequence available from the graphic that represents each system. The sequence shall pop up in a printable format such as HTML or PDF.

2.5. CONTROLLER SOFTWARE (i.e. Building Controller software, Direct Digital Controls software, Field Panel software)

A. Provide a full capability user license to the City of New York for the operator to be able to see, modify, create, upload, download and save control programs to the direct digital controls.

B. The software program shall be provided as an integral part of direct digital controls and shall not be dependent upon any higher level computer or another controller for execution.

C. The software application shall be accessible from a PC, but shall use all of its own services and data files.

D. The software shall be provided with an interactive HELP function to assist operators with syntax, abbreviations, commands and saving programs.

E. Point naming and communication format:

1. All points, panels, and programs shall be identified by a 30-character name. All points shall also be name " Location_comp_subcomp_point type for example: S101_HV1_DAT, S103_VRF_FCU1-

5_ZoneTemp, S101_ERV1_Zone1_NOx, etc. The same names shall be displayed at both Building Controller and the Operator Interface.

2. All digital points shall have a consistent, user-defined, two-state status indication with 8 characters minimum (e.g., Summer, Enabled, Disabled, Abnormal).
3. The Building Controller Software shall be capable of building automation and control network communications. The Building shall have demonstrated interoperability during at least one BTL Interoperability Workshop, have demonstrated compliance to BTL through BTL listing and shall substantially conform to Building Controller device profile as specified in ANSI/ASHRAE 135-2004, Annex L.

F. System Security

1. User access shall be secured using individual security passwords and user names.
2. Passwords shall restrict the user to the objects, applications, and system functions as assigned by the system manager.
3. Building Controllers shall be able to assign a minimum of 50 passwords access and control priorities to each point individually. The logon password (at any Operator Interface or portable operator terminal) shall enable the operator to monitor, adjust and control only the points that the operator is authorized for. All other points shall not be displayed at the Operator Interface or portable terminal. Passwords and priorities for every point shall be fully programmable and adjustable.
4. User Log On/Log Off attempts shall be recorded.
5. The system shall protect itself from unauthorized use by automatically logging off following the last keystroke. The delay time shall be user-definable.
6. Use of workstation resident security as the only means of access control is not an acceptable alternative to resident system security in the direct digital controls software.

G. User Defined Control Applications: The applications software shall program direct digital controls routines to meet the sequences of operations.

1. Building Controllers shall have the ability to perform energy management routines including but not limited to time of day scheduling, calendar-based scheduling, holiday scheduling, temporary schedule overrides, start stop time optimization, automatic daylight savings time switch over, night setback control, enthalpy switch over, peak demand limiting, temperature-compensated duty cycling, heating/cooling interlock, supply temperature reset, priority load shedding, and power failure restart.
2. The Building Controllers shall have the ability to perform the following pre tested control algorithms:
   a. Two position with differential control and time delays
   b. Floating control
   c. Proportional control
   d. Proportional plus integral control
   e. Proportional, integral, plus derivative control
   f. Automatic tuning of control loops
   g. Manual tuning of control loops
   h. Model-free adaptive control
3. Controllers shall be able to execute custom, job-specific processes defined by the user, to automatically perform calculations and special control routines.
4. Each controller shall support plain language text comment lines in the operating program to allow for quick troubleshooting, documentation, and historical summaries of program development.

H. Peer-to-peer access to other direct digital controls

1. It shall be possible to use any actual or virtual point data or status, any system calculated data, a result from any process, or any user-defined constant in any controller in the system.
2. Any process shall be able to issue commands to points in any and all other controllers in the system.
3. Processes shall be able to generate operator messages and advisories to other operator I/O devices. A process shall be able to directly send a message to a specified device or cause the execution of an advanced annunciation feature, such as:
   a. Generate a report
   b. Annunciate an alarm
   c. Issue a text message or email

I. Alarm Management

1. Alarm management shall be provided within the controller software to monitor and direct alarm information to operator devices.
2. Each Building Controller shall perform distributed, independent alarm analysis, minimize network traffic and prevent alarms from being lost. At no time shall the Building Controllers ability to report alarms be affected by either operator or activity at a PC workstation, local I/O device or communications with other panels on the network.
3. Conditional alarming shall allow generation of alarms based upon user defined multiple criteria.
4. An Alarm "shelving" feature shall be provided to disable alarms during testing. (Pull the Plug, etc.).
5. Binary Alarms. Each binary alarm object shall be set to alarm based on the operator-specified state. Provide the capability to automatically and manually disable alarming.
6. Analog Alarms. Each analog alarm object shall have both high and low alarm limits. Alarming must be able to be automatically and manually disabled.
7. All alarm shall include the point's user-defined language description and the time and date of occurrence.
8. Alarm reports and messages shall be routed to user-defined list of operator workstations, or other devices based on time and other conditions. An alarm shall be able to start programs, print reports, be logged in the event log, generate custom messages, and display graphics.
9. The user shall be able to add a 200-character alarm message to each alarm point to more fully describe the alarm condition or direct operator response. Each Building Controller shall be capable of storing a library of at least 50 alarm messages. Each message may be assigned to any number of points in the Controller.
10. Operator-selected alarms shall be capable of initiating a trigger to an advanced annunciation, such as text, email, etc.
11. An alarm history log shall report the start of the alarm condition, acknowledgement by a user and return of the alarm to normal condition.

J. Scheduling:

1. Provide a comprehensive menu driven program to automatically start and stop designated multiple objects or events in the system according to a stored time.
2. Schedules shall reside in the building controller and shall not rely on external processing or network.
3. It shall be possible to define a group of objects as a custom event (i.e., meeting, athletic activity, etc.). Events can then be scheduled to operate all necessary equipment automatically.
4. For points assigned to one common load group, it shall be possible to assign variable time delays between each successive start and/or stop within that group.
5. The operator shall be able to define the following information:
   a. Time, day
   b. Commands such as on, off, auto, etc.

c. Time delays between successive commands.
d. There shall be provisions for manual overriding of each schedule by an authorized operator.

6. It shall be possible to schedule calendar-based events up to one year in advance based on the following:
   a. Weekly Schedule. Provide separate schedules for each day of the week. Each of these schedules should include the capability for start, stop, optimal start, optimal stop, and night economizer. When a group of objects are scheduled together as an Event, provide the capability to adjust the start and stop times for each member.
   b. Exception Schedules. Provide the ability for the operator to designate any day of the year as an exception schedule. Exception schedules may be defined up to a year in advance. Once an exception schedule is executed, it will be discarded and replaced by the standard schedule for that day of the week.

K. Peak Demand Limiting (PDL):

1. The Peak Demand Limiting (PDL) program shall limit the consumption of electricity to prevent electrical peak demand charges
2. PDL shall continuously track the amount of electricity being consumed, by monitoring one or more electrical kilowatt-hour/demand meters. These meters may measure the electrical consumption (kWh), electrical demand (kW), or both.
3. PDL shall sample the meter data to continuously forecast the demand likely to be used during successive time intervals.
4. If the PDL forecasted demand indicates that electricity usage is likely to exceed a user preset maximum allowable level, then PDL shall automatically shed electrical loads.
5. Once the demand peak has passed, loads that have been shed shall be restored and returned to normal control.
6. Any PDL capabilities shall be coordinated with DSNY and approved prior to programming.

L. Temperature-compensated duty cycling

1. User defined conditions shall be able to initiate a Duty Cycle Control Program.
2. The Duty Cycle Control Program (DCCP) shall be configured to periodically stop and start loads according to various patterns.
3. The loads shall be cycled such that there is a net reduction in both the electrical demands and the energy consumed.

M. Automatic Daylight Savings Time Switchover. The system shall provide automatic time adjustment for switching to/from Daylight Savings Time.

N. Night or Unoccupied setback control. The system shall provide the ability to automatically adjust set points for night or unoccupied control.

O. Enthalpy switchover (economizer). The Building Controller Software (BCS) shall control the position of the air handler relief, return, and outside air dampers. If the outside air dry bulb temperature falls below changeover setpoint the BCS will modulate the dampers to provide 100 percent outside air. The user will be able to quickly change over to an economizer system based on dry bulb temperature and will be able to override the economizer cycle and return to minimum outside air operation at any time.

P. Control Loop Algorithm

1. Provide a PID (proportional-integral-derivative) closed-loop control algorithm with direct or reverse action and anti-windup. The algorithm shall calculate a time-varying analog value that is used to

position an output or stage a series of outputs. The controlled variable, setpoint, and weighting parameters shall be accessible from the operator workstation.

Q. Adaptive Loop Tuning

1. Building Controllers shall also provide high resolution sampling capability for verification of direct digital control loop performance. Documented evidence of tuned control loop performance shall be provided on a monthly, seasonal, quarterly, annual period.
2. For Model-Free Adaptive Control loops, evidence of tuned control loop performance shall be provided via graphical plots or trended data logs. Graphical plots shall minimally include depictions of setpoint, process variable (output), and control variable (e.g., temperature). Other parameters that may influence loop control shall also be included in the plot (e.g., fan on/off, mixed-air temp).
3. For PID control loops, operator-initiated automatic and manual loop tuning algorithms shall be provided for all operator-selected PID control loops. Evidence of tuned control loop performance shall be provided via graphical plots or trended data logs for all loops.
   a. In automatic mode, the controller shall perform a step response test with a minimum one-second resolution, evaluate the trend data, calculate the new PID gains and input these values into the selected LOOP statement.
   b. Loop tuning shall be capable of being initiated either locally at the Building Controller, from a network workstation or remotely using dial-in modems. For all loop tuning functions, access shall be limited to authorized personnel through password protection.

R. Logic programming: Provide a software routine that can build ladder logic to control using many conditional statements.

1. The logic programming syntax shall be able to combine ladder logic with other software features, such as combining status, scheduling, PDL and alarm conditions into one conditional decision.
2. Logic programming shall be able to reference conditions in any other controller in the system.

S. Staggered Start:

1. This application shall prevent all controlled equipment from simultaneously restarting after a power outage. The order in which equipment (or groups of equipment) is started, along with the time delay between starts, shall be user definable in an application and shall not require written scripts or ladder logic.
2. Upon the resumption of power, each Building Controller shall analyze the status of all controlled equipment, compare it with normal occupancy scheduling and turn equipment on or off as necessary to resume normal operations.

T. Totalization Features:

1. Run-Time Totalization. Building Controllers shall automatically accumulate and store run-time hours for all digital input and output points. A high runtime alarm shall be assigned, if required, by the operator.
2. Consumption totalization. Building Controllers shall automatically sample, calculate and store consumption totals on a daily, weekly or monthly basis for all analog and digital pulse input type points.
3. Event totalization. Building Controllers shall have the ability to count events such as the number of times a pump or fan system is cycled on and off. Event totalization shall be performed on a daily, weekly or monthly basis for all points. The event totalization feature shall be able to store the records associated with events before reset.

U. Data Collection:

1. A variety of historical data collection utilities shall be provided to manually or automatically sample, store, and display system data for all points.
2. Building Controllers shall store point history data for selected analog and digital inputs and outputs:
3. Any point, physical or calculated may be designated for trending. Any point, regardless of physical location in the network, may be collected and stored in each Building Controllers point group.
4. Two methods of collection shall be allowed: either by up to four pre-defined time intervals or upon a pre-defined change of value. Sample intervals of 1 minute to 7 days shall be provided.
5. Each Building Controller shall have a dedicated RAM-based buffer for trend data and shall be capable of storing a minimum of 10,000 data samples.
6. Trend data shall be stored at the Building Controllers and uploaded to the workstation when retrieval is desired. Uploads shall occur based upon either user-defined interval, manual command or when the trend buffers are full. All trend data shall be available for use in third-party personal computer applications.

2.6. BUILDING CONTROLLERS (B-BC)

A. Provide all necessary hardware for a complete operating system as required. The Building Controller shall be able to operate as a standalone panel and shall not be dependent upon any higher level computer or another controller for operation.

B. This controller shall have the BTL listing and meet the BACnet device profile of a Building Controller (B-BC).

1. The Building Level Controller shall have the capability to be the BACnet/IP Broadcast Management Device (BBMD) and support foreign devices.
2. The Building Level Controller shall have the capability to act as a BACnet router between MS/TP subnetworks and BACnet/IP.

C. This level of controller shall be used for the following types of systems:

1. VRF systems
2. Heating systems
3. Pumping systems
4. ERV units
5. H & V units
6. Rooftop units
7. Exhaust Fans
8. Solar hot water heating
9. Generator
10. Unit heaters
11. Systems with over 24 input/output points

D. Computing power and memory minimum:

1. A 32-bit, stand-alone, multi-tasking, multi-user, real-time 100MHz digital control microprocessor module.
2. Inputs shall be 16-bit minimum analog-to-digital resolution
3. Outputs shall be 10-bit minimum digital-to-analog resolution
4. Memory module (24 Megabyte, minimum) to accommodate all Primary Control Panel software requirements, including but not limited to, its own operating system and databases (see Controllers

Software section), including control processes, energy management applications, alarm management applications, historical/trend data for points specified, maintenance support applications, custom processes, operator I/O, dial-up communications.

5. Real time clock and battery
6. Data collection/ Data Trend module sized for 10,000 data samples.
7. Flash Memory Firmware: Each Building Level Control Panel shall support firmware upgrades without the need to replace hardware.

E. Onboard or Modular hardware and connections:

1. Primary Network communication module, if needed for primary network communications.
2. Secondary Network communication module, if needed for secondary network communications.
3. RJ45 port 10/100Mbaud
4. RS485 ports for subnetworks and point expansion
5. Man to Machine Interface port (MMI)
6. USB Port

F. Input and Output Points Hardware

1. Input/output point modules as required including spare capacity.
2. Monitoring of the status of all hand-off-auto switches. An alarm shall signal at the BMS if the equipment is in hand.
3. Monitoring of all industry standard types of analog and digital inputs and outputs, without the addition of equipment to the primary control panel.
4. Local status indication for each digital input and output for constant, up-to-date verification of all point conditions without the need for an operator I/O device. Each primary control panel shall perform diagnostics on all inputs and outputs and a failure of any input or output shall be indicated both locally and at the operator workstation.
5. Graduated intensity LEDs or analog indication of value for each analog output.

G. Code compliance

1. Approvals and standards: UL916; CE; FCC
2. Provide UL864-UUKL where called for in the sequences of operations.

H. Accessories:

1. Appropriate NEMA rated metal enclosure.
2. Power supplies as required for all associated modules, sensors, actuators, etc.

I. Keypad.

1. Where called for in the sequence of operation, or on the plans, a local keypad and display shall be provided for each controller. The keypad shall be provided for interrogating and editing data. An optional system security password shall be available to prevent unauthorized use of the keypad and display.

J. The operator shall have the ability to manually override automatic or centrally executed commands at the primary control panels via local, point discrete, on-board hand/off/auto operator override switches. If on board switches are not available, provide separate control panels with HOA switches. Mount panel adjacent to primary control panel. Provide hand/off/auto switch for each digital output, including spares.

K. Each Building Level Control Panel shall continuously perform self-diagnostics on all hardware modules and network communications. The System Level Control Panel shall provide both local and remote an-

nunciation of any detected component failures, low battery conditions or repeated failure to establish communication with any system.

L. Panel setup, point definitions and sequencing diagrams shall be backed up on EEPROM memory.

M. Power loss. In the event of the loss of power, there shall be an orderly shutdown of all Building Controllers to prevent the loss of database or operating system software. Non-volatile memory shall be incorporated for all critical controller configuration data and battery backup shall be provided to support the real-time clock and all volatile memory for a minimum of 30 days.

N. Building Level control panels shall provide at least two serial data communication ports for operation of operator I/O devices such as industry standard printers, operator terminals, modems and portable laptop operator's terminals. Primary control panels shall allow temporary use of portable devices without interrupting the normal communications, operation of permanently connected modems, printers or terminals.

O. Building Level Controllers shall have the capability to serve as a gateway between Modus subnetworks and BACnet objects. Provide software, drives and programming.

P. Isolation shall be provided at all primary control panel terminations, as well as all field point terminations to suppress induced voltage transients consistent with IEEE Standards 587-1980.

Q. Spare Capacity: Provide enough inputs and outputs to handle the equipment shown to be "future" on drawings and 10% more of each point type. Provide all hardware modules, software modules, processors, power supplies, communication controllers, etc. required to ensure adding a point to the spare point location only requires the addition of the appropriate sensor/actuator and field wiring/tubing.

R. Environment.

1. Controller hardware shall be suitable for the anticipated ambient conditions.
2. Controllers used outdoors and/or in wet ambient conditions shall be mounted within waterproof enclosures and shall be rated for operation at 32°F to 120°F.
3. Controllers used in conditioned space shall be mounted in dust-proof enclosures and shall be rated for operation at -4°F to 120°F.

S. Immunity to power and noise.

1. Controller shall be able to operate at 90% to 110% of nominal voltage rating and shall perform an orderly shutdown below 80% nominal voltage.
2. Operation shall be protected against electrical noise of 5 to 120 Hz and from keyed radios up to 5 W at 1 m (3 ft).
3. Isolation shall be provided at all primary network terminations, as well as all field point terminations to suppress induced voltage transients consistent with:
   a. RF-Conducted Immunity (RFCI) per ENV 50141 (IEC 1000-4-6) at 3V.
   b. Electro Static Discharge (ESD) Immunity per EN 61000-4-2 (IEC 1000-4-2) at 8 kV air discharge, 4 kV contact.
   c. Electrical Fast Transient (EFT) per EN 61000-4-4 (IEC 1000-4-4) at 500V signal, 1 kV power.
   d. Output Circuit Transients per UL 864 (2,400V, 10A, 1.2 Joule max).
4. Isolation shall be provided at all Building Controller's AC input terminals to suppress induced voltage transients consistent with:
   a. IEEE Standard 587 1980
   b. UL 864 Supply Line Transients
   c. Voltage Sags, Surge, and Dropout per EN 61000-4-11 (EN 1000-4-11)

2.7. ADVANCED APPLICATION CONTROLLERS

A. Provide all necessary hardware for a complete operating system as required. The Advanced Application level control panel shall be able to operate as a standalone panel and shall not be dependent upon any higher level computer or another controller for operation.

B. This controller shall have the BTL listing and meet the building automation and control network device profile of an Advanced Application Controller.

C. Communication:

1. BAS Network: The Advanced Application Controller shall support the following Data Link Layers:
   a. MS/TP Master
2. Serial Communication: Temporary use of portable devices shall not interrupt the BAS communication, nor the normal operation of permanently connected printers or terminals.
   a. Provide at least one EIA-232C serial data communication port for operation of operator I/O devices such as industry standard printers, operator terminals, and portable laptop operator's terminals.
   b. A USB port shall alternatively be available to support local HMI tools connection.

D. Software

1. The software programs specified in this section shall be provided as an integral part of Advanced Application Controllers and shall not be dependent upon any higher level computer or another controller for execution.
2. Advanced Application Controllers shall have the ability to perform energy management routines including but not limited to
   a. scheduling, calendar-based scheduling, holiday scheduling, temporary schedule overrides
   b. automatic daylight savings time switch over
   c. night or unoccupied setback control
   d. economizer switch over using enthalpy, dry bulb or a combination
   e. peak demand limiting,
   f. temperature-compensated duty cycling
   g. heating/cooling interlock
   h. supply temperature reset
   i. priority load shedding
   j. power failure restart
   k. heat recovery
3. The software shall have a routine for automatic tuning of control loops
4. System Security in the Field Panel
   a. User access shall be secured using individual security passwords and user names.
   b. Passwords shall restrict the user to the objects, applications, and system functions as assigned by the system manager.
   c. The system shall protect itself from unauthorized use by automatically logging off following the last keystroke. The delay time shall be user-definable.
   d. Use of workstation resident security as the only means of access control is not an acceptable alternative to resident system security in the field panel.
5. User Defined Control Applications:
   a. Controllers shall be fully-programmable. Controllers shall execute custom, job-specific sequences to automatically perform calculations and special control routines. Factory installed

or pre-configured sequences shall only be allowed if they exactly match the sequence specified herein.

b. Programs shall combine control logic, control loop algorithms, and energy management routines
c. Each controller shall support plain language text comment lines in the operating program to allow for quick troubleshooting, documentation, and historical summaries of program development.
d. Controller shall provide a HELP function key, providing enhanced context sensitive on-line help with task oriented information from the user manual.

E. This level of controller shall be used for the following types of systems:

1. Systems with custom sequences that meet all of the criteria below:
2. No primary pumping systems
3. Secondary Pumping systems that are remote from Central Plants
4. Air handlers up to 15,000 cfm
5. Systems up to 20 input/output points
6. Room control sequences that do not fit into an ASC controller
7. BAS Network or Architecture or Sequences do not require the system to be on an IP network
8. No systems that require integration to meters, VFDs or other smart equipment
9. Integration to smart thermostats is allowed

F. Each System Level Control Panel shall, at a minimum, be provided with:

1. Appropriate NEMA rated metal enclosure.
2. A 32-bit,multi-tasking, real-time 100 MHz digital control microprocessor with plug-in, enclosed processors.
3. Each Advanced Application Controller shall have sufficient memory, a minimum of 24 megabyte, to support its own operating system and databases, including control processes, energy management applications, alarm management applications, historical/trend data for points specified, maintenance support applications, custom processes, and operator I/O.
4. Real time clock and battery
5. Data collection/ Data Trend module sized for 10,000 data samples.
6. Power supplies as required for all associated modules, sensors, actuators, etc.
7. Monitoring of all industry standard types of analog and digital inputs and outputs, without the addition of equipment to the primary control panel.
8. Local status indication for each digital input and output for constant, up-to-date verification of all point conditions without the need for an operator I/O device.
9. Each control panel shall perform diagnostics on all inputs and outputs and a failure of any input or output shall be indicated both locally and at the operator workstation.
10. Graduated intensity LEDs or analog indication of value for each analog output.

G. Power loss. In the event of the loss of power, there shall be an orderly shutdown of all controllers to prevent the loss of database or operating system software. Non-volatile memory shall be incorporated for the operating system software and firmware.

1. Controller shall be able to operate at 90% to 110% of nominal voltage rating and shall perform an orderly shutdown below 80% nominal voltage.
2. Brownout protection and power recovery circuitry protect the controller board from power fluctuations.
3. Battery backup shall be provided to support the real-time clock for 10 years

4. The program and database information stored SDRAM memory shall be battery backed for a minimum of 30 days and up to 60 days. This eliminates the need for time consuming program and database re-entry in the event of an extended power failure.

H. Database Restore: Each AAC controller shall automatically save the latest programmed database. The controller shall be able to automatically restore a lost or corrupt database without involvement from the operator.

I. Each System Level Control Panel shall continuously perform self-diagnostics on all hardware modules and network communications. The System Level Control Panel shall provide both local and remote annunciation of any detected component failures, low battery conditions or repeated failure to establish communication with any system.

J. Each Control Panel shall support firmware upgrades without the need to replace hardware.

1. The AAC level controller shall be upgradable to a BC level controller with a flash upgrade of the firmware.

K. System Level control panels shall provide at least two RS-232C serial data communication ports for operation of operator I/O devices such as operator terminals, and additional memory. Control panels shall allow temporary use of portable operator interface devices without interrupting the normal communications.

L. Immunity to noise.

1. Operation shall be protected against electrical noise of 5 to 120 Hz and from keyed radios up to 5 W at 1 m (3 ft).
2. Isolation shall be provided at all primary network terminations, as well as all field point terminations to suppress induced voltage transients consistent with:
   a. RF-Conducted Immunity (RFCI) per ENV 50141 (IEC 1000-4-6) at 3V.
   b. Electro Static Discharge (ESD) Immunity per EN 61000-4-2 (IEC 1000-4-2) at 8 kV air discharge, 4 kV contact.
   c. Electrical Fast Transient (EFT) per EN 61000-4-4 (IEC 1000-4-4) at 500V signal, 1 kV power.
   d. Output Circuit Transients per UL 864 (2,400V, 10A, 1.2 Joule max).
3. Isolation shall be provided at all Advanced Application Controller's AC input terminals to suppress induced voltage transients consistent with:
   a. IEEE Standard 587 1980
   b. Voltage Sags, Surge, and Dropout per EN 61000-4-11 (EN 1000-4-11)

M. Agency Compliance

1. UL UL916 PAZX (all models)
2. UL916 PAZX7 (all models)
3. FCC Compliance CFR47 Part 15, Subpart B, Class B
4. Australian EMC Framework
5. European EMC Directive (CE)
6. European Low Voltage Directive (LVD)
7. BACnet Testing Laboratories (BTL) Certified

N. Spare Capacity: Provide enough inputs and outputs to handle the equipment shown to be "future" or "existing" on drawings and 10% more of each point type. Provide all hardware modules, software modules, processors, power supplies, communication controllers, etc. required to ensure adding a point to the spare point location only requires the addition of the appropriate sensor/actuator and field wiring/tubing.

O. Local Operator Interfaces: Provide if called for elsewhere in the specification or the sequences of operations.

1. Controllers shall support an optional Operator Interface Module.

2.8. APPLICATION SPECIFIC CONTROLLERS

A. Each Application Level Control Panel shall operate as a stand-alone controller capable of performing its user selectable control routines independently of any other controller in the system. Each Application Specific Controller shall provide standard applications and programmability to provide both reliability and flexibility. Each application specific controller shall be a microprocessor-based, multi-tasking, real-time digital control processor.

B. Configurable control applications. Each Application Specific Controller model must have a set of pre-loaded, selectable and field-adjustable control applications appropriate for the secondary HVAC equipment that the controller model is intended to control. Specific applications must be configurable to meet the user's control strategy requirements, allowing for additional system flexibility.

C. Each Application Specific Controller model must have a set of pre-loaded, selectable and field-adjustable control applications for lighting equipment control, independent from or in conjunction with the HVAC control applications, which can be enabled if the appropriate lighting control devices are connected.

D. Each Application Specific Controller model must have a set of pre-loaded, selectable and field-adjustable control applications for shading equipment control, independent from or in conjunction with the HVAC control applications, which can be enabled if the appropriate shading control devices are connected.

E. The Application Specific Controller shall include all point inputs and outputs necessary to perform the specified HVAC control sequences. The controller shall accept input and provide output signals that comply with industry standards. Controllers utilizing proprietary control output signals shall not be acceptable. Controllers shall provide outputs utilized either for two-state, modulating floating, or proportional control, allowing for additional system flexibility.

1. Analog inputs shall be software configurable to accept sensors using 0-10v (such as RH or CO2 sensors), NTC3k, NTC10k, NTC100k, Ni1000, PT1K 385, and resistance sensors of 1000Ω, 2500 Ω, 10K Ω, and 100k Ω . 24vDC power to drive active sensors shall be an option available from the controller.
2. Digital input
3. Analog Outputs shall support 0-10v HVAC control signals.
4. Digital outputs shall be AC 24V high-side switching triacs, able to switch loads of 250 mA / 6 VA per output.
5. Every installed Application Specific Controller shall be prepared for the addition of occupancy, CO2, CO, NOx and humidity sensors
6. Additional sensors and output modules for occupancy, lighting and shade control within the same space as the HVAC control shall be connected as needed via a sub-network connection on each Application Specific Controller
7. The Application Specific Controller shall be compatible with a room operator unit which combines a display with CO2, temperature and humidity sensing in 1 wall device.
8. The Application Specific Controller shall be compatible with a room operator unit which combines a display with temperature sensing and configurable switches for lighting, shade and scene control in 1 wall device.

F. Application Specific Controller communication

1. Communication over floor level network shall be building automation and control network over MS/TP or building automation and control network IP over Ethernet.
2. A maximum of 96 controllers may be configured on individual building automation and control network MS/TP networks.
3. Each controller that uses building automation and control network IP shall provide at least two Ethernet ports allowing the controllers to be wired in a daisy-chain configuration of up to at least 20 controllers per chain, utilizing standard Ethernet cables of up to 300ft in length between each controller.

G. The Application Specific Controller shall have the BTL listing and meet the building automation and control network device profile of an Application Specific Controller (B-ASC) as specified in ANSI/ASHRAE 135-2012. The controller shall support the following BACnet BIBBs:

1. Data Sharing
   a. DS-RP-A: Data Sharing – Read Property-A
   b. DS-RP-B: Data Sharing – Read Property-B
   c. DS-RPM-A: Data Sharing – Read Property Multiple-A
   d. DS-RPM-B: Data Sharing – Read Property Multiple-B
   e. DS-WP-A: Data Sharing – Write Property-A
   f. DS-WP-B: Data Sharing – Write Property-B
   g. DS-WPM-A: Data Sharing – Write Property Multiple-A
   h. DS-WPM-B: Data Sharing – Write Property Multiple-B
   i. DS-COV-A: Data Sharing – Change of Value -A
   j. DS-COV-B: Data Sharing – Change of Value -B
   k. DS-COVP-A: Data Sharing – Change of Value Property -A
   l. DS-COVP-B: Data Sharing – Change of Value Property –B
2. Alarm and Event
   a. AE-N-I-B: Alarm and Event – Notification Internal-B
   b. AE-ACK-B: Alarm and Event – ACK-B
   c. AE-ASUM-B: Alarm and Event – Alarm Summary-B
   d. AE-ESUM-B: Alarm and Event – Enrollment Summary-B
   e. AE-INFO-B: Alarm and Event – Information-B
   f. AE-EL-I-B: Alarm and Event – Event Log Internal-B
3. Trending
   a. T-VMT-I-B: Trending – Viewing and Modifying Internal-B
   b. T-ATR-B: Trending – Automated Trend Retrieval-B
4. Device Management
   a. DM-DDB-A: Device Management – Dynamic Device Binding-A
   b. DM-DDB-B: Device Management – Dynamic Device Binding-B
   c. DM-DOB-B: Device Management – Dynamic Object Binding-B
   d. DM-DCC-B : Device Management – Device Communication Control-B
   e. DM-TS-B: Device Management – Time Synchronization-B
   f. DM-UTC-B: Device Management – UTC Time Synchronization-B
   g. DM-RD-B: Device Management – Reinitialize Device-B
   h. DM-BR-B: Device Management – Backup and Restore-B
   i. DM-R-B: Device Management – Restart-B
   j. DM-LM-B : Device Management – List Manipulation-B
5. The Application Specific Controller shall support the following Data Link Layers:

a. Building automation and control network MS/TP Master (Clause 9)
b. Building automation and control network IP, Foreign Device

H. Provide a Application Specific Control Panel for each of the following types of equipment:

1. VRF systems
2. Heating systems
3. Pumping systems
4. H & V units
5. ERV units
6. Rooftop units
7. Exhaust Fans
8. Solar hot water heating
9. Generator
10. Unit heaters
11. Systems with over 24 inputs/output points

I. Applications for ERV terminals:

1. The following Unit Ventilator terminal box equipment configurations must be supported with pre-loaded, pre-tested applications that can be selected and configured during commissioning.
   a. Heating and/or Cooling with Outdoor air damper control
2. All ERV applications must support the following options (where appropriate):
   a. DX
   b. Electric
   c. Discharge temperature control
   d. Demand Control Ventilation –if required
   e. Single or multi-speed or Variable speed fan control
   f. Cooling via economizer control of outside air damper.
   g. Occupancy sensor

J. Provide centralized control functions for secondary HVAC control, Lighting

1. Functions for coordinating control across a grouping of rooms, a floor area, entire floor, façade, mechanical or electrical supply chains, or different combinations thereof shall be provided.
2. Support commanding of all group members to a common position or state.
3. Support consolidation of common information from group members for calculation or optimization purposes
4. Central functions shall reside in an Application Specific Controller dedicated to the central control functions specified herein.
5. Members of the groups used by the central functions specified herein shall be assigned and be changeable through standard BACnet services.

K. Central functions for H & V

1. Utilize the HV control status and conditions in a large number of Application Specific Controllers in order to support optimization of H & V units.
   a. Central Supply Air function collects air demand data from rooms (Application Specific Controller flow control loops) to support demand-based run/stop decisions for unit. Garage indicate need for primary heating and ventilation.
   b. Central Supply Air function collects data from rooms (Application Specific Controller flow loops) to minimize duct pressure. Application Specific Controllers provide multiple signals to

support duct pressure reset, including damper command, damper saturation signal and air flow deviation signal. All are available for collection by Central Air application.

c. Central Supply Air function collects data from rooms (Application Specific Controller control loops) to support dynamically optimizing the primary supply air temperature. Data available from the Application Specific Controller includes cooling demand and demand in the room for reheat.

d. Central Supply Air function collects data from rooms (Application Specific Controller control loops) to support dynamically optimizing the outside air intake. Data available from the Application Specific Controller includes ventilation demand, CO, NOx and CO2 levels.

L. Coordination between Application Specific Controllers. In situations where more than one controller is serving a common space, it must be possible through configuration only (not reprogramming) to subordinate one or more Application Specific Controllers to another Application Specific Controller allowing multiple controllers to coordinate HVAC control in a large space.

M. Application Operating Modes - All of the following operating modes shall be supported, with configurable operation of each controlled device during each mode.

1. Comfort, Standby (Pre-comfort), Economy, and Building Protection modes
   a. Comfort: Space is occupied
   b. Standby: Space has been or will be unoccupied for a short time
   c. Economy: Space has been or will be unoccupied for a longer time
   d. Building Protection: Space has been or will be unoccupied for a more than a day
2. Configurable set points and limits for each mode.
   a. The operating mode can be changed by system schedule or command or by conditions in the space such as by presence detection.
   b. All controlled devices shall respond to changes in operating mode in a configurable way such as set point resets after a configurable time to optimize energy consumption.

N. Room Units / HMIs shall provide an intuitive user alert to indicate energy-efficient operation or when there is unnecessary energy consumption, and provide occupants with a one-touch release to return to efficient, comfortable control. Energy efficient operation shall be determined by configurable and programmable algorithms provided by the Application Specific Controller and shall include (but not be limited to) the following conditions:

1. Temperature set point is set outside customer-specified limits
2. Fan Speed is overridden to a higher speed than is required for automated temperature control
3. Manual override of brightness control, lights using more energy than needed to light the space
4. Shades are overridden to position that allows too much solar radiation into the room during cooling modes, wasting HVAC energy

O. The energy efficiency status for each Application Specific Controller and space shall also be available as BACnet object at the BMS for operating and monitoring.

P. Scene control. The Application Specific Controller shall provide a set of configurable and field-adjustable presets of HVAC, lighting levels that can be activated by pressing assigned buttons on the Room Unit / HMI.

Q. Application Specific Controller Configuration and Commissioning Tool

1. Provide industry standard, commercially available laptop to host the Application Specific Controller Configuration and Commissioning Tool. The tool shall plug directly into all controllers as described below:

2. Functionality of the Configuration and Commissioning Tool connected to any Application Specific Controller shall include:
   a. Provide connection capability at either the controller, a related room unit, through a building automation and control network router or controller to access controller information.
      1) When connected via a related room unit to a controller, the tool shall be able to access information of the controller the room unit is connected to and all controllers connected to the same MS/TP or IP network.
      2) Connection of the Tool to a controller shall not interrupt nor interfere with normal network operation in any way, prevent alarms from being transmitted or preclude centrally-initiated commands and system modification.
      3) Tool access to controller shall be password-controlled. Password protection shall be configurable for each operator based on function, points (designating areas of the facility), and edit/view capability.
   b. Provide device discovery, configuration and setup for addressing and network management of multiple devices from one connection point (location) in parallel.
   c. Select, view, command, change, and enable/disable features and functionality of the control application.
   d. Load pre-designed templates of configuration settings and allow copying of templates to other controllers in order to speed the commissioning process.
   e. Provide status, setup, balancing and control reports to support commissioning and troubleshooting activities.
   f. Backup and restore of application configurations
   g. Air flow balancing.
      1) For every air flow sensing channel in the Application Specific Controller control application, the Tool shall offer an interface and menu specifically designed to support the Test, Adjust, and Balance functions. Through the balancing menu, the controller enables the following operations:
         a) Select the operating point for the test from a list of named operating points, including maximum and minimum cooling, maximum and minimum ventilation and maximum and minimum heating.
         b) Accept the balancer's flow measurement as a manually entered value.
         c) Automatically calculate and display the revised flow calibration factor.
         d) Apply the new calibration factor on command.
      2) The Application Specific Controller shall maintain a BACnet object reflecting the TAB state of the controller as: Initial, Balancing, Balanced. The Application Specific Controller records data representing the TAB process, and stores for later retrieval. The controller delivers the data when called for producing reports. Stored data includes:
         a) Air balancer's air flow measurement.
         b) Controller's air flow measurement after correction.
         c) Named test point (max cooling, etc.).
         d) Initial calibration factor.
         e) Applied selected calibration factor
   h. The tool should allow configuring, loading and balancing multiple controllers from one connection point (location) in parallel.

   i. The Ethernet / IP Application Specific Controller models shall provide web pages for troubleshooting and operation and monitoring which can be accessed via a standard web browser.

R. Each Application Specific Controller shall, at a minimum, be provided with:

1. Appropriate NEMA rated enclosure
2. Floor Level network communications ability
3. Power supplies as required for all associated modules, sensors, actuators, etc.
4. Software as required for all sequences of operation, logic sequences and energy management routines.
5. A portable operator terminal connection port
6. Auxiliary enclosure for analog output transducers, isolation relays, etc. Auxiliary enclosure shall be part of primary enclosure or mounted adjacent primary enclosure
7. Each controller measuring air volume shall include provisions for manual and automatic calibration of the differential pressure transducer in order to maintain stable control and insuring against drift over time
8. Each controller measuring air volume shall include a differential pressure transducer
9. Approvals and standards: UL916 PAZX; CE; CUL;FCC

S. Each Application Specific Controller shall continuously perform self-diagnostics on all hardware and secondary network communications. The Application Specific Controller shall provide both local and remote annunciation of any detected component failures, low battery conditions, or repeated failure to establish communication to the system.

T. Provide each Application Specific Controller with sufficient memory to accommodate point databases, operating programs, local alarming and local trending. All databases and programs shall be stored in non-volatile EEPROM, EPROM and PROM. The controllers shall be able to return to full normal operation without user intervention after a power failure of unlimited duration. Provide uninterruptible power supplies (UPSs) of sufficient capacities for all terminal controllers that do not meet this protection requirement. Operating programs shall be field-selectable for specific applications. In addition, specific applications may be modified to meet the user's exact control strategy requirements, allowing for additional system flexibility. Controllers that require factory changes of all applications are not acceptable.

U. All controller configuration settings and programs shall be stored in non-volatile memory. The controllers shall be able to return to full normal operation without user intervention after a power failure of unlimited duration.

V. The Application Specific Controller shall be powered from a 24 VAC source provided by this subcontractor and shall function normally under an operating range of -15% to +20%), allowing for power source fluctuations and voltage drops. Install plenum data line and sensor cable in accordance with local code and NEC. The controllers shall also function normally under ambient conditions of 23 to 122 F (-5 to 50 C) and 5% to 95%RH (non-condensing). Provide each controller with a suitable cover or enclosure to protect the intelligence board assembly.

2.9. ROUTERS

A. Provide a router for each subnetwork to connect the floor level network to the base building backbone level network. The router shall connect BACnet MS/TP subnetworks to BACnet over Ethernet.

B. The router shall be capable of handling all of the BACnet BIBBs that are listed for the controller that reside on the subnetwork.

2.10. CONTROL PANELS

A. Controllers in mechanical rooms shall be mounted in NEMA 1 enclosures.

B. Mount on walls at an approved location or provide a free standing rack.

C. Panels shall be constructed of 16 gauge, furniture-quality steel, or extruded-aluminum alloy, totally enclosed, with hinged doors and keyed lock and with ANSI 61 gray polyester-powder painted finish, UL listed. Provide common keying for all panels.

D. Provide power supplies for control voltage power.

E. Dedicate 1 power supply to the direct digital controller. Other devices shall be on a separate power supply, unless the power for the control device is derived from the controller terminations.

F. Power supplies for controllers shall be a transformer with a fuse or circuit breaker. Power supplies for other devices can be plain transformers.

G. All power supplies for 24V low voltage wiring shall be class 2 rated and less than 100VA. If low voltage devices require more amps, then provide multiple power supplies. If a single device requires more amps, then provide a dedicated power supply in a separate enclosure and run a separate, non-class 2 conduit to the device.

H. Surge transient protection shall be incorporated in design of system to protect electrical components in all direct digital controls and operator's workstations.

I. All devices in a panel shall be permanently mounted, including network switches, modems, media converters, etc.

J. Provide a pocket to hold documentation.

2.11. GENERAL SPECIFICATIONS FOR DEVICES

A. Provide mounting hardware for all devices, including actuator linkages, wells, installation kits for insertion devices, wall boxes and fudge plates, brackets, etc.

B. If a special tool is required to mount a device, provide that tool.

2.12. SENSORS

A. Terminal Unit Space Thermostats

1. Each controller performing space temperature control shall be provided with a matching room temperature sensor.
   a. Plain Space Temperature Sensors – Wired: Where called for in the sequences or on the drawings, provide sensors with plain covers.
   b. The sensing element for the space temperature sensor shall be thermistor type providing the following.

1)	Element Accuracy:	+ /- 1.0°F
2)	Operating Range:	5 to 95°F
3)	Set Point Adjustment Range:	55 to 95°F
4)	Calibration Adjustments:	None required
5)	Installation:	Up to 100 ft. from controller
6)	Auxiliary Communications Port:	As required
7)	Local LCD Temperature Display:	As required
8)	Setpoint Adjustment Dial	As required
9)	Occupancy Override Switch	As required

   c. Auxiliary Communication Port. Each room temperature sensor shall include a terminal jack integral to the sensor assembly. The terminal jack shall be used to connect a portable operator's terminal to control and monitor all hardware and software points associated with the controller.

d. RS-232 communications port shall allow the operator to query and modify operating parameters of the local room terminal unit from the portable operator's terminal.

2. Digital Display temperature sensor specifications – Wired:
   a. As called for in the sequences of operations or on the drawings, provide temperature sensors with digital displays.
   b. The sensing element for the space temperature sensor must be IC-based and provide the following.
      1) Digitally communicating with the Application Specific Controller.
      2) Mountable to and fully covering a 2 x 4 electrical junction box without the need for an adapter wall plate.
      3) IC Element Accuracy: +/- 0.9°F
      4) Operating Range: 55 to 95°F
      5) Setpoint Adjustment Range: User limiting, selectable range between 55 and 95°F
      6) Display of temperature setpoint with numerical temperature values
      7) Display of temperature setpoint graphically, with a visual Hotter/Colder setpoint indication
      8) Calibration: Single point, field adjustable at the space sensor to +/- 5°F
      9) Installation: Up to 100 ft. from controller
      10) Auxiliary Communications Port: Included
      11) Local OLED Temperature Display: Included
      12) Display of Temperature to one decimal place
      13) Temperature Setpoint Adjustment Included
      14) Occupancy Override Function Included
   c. Auxiliary Communication Port. Each room temperature sensor shall include a terminal jack integral to the sensor assembly. The terminal jack shall be used to connect a portable operator's terminal to control and monitor all hardware and software points associated with the controller. RS-232 communications port shall allow the operator to query and modify operating parameters of the local room terminal unit from the portable operator's terminal.

3. Provide the following options as they are called for in the sequences or on the drawings:
   a. Setpoint Adjustment. The setpoint adjustment function shall allow for modification of the temperature by the building operators. Setpoint adjustment may be locked out, overridden, or limited as to time or temperature through software by an authorized operator at any central workstation, Building Controller, room sensor two-line display, or via the portable operator's terminal.
   b. Override Switch. An override button shall initiate override of the night setback mode to normal (day) operation when activated by the occupant and enabled by building operators. The override shall be limited to two (2) hours (adjustable.) The override function may be locked out, overridden, or limited through software by an authorized operator at the operator interface, Building Controller, room sensor two-line display or via the portable operator's terminal.
   c. Space Combination Temperature and Humidity Sensors. Each controller performing space temperature control shall be provided with a matching room temperature sensor, which also includes the ability to measure humidity for either monitoring or control purposes. The combination temperature and humidity sensors shall have the same appearance as the space temperature sensors. Humidity elements shall measure relative humidity with a +/- 2% accuracy over the range of 10 to 90% relative humidity. Humidity element shall be an IC

(integrated circuit) sensing element. Humidity sensing elements shall be removable and field replaceable if needed.

B. Temperature Sensors

1. All temperature sensors shall meet the following specifications:
   a. Accuracy: Plus or minus 0.2 percent at calibration point.
   b. Wire: Twisted, shielded-pair cable.
   c. Vibration and corrosion resistant
2. Space temperature sensors shall meet the following specifications:
   a. 10k ohm type 2 thermisters
3. Insertion Elements in Ducts shall meet the following specifications:
   a. Single point 10k ohm thermister
   b. Use where not affected by temperature stratification
   c. The sensor shall reach more that 1/3 the distance from the duct wall
   d. Junction box for wire splices
4. Averaging Elements in Ducts shall meet the following specifications:
   a. 72 inches (183 cm) long
   b. Flexible
   c. Use where prone to temperature stratification, in front of coils, or where ducts are larger than 9 sq. ft.
   d. Junction box for wire splices
5. Outside-Air Sensors Platinum RTD with 4-20mA transmitter:
   a. Watertight enclosure, shielded from direct sunlight
   b. Circulation fan
   c. Watertight conduit fitting

C. Where called for in the sequences of operations, provide the following feature on space sensors and thermostats:

1. Security Sensors: Stainless-steel cover plate with insulated back and security screws
2. Space sensors with setpoint adjust: Plain white plastic cover with slide potentiometer to signal a setpoint adjustment to the direct digital controls
3. Space Sensors with LCD display:
   a. Operator buttons for adjusting setpoints, setting fans speeds and overriding unit to on/off
   b. Graphical LCD icons for signaling heating/cooling mode, fans speed, schedule mode, actual temperature and current setpoint

D. Humidity Sensors shall meet the following specifications:

1. Bulk polymer sensor element
2. Accuracy: 2 percent full range with linear output
3. Room Sensors: With locking cover matching room thermostats, span of 0 to 100 percent relative humidity
4. Duct and Outside-Air Sensors: With element guard and mounting plate, range of 0 to 100 percent relative humidity

E. Air Static Pressure Transmitter shall meet the following specifications:

1. Non-directional sensor with suitable range for expected input, and temperature compensated.
2. Accuracy: 2 percent of full scale with repeatability of 0.5 percent.
3. Output: 4 to 20 mA.

4. Building Static-Pressure Range: 0 to 0.25 inches wg.
5. Duct Static-Pressure Range: 0 to 5 inches wg.

F. Pressure Transmitters: Direct acting for gas, liquid, or steam service; range suitable for system; proportional output 4 to 20 mA.

G. Equipment operation sensors as follows:

1. Status Inputs for Fans: Differential-pressure switch with adjustable range of 0 to 5 inches wg.
2. Status Inputs for Pumps: Differential-pressure switch piped across pump with adjustable pressure-differential range of 8 to 60 psig.
3. Status Inputs for direct drive electric motors: Current-sensing relay with current transformers, adjustable and sized for 175 percent of rated motor current.
4. Status inputs for belt drive electric motors: Current sensing transmitter with linear 4-20mA output

H. Electronic Valve/Damper Position indication: Visual scale indicating percent of travel and 0 to 10 V dc, feedback signal.

I. Air Differential Pressure Switches: Diaphragm type air differential pressure switches with die cast aluminum housing, adjustable setpoint, minimum 5 amp switch rating at 120VAC, SPDT switches, and the switch pressure range shall be suited for the application. These switches shall be utilized for filter status.

J. Leak detectors: Provide spot leak detectors that can be secured to the floor or secured to a drain pan. The detection shall used a microchip controlled energized probes. The detector shall operate on 24Vor less. Provide a way to adjust the height of the leak probes. The SPDT contacts shall be inside a watertight enclosure.

2.13. ELECTRO-MECHANICAL THERMOSTATS

A. Fire-Protection Thermostats: UL listed with fixed or adjustable settings to operate at not less than 75 deg F above normal maximum operating temperature, with the following:

1. Reset: Automatic with control circuit arranged to require manual reset at central control panel, with pilot light and reset switch on panel labeled to indicate operation.

B. Electric Low-Limit Duct Thermostat: Snap-acting, single-pole, single-throw, manual- or automatic-reset switch that trips if temperature sensed across any 12 inches of bulb length is equal to or below set point. Setpoint shall be adjustable.

1. Bulb Length: Minimum 20 feet.
2. Quantity: One thermostat for every 20 sq. ft. of coil surface.

C. Electric space thermostats: Provide a charged element type stat with snap acting SPDT switch. The switch shall be rated for 16A or 1HP at 120V.

D. Aquastat: Provide a charged element type stat with snap acting SPDT switch. The switch shall be rated for 16A or 1HP at 120V.

2.14. SMOKE DETECTORS

A. Smoke detectors to be provided by the contractor.

B. The provided smoke detector for each unit above 2000 cfm.

2.15. ELECTRONIC ACTUATOR SPECIFICATION

A. ELECTRONIC VALVE ACTUATORS

1. Actuator shall be fully modulating, floating (tri-state), two position, and/or spring return as indicated in the control sequences. Specified fail safe actuators shall require mechanical spring return.
2. Modulating valves shall be positive positioning, responding to a 2-10VDC or 4-20mA signal. There shall be a visual valve position indicator.
3. The actuator shall have the capability of adding auxiliary switches or feedback potentiometer if specified.
4. Actuator shall provide minimum torque required for proper valve close-off. The actuator shall be designed with a current limiting motor protection. A release button (clutch) or handle on the actuator shall be provided to allow for manual override (except when actuator is spring return type).
5. Actuators shall be UL listed. Each damper connected to a fan shall be provided with end switch.

B. ELECTRONIC DAMPER ACTUATORS

1. Actuator shall be direct coupled (over the shaft), enabling it to be mounted directly to the damper shaft without the need for connecting linkage. The actuator-to-shaft clamp shall use a "V" bolt and "V" shaped, toothed cradle to attach to the damper shaft for maximum holding strength. Single bolt or set screw type fasteners are not acceptable.
2. Actuator shall have electronic overload or digital rotation sensing circuitry to prevent damage to the actuator throughout the rotation of the actuator. End switches to deactivate the actuator at the end of rotation or magnetic clutch are not acceptable.
3. For power-failure/safety applications, a mechanical, spring return mechanism shall be used.
4. Actuators with spring return mechanisms shall be capable of either clockwise or counterclockwise spring return operation by simply changing the mounting orientation.
5. Proportional actuators shall accept a 2-10VDC, 4-20mA signal, or be of the 2 point floating type and provide a 2-10VDC actuator position feedback signal.
6. All actuators shall have an external manual gear release (clutch) or manual crank to aid in installation and for allowing manual positioning when the actuator is not powered.
7. All actuators shall have an external direction of rotation switch to aid in installation and to allow proper control response.
8. Actuators shall be provided with a factory-mounted 3-foot electrical cable and conduit fitting to provide easy hook-up to an electrical junction box.
9. Actuators shall be listed under Underwriters Laboratories Standard 873. They must be manufactured under ISO 9001.
10. End switch shall be included on all damper actuators.

PART 3 - EXECUTION

3.1. EXECUTION REQUIREMENTS

A. Refer to DDC General Conditions for execution requirements.

3.2. EXAMINATION

A. The project plans shall be thoroughly examined for control device and equipment locations. Any discrepancies, conflicts, or omissions shall be reported to the Commissioner for resolution before rough-in work is started.

B. Inspect the site to verify that equipment is installed as shown. Any discrepancies, conflicts, or omissions shall be reported to the Commissioner for resolution before rough-in work is started.

C. Examine the drawings and specifications for other parts of the work. If head room or space conditions appear inadequate—or if any discrepancies occur between the plans and the contractor's work and the plans and the work of other trades—the contractor shall report these discrepancies to the commissioner and shall obtain written instructions for any changes necessary to accommodate the contractor's work with the other trades.

3.3. INSTALLATION

A. Provide all relays, switches, sources of emergency and UPS battery back-up electricity and all other auxiliaries, accessories and connections necessary to make a complete operable system in accordance with the sequences specified. All field wiring shall be by the contractor.

B. Install controls so that adjustments and calibrations can be readily made. Controls are to be installed by the control equipment manufacturer.

C. Mount surface-mounted control devices on brackets to clear the final finished surface on insulation.

D. Install equipment level and plumb.

E. Install control valves horizontally with the power unit up.

F. Unless otherwise noted, install wall mounted thermostats and humidistat 60" above the floor measured to the center line of the instrument, or as otherwise directed by the Commissioner.

G. Install averaging elements in ducts and plenums in horizontal crossing or zigzag pattern.

H. Install outdoor sensors in perforated tube and sunshield.

I. Install damper motors on outside of duct in protected areas, not in locations exposed to outdoor temperatures.

J. Install labels and nameplates on each control panel listing the name of the panel referenced in the graphics and a list of equipment numbers served by that panel.

K. Furnish hydronic instrument wells, valves, and other accessories to the mechanical contractor for installation.

3.4. ELECTRICAL WIRING SCOPE

A. Interlock wiring shall be run in separate conduits from BAS associated wiring.

B. Provide network wiring for equipment that is called to be integrated to the BAS.

3.5. ELECTRICAL WIRING AND CONNECTION INSTALLATION

A. All low voltage control wiring shall be class 2. Control wiring that is not class 2 shall be run in separate conduits from class 2 wiring.

B. Floor level network wiring between terminal units can be combined with thermostat and other low voltage wiring in the same conduit. All other network wiring shall be in dedicated conduits.

C. Install raceways, boxes, and cabinets according to Section 260533 "Raceways and Boxes."

D. Install building wire and cable according to Section 260519 "Conductors and Cables."

E. Installation shall meet the following requirements:

1. Conceal cable and conduit, except in mechanical rooms and areas where other conduit and piping are exposed.
2. Install exposed cable in raceway or conduit.
3. Install concealed cable using plenum rated cable.
4. Bundle and harness multiconductor instrument cable in place of single cables where several cables follow a common path.
5. Fasten flexible conductors, bridging cabinets and doors, along hinge side; protect against abrasion. Tie and support conductors.
6. Number-code or color-code conductors for future identification and service of control system, except local individual room control cables.
7. All wiring in lab areas shall be in conduit.
8. All unsupported risers shall be rigid steel conduit. Supported risers shall be EMT.

F. Rigid conduit shall be steel, hot dip galvanized, threaded with couplings, ¾ inch minimum size, manufactured in accordance with ANSI C-80-1. Electrical metallic tubing (EMT) with compression fittings or intermediate metallic conduit (IMC) may be used as conduit or raceway where permitted by the NEC.

G. Concealed control conduit and wiring shall be provided in all spaces except in the Mechanical Equipment Rooms and in unfinished spaces. Install in parallel banks with all changes in directions made at 90 degree angles.

H. Install conduit adjacent to machine to allow service and maintenance.

I. Connect manual-reset limit controls independent of manual-control switch positions. Automatic duct heater resets may be connected in interlock circuit of power controllers.

J. Connect hand-off-auto selector switches to override automatic interlock controls when switch is in hand position.

K. Ground equipment.

3.6. COMMUNICATION WIRING

A. All cabling shall be installed in a neat and workmanlike manner. Follow manufacturer's installation recommendations for all communication cabling.

B. Do not install communication wiring in raceway and enclosures containing Class 1 wiring.

C. Maximum pulling, tension, and bend radius for cable installation, as specified by the cable manufacturer, shall not be exceeded during installation.

D. Contractor shall verify the integrity of the entire network following the cable installation. Use appropriate test measures for each particular cable.

E. Cable bundling:

1. RS485 cabling run open air in accessible areas can be bundled with other class 2 low voltage cabling.
2. RS485 cabling run between terminal units in conduits above ceilings or under floors or in inaccessible areas can be bundled with other class 2 low voltage cabling.
3. RS485 cabling run between floors shall be in a communication only conduit.
4. RS485 conduit run long distances between utility rooms or between buildings shall be in a communication only conduit.

5. Ethernet cabling shall be in a communication only conduit.
6. Ethernet and RS485 can be run together.
7. Fiber optics can be run with Ethernet and RS485 cabling as long as the conduit is bent to fiber optic standards and junction boxes are sized for fiber optic use.

F. RS485 Cabling

1. RS485 cabling shall be used for BACnet MS/TP networks.
2. RS485 shall use low capacitance, 20-24 gauge, twisted shielded pair.
3. The shields shall be tied together at each device.
4. The shield shall be grounded at one end only and capped at the other end.
5. Provide end of line (EOL) termination devices at each end of the RS485 network or subnetwork run, to match the impedance of the cable, 100 to 120ohm.

G. Ethernet Cabling

1. Ethernet shall not be run with any Class 1 or low voltage Class 2 wiring.
2. CAT6, unshielded twisted pair (UTP) cable shall be used for BAS Ethernet.
3. Solid wire shall be used for long runs, between mechanical rooms and between floors. Stranded cable can be used for patch cables and between panels in the same mechanical room up to 50 feet away.
4. When the BAS Ethernet connects to the City of New York's network switch, document the port number on the BAS As-builts.

H. When a cable enters or exits a building, a lightning arrestor must be installed between the lines and ground. The lighting arrestor shall be installed according to the manufacturer's instructions.

I. All runs of communication wiring shall be unspliced length when that length is commercially available.

J. All communication wiring shall be labeled to indicate origination and destination data.

K. Grounding of coaxial cable shall be in accordance with NEC regulations article on "Communications Circuits, Cable, and Protector Grounding."

3.7. IDENTIFICATION

A. Permanent warning labels shall be affixed to all equipment that can be automatically started by the direct digital control system.

1. Labels shall use white lettering (12-point type or larger) on a red background.
2. Warning labels shall read as follows: C A U T I O N This equipment is operating under automatic control and may start or stop at any time without warning. Switch disconnects to "Off" position before servicing.

B. Permanent warning labels shall be affixed to all motor starters and all control panels that are connected to multiple power sources utilizing separate disconnects.

1. Labels shall use white lettering (12-point type or larger) on a red background.
2. Warning labels shall read as follows: C A U T I O N This equipment is fed from more than one power source with separate disconnects. Disconnect all power sources before servicing.

3.8. FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect field-assembled components and equipment installation, including piping and electrical connections. Report results in writing.

1. Operational Test: After electrical circuitry has been energized, start units to confirm proper unit operation. Remove malfunctioning units, replace with new units, and retest.
2. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment, and retest.
3. Calibration test controllers by disconnecting input sensors and stimulating operation with compatible signal generator.
4. Contractor QC should include a point to point check along with the sensor calibration in the field quality control section.

B. Replace damaged or malfunctioning controls and equipment.

1. Start, test, and adjust control systems.
2. Demonstrate compliance with requirements, including calibration and testing, and control sequences.
3. Adjust, calibrate, and fine tune circuits and equipment to achieve sequence of operation specified.

3.9. SYSTEM CHECKOUT AND STARTUP

A. Inspect each termination in the MER control panels and devices to make sure all wires are connected according to the wiring diagrams and all termination are tight.

B. After the controls devices and panels are installed and power is available to the controls, perform a static checkout of all the points, including the following:

1. Inspect the setup and reading on each temperature sensor against a thermometer to verify its accuracy.
2. Inspect the setup and reading on each humidity sensor against a hygrometer to verify its accuracy.
3. Inspect the reading on each CO2 sensor using a calibration kit to verify the sensor range accuracy matches the direct digital control setup.
4. Inspect the reading of each status switch to verify the direct digital control reads the open and close correctly.
5. Command each relay to open and close to verify its operation.
6. Command each 2-position damper actuator to open and close to verify operation.
7. Command each 2-position valve to open and close to verify operation.
8. Ramp each modulating actuator to 0%, 25%, 50%, 75% and 100% to verify its operation.
9. Ramp each modulating output signal, such as a VFD speed, to verify its operation.
10. Test each safety device with a real life simulation, for instance check freezestats with ice water, water detectors with water, etc.

C. Document that each point was verified and operating correctly. Correct each failed point before proceeding to the dynamic startup. Submit results in writing before proceeding to dynamic startup.

D. Verify that each direct digital controller communicates on its respective network correctly.

E. After all of the points are verified, and power is available to the mechanical system, coordinate a startup of each system with the mechanical contractor. Include the following tests:

1. Start systems from direct digital control.
2. Verify that each setpoint can be met by the system.
3. Change setpoints and verify system response.
4. Change sensor readings to verify system response.
5. Test safety shutdowns.
6. Verify time delays.
7. Verify mode changes.

8. Adjust filter switches and current switches for proper reactions.
9. Adjust proportional bands and integration times to stabilize control loops.

F. Perform all program changes and debugging of the system for a fully operational system.

G. Verify that all graphics at the operator workstations correspond to the systems as installed. Verify that the points on the screens appear and react properly. Verify that all adjustable setpoints and manual commands operate from the operator workstations.

H. After the sequence of operation is verified, setup the trends that are listed in the sequence of operations for logging and archiving for the commissioning procedure.

3.10. SYSTEM COMMISSIONING, INSTRUCTION AND TURNOVER

A. Prepare and submit for approval a complete acceptance test procedure including submittal data relevant to point index, functions, sequence, inter-locks, and associated parameters, and other pertinent information for the operating system. Prior to acceptance of the BAS by the City of New York and Commissioner, the BAS subcontractor shall completely test the BAS using the approved test procedure. The BAS contractor shall provide commissioning agent with a calibration report which includes all sensors and control points organized by location, system, and sub system. The BAS contractor shall work with the commissioning agent on a detailed point to point check report which includes all sensors and control points organized by location, system, and sub system.

B. After the BAS is 100% complete, the Commissioner shall be requested, in writing, to approve the satisfactory operation of the system, sub-systems and accessories. Submit Maintenance and Operating manuals at this time for approval. An acceptance test in the presence of the Commissioner. The City of New York will then shake down the system for a fixed period of time (30 days).

C. Fix punch list items from the Construction Manager, Commissioning Agent and the Commissioner in order to achieve substantial completion of the BMS.

D. When the system performance is deemed satisfactory in whole or in part by these observers, the system parts will be accepted for beneficial use. Beneficial use does not constitute substantial completion and shall not initiate warranty.

3.11. PROJECT RECORD DOCUMENTS

A. Refer to DDC General Conditions for contract record documents.

1. Testing and Commissioning Reports and Checklists. Completed versions of reports, checklists, and trend logs used to meet requirements in the Control System Demonstration and Acceptance section of this specification.
2. Operation and Maintenance (O & M) Manual.
   a. As-built versions of the submittal product data.
   b. Names, addresses, and 24-hour telephone numbers of installing contractors and service representatives for equipment and control systems; all administrative passwords to work stations and controllers.
   c. Operator's Manual with procedures for operating control systems, logging on and off, handling alarms, producing point reports, trending data, overriding computer control, and changing setpoints and variables.
   d. Programming manual or set of manuals with description of programming language and of statements for algorithms and calculations used, of point database creation and modification, of program creation and modification, and of editor use.

e. Engineering, installation, and maintenance manual or set of manuals that explains how to design and install new points, panels, and other hardware; how to perform preventive maintenance and calibration; how to debug hardware problems; and how to repair or replace hardware.
f. Documentation of all programs created using custom programming language, including setpoints, tuning parameters, and object database.
g. Graphic files, programs, and database on electronic media.
h. List of recommended spare parts with part numbers and suppliers.
i. Complete original-issue documentation, installation, and maintenance information for furnished third-party hardware, including computer equipment and sensors.
j. Complete original original-issue copies of furnished software, including operating systems, custom programming language, operator workstation software, and graphics software.
k. Licenses, guarantees, and warranty documents for equipment and systems.
l. Configuration Management Matrix (as specified in the above comments).
m. All administrative passwords to workstation and controllers.

B. Operating manual to serve as instruction and reference manual for all aspects of day-to-day operation of the system. As a minimum include the following:

1. Sequence of operation for automatic and manual operating modes for all building systems. The sequences shall cross-reference the system point names.
2. Description of manual override operation of all control points in system.
3. BMS system manufacturers complete operating manuals.

C. Provide maintenance manual to serve as instruction and reference manual for all aspects of day-to-day maintenance and major system repairs. As a minimum include the following:

1. Complete as-built installation drawings for each building system.
2. Overall system electrical power supply schematic indicating source of electrical power for each system component. Indicate all battery backup provisions.
3. Photographs and/or drawings showing installation details and locations of equipment.
4. Routine preventive maintenance procedures, corrective diagnostics troubleshooting procedures, and calibration procedures.
5. Comprehensive parts list with manufacturer's catalog numbers and ordering information.
6. Lists of ordinary and special tools, operating materials supplies and test equipment recommended for operation and servicing.
7. Manufacturer's operation, set-up, maintenance and catalog literature for each piece of equipment.
8. Maintenance and repair instructions.
9. Recommended spare parts.

D. Provide Programming Manual to serve as instruction and reference manual for all aspects of system programming. As a minimum include the following:

1. Complete programming manuals, and reference guides.
2. Details of any custom software packages and compilers supplied with system.
3. Information and access required for independent programming of system.

3.12. INSTRUCTION

A. During System commissioning and at such time as acceptable performance of the Building Automation System hardware and software has been established, provide on-site operator instruction to the City of New York's operating personnel. Operator instruction during normal working hours shall be performed

by a competent building automation contractor representative familiar with the Building Automation System's software, hardware and accessories.

B. At a time mutually agreed upon, during System commissioning as stated above, give 16-hours of onsite instruction on the operation of all BAS equipment. Describe its intended use with respect to the programmed functions specified. Operator orientation of the automation system shall include, but not be limited to:

1. Explanation of drawings and operator's maintenance manuals.
2. Walk-through of the job to locate all control components.
3. Operator workstation and peripherals.
4. Direct digital controller and ASC operation/sequence.
5. Operator control functions including scheduling, alarming, and trending.
6. Explanation of adjustment, calibration and replacement procedures.

C. Additional 8-hours of instruction shall be given after the 30 day shakedown period.

D. Since the City of New York may require personnel to have more comprehensive understanding of the hardware and software, additional instruction must be available from the Contractor.

END OF SECTION 230900

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SECTION 230993
Sequence of Operations

PART 1 - GENERAL

1.1. RELATED DOCUMENTS

A. The following documents apply to all required work for the Project: (1) the Contract Drawings, (2) the Specifications, (3) the General Conditions, (4) the Addendum and (5) the Contract (City of New York Standard Construction Contract).

1.2. SUMMARY

A. This Section includes control sequences for HVAC systems, subsystems and equipment.

1.3. DEFINITIONS

A. AHU: Air Handling Unit.

B. AI: Analog Input.

C. AO: Analog output.

D. ATC: Automatic Temperature Control.

E. BMS: Building Management System.

F. CFM: Cubic Feet per Minute.

G. DDC: Direct-digital controls.

H. DI: Digital Input.

I. DO: Digital Output.

J. FAS: Fire Alarm System.

K. HVAC: Heating, Ventilating and Air Conditioning.

L. H & V Heating and Ventilating Unit

M. LAN: Local area network.

N. LCD: Liquid Crystal Display

O. MER: Mechanical Equipment Room.

P. PID: Proportional Integral Derivative.

Q. POT: Portable Operators Terminal.

R. RTU: Rooftop Unit.

S. VFD: Variable Frequency Drive.

T. VRF: Variable Refrigerant Flow

U. ERV: Energy Recovery Ventilation

1.4. GENERAL

A. All safety devices shall be hardwired to the starter and shall have a second contact for monitoring via the BMS.

B. A failure alarm, as included in the point list, shall indicate the type of equipment that has failed (pump, fan, valve, etc.) including the specific designation of the piece of equipment (e.g., supply fan SF-1). It is not acceptable to generate a general failure alarm.

C. Alarming devices such as freezestats, pressure safeties, etc. shall be wired so the contacts open in the alarm condition. All alarm points shall be annunciated at the BMS audibly and visually. All alarm points associated with varying values shall be provided with adjustable limits.

D. Freezestats shall be automatic reset type and shall be installed with time delay and latching relays. A freezestat must sense a temperature below 40°F (adj.) for a period of 180 seconds (adj.) prior to initiating a response to a freeze condition. Once the freezestat condition response has been activated, manual reset at the BMS panel shall be required to allow the system to return to normal.

E. Air pressure switches shall be manual reset type and a manual reset at the switch shall be required to allow the system to restart.

F. All setpoints including setpoints internal to control algorithms shall be adjustable from all BMS operator interfaces. All commands shall be overrideable from all BMS operator interfaces. All control points shall be adjustable or overrideable from the same graphic page that displays the points.

G. All points for a specific mechanical system shall be connected to and controlled by the same direct-digital controller unless otherwise specified. For example, it is not acceptable to control a supply fan with one (1) direct-digital controller located at a motor control center and to control the rest of the air-handling unit points with a direct-digital controller located at the air-handling unit.

H. All points required by the sequence of operation including, but not limited to, the points listed in the sequences of operation below, as well as all of the points' associated values, shall be connected to the BMS and available to the BMS operators on all operator workstations and all operator interface devices as part of a graphical display that depicts the mechanical system controlled.

I. The installed BMS shall have dedicated, LAN based communication buses independent of the building IT network for both primary and secondary buses. The BMS shall utilize the building LAN as the primary network. Ethernet drops shall be provided by others as required. Coordinate exact locations of all Ethernet drops. Provide all other wiring, devices, etc required to connect to the LAN. The BMS shall have dedicated communication buses independent of the building network for all secondary buses.

J. All valves, dampers, controllers, control devices, etc. exposed to outside air conditions shall be specifically designed for outside air conditions including, but not limited to, NEMA 4X enclosures, weatherproof enclosures and all other weather precautions recommended by the manufacturer.

K. Furnish, install and wire a UPS for every primary control panel, every switch, and every operator workstation.

L. The BMS shall monitor a contact from the FAS for each smoke zone indicating that a fire condition exists in the zone. One (1) contact shall be monitored for the entire building, each floor, each portion of a floor, etc. that constitutes a smoke zone.

M. No part of the programming specified herein shall be programmed into operator priority.

N. All alarms associated with equipment that is disabled shall be inhibited.

O. All initial field settings applied shall be saved as the default values. These values shall be downloaded to the controller such that they are the default value if the controller loses power. A printed copy shall also be provided to the City of New York as part of the O & M manuals.

P. When the motor controller is equipped with an HOA, the motors shall only be controlled by the BMS when the HOA switch is in the auto position.

Q. Freezestats, pressure safeties, interlocked dampers, etc. shall be wired to shutdown motors when the HOA switch is in both the hand and auto positions. It shall not be possible to override these or any other safety devices or any fire alarm system control functions, except in the case of an engineered smoke control system in which case freeze protection safeties shall be overridden.

R. Where fans and dampers are to be hardwire interlocked, provide hardwire interlocks between the motor terminal strip and dampers such that the damper shall be driven open then the motor is required to start. Motor start-up shall not occur until the damper end switch indicates the damper is in the full open position. Where fans and dampers are hardwire interlocked, the interlocks shall apply in both the "hand" and "auto" positions of the HOA switch at the motor controller.

S. The point lists are provided for convenience and are not intended to be all-inclusive. All points required to provide the Sequence of Operation shall be included as if listed.

T. Refer to the Control Diagrams included in the mechanical drawings for additional information to facilitate the interpretation of the sequences of operation as defined herein. The Control Diagrams are for reference only. All points included herein or required by the sequence of operation are required regardless of whether they are shown in the Control Diagrams.

1.5. QUALITY ASSURANCE

A. Refer to DDC General Conditions Section 01 40 00 "Quality Requirements".

1.6. SUBMITTAL PROCEDURES

A. Refer to DDC General Conditions Section 01 33 00 "Submittal Procedures".

1.7. SAFETIES

A. Dampers (FSDs interlocked with fan operation, hardwired at unit)

1. All fire/smoke and smoke dampers shall be hardwire interlocked to open/close with fan operation. Supply dampers shall be hardwire interlocked with the supply fan and return dampers shall be interlocked with the return fan.

2. Fire/smoke and smoke dampers directly upstream or downstream of a fan shall be hardwire interlocked to the associated fan starter/VFD such that the fan cannot start until the dampers prove open.
3. Upon the presence of smoke the FAS system will stop the unit via hard wired interlock and send an indication to the BMS. All associated fire/smoke, smoke and isolation dampers shall close.
4. Static Pressure
   a. A high discharge pressure switch for the supply fan shall stop the supply and return fans when duct pressure exceeds design. The fans shall remain off until the pressure switch is manually reset.
   b. A low suction pressure switch for the return fan shall stop the supply and return fans when duct pressure exceeds design. The fans shall remain off until the pressure switch is manually reset.
5. Leak Detector
   a. A leak detector located below each coil shall stop its associated unit from operation and transmit an alarm signal to the BMS console whenever a leak is detected.
6. Supply and Return Fans
   a. There shall always be an equal number of supply and return fans running. If a supply fan is shutdown due to a safety, a return fan shall also be shutdown. Likewise, if a return fan is shutdown due to a safety, a supply fan shall also be shutdown.

1.8. HEATING, VENTILATING AND ROOFTOP UNITS WITH ENERGY RECOVERY EQUIPMENT

A. See BMS drawings

1.9. VRF AND INDDOR RELATED EQUIPMENT

A. See drawings

1.10. EXHAUST FANS – CONTINUOUS OPERATION

A. General: These fans serve different areas: electrical room, restrooms, Elevator EMR

B. Fan Operation

1. The fan shall be energized based upon a manual command and run continuously. The fan shall be started by the BMS system.
2. Upon a command to start, all associated exhaust air damper(s) / isolation damper(s), shall open by the BMS.
3. When all associated dampers located directly upstream or downstream of the exhaust fan are open as proven by end switches, the exhaust air fan shall start.
4. When the fan is off, all associated outside air damper(s) / isolation damper(s), shall close.

C. Emergency Shutdown (where applicable based on fan CFM)

1. The Fire Alarm System will shut down the fan via hard wired interlock and signal the BMS when a fire alarm is present. When the floor or area served is in alarm all associated fire smoke and isolation dampers shall close.

1.11. BOILER OPERATIONS

A. See BMS drawings

1.12. ELECTRIC UNIT HEATERS (ECHU'S, EUH, EH's)

A. The unit will control to maintain the zone temperature set point of 65°F (Adj.) as sensed by the zone temperature sensor.

B. The fan will run anytime the zone temperature drops below heating setpoint unless shutdown on safeties.

C. Monitoring points:

1. Discharge air temperature
2. Fan status.

D. Alarms

1. High Discharge Air Temp: if the discharge air temperature is greater than 120°F (Adj.).
2. Low Discharge Air Temp: If the discharge air temperature is less than 40°F (Adj.).
3. Low Zone Temp: If the zone temperature is less than the heating setpoint by a user definable amount (Adj.). 2. Fan failure alarm – fan commanded on, but the status is off.
4. Fan hand alarm-fan commanded off, but the status is on.

1.13. SMOKE PURGE

A. Smoke Purge Operation

1. The fans inside the H & V's/RTU's shall be enabled by a manual command from the Fire Command Station. The fire/smoke dampers required to purge the desired area/ floor(s) shall be positioned via the Fire Command Station. The Fire Command Station shall control smoke purge set-up and control of equipment and dampers to the appropriate state.

1.14. ELECTRICAL EQUIPMENT MONITORING

A. Emergency Generators, Switchgear, Paralleling Gear, Uninterruptible Power Supplies, Power Distribution Units, Automatic Transfer Switch

1. Provide and wire serial communication interface with each generator, UPS and PDU. Include twenty-five (25) monitoring and control points per generator, UPS and PDU. Include one-hundred (100) points for the switchgear and paralleling gear. Include ten (10) monitoring and control points per ATS.

1.15. ELECTRICAL EQUIPMENT

A. Generators

1. The BMS shall interface to the generators. All information, points, alarms, etc. available via the interface shall be displayed on the BMS operator workstation. Coordinate with the equipment manufacturer to ensure that all available points are picked up by the BMS.

B. UPS

1. The BMS shall interface to the UPS. All information, points, alarms, etc. available via the interface shall be displayed on the BMS operator workstation. Coordinate with the equipment manufacturer to ensure that all available points are picked up by the BMS.

C. ATS

1. The BMS shall interface to the ATS . All information, points, alarms, etc. available via the interface shall be displayed on the BMS operator workstation. Coordinate with the equipment manufacturer to ensure that all available points are picked up by the BMS.

D. Switchgear

1. The BMS shall interface to the switchgear. All information, points, alarms, etc. available via the interface shall be displayed on the BMS operator workstation. Coordinate with the equipment manufacturer to ensure that all available points are picked up by the BMS.

1.16. HEAT TRACING (If applicable)

A. The BMS shall monitor the following:

1. DI – Common alarm (for each heat trace control panel, if available from heat trace manufacturer provided controls).
2. DI – Heat tracing on/off status (as sensed by a current sensing relay; install one (1) per heat tracing circuit and each current sensing relay shall be an individual input to the BMS).

1.17. VARIABLE FREQUENCY DRIVES

A. Provide all required interconnecting control wiring to interface the variable frequency drives and the associated equipment to the BMS.

B. Provide all required wiring from the motor winding heaters to each drive.

C. Provide the following points hardwired to the BMS for each VFD controlled motor:

1. AO – VFD speed control (0-100%).
2. DI – VFD bypass status.
3. DI – VFD status (via current sensing relay, monitoring VFD status is not acceptable).
4. DO – VFD command (start/stop).

D. In addition to the hardwired points indicated above, provide a communication interface to each VFD.

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1.18. EQUIPMENT RESTART PROGRAM

A. Subsequent to any building wide equipment shutdown, due to power failure, smoke control, occupancy scheduling, priority lead shedding, etc., the mechanical equipment restarts shall be staggered and phased to minimize peak electrical loads. Time delays will be adjustable and be provided for each controlled motor. The final sequence will submitted for approval.

B. All motors shall be remotely reset and restarted from the BMS after a safety shutdown.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)

END OF SECTION 230993

SECTION 231217

Vehicle Exhaust System

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The following documents apply to all required work for the Project: (1) the Contract Drawings, (2) the Specifications, (3) the General Conditions, (4) the Addendum and (5) the Contract (City of New York Standard Construction Contract).

B. Related Sections:

1. Section "Vibration Control."
2. Section "Adjustable Frequency Drives."

1.2 REFERENCES

A. AMCA – B – Construction of Spark Resistant Fans.

B. ASHRAE - Handbook, Equipment Volume, Chapter "Chimney, Gas Vent, and Fireplace Systems."

C. NFPA 211 - Standard for Chimneys, Fireplaces, Vents, and Solid Fuel-Burning Appliances.

D. SMACNA - HVAC Duct Construction Standards - Metal and Flexible.

1.3 SUBMITTALS

A. Refer to DDC General Conditions Section 01 33 00 "Submittal Procedures."

B. Product Data and Information: Submit catalog product data indicating dimensions, general assembly, specialties and accessories, weights, rated capacities, performance ratings, materials and finishes, controls, electrical requirements, and wiring diagrams.

C. Shop Drawings: Submit shop drawings indicating components, assembly, equipment locations, dimensions, weights and loadings, required clearances, and location and size of field connections. Include layout drawings showing field location of all hose reel, duct diameters and hanger details.

D. Operations and Maintenance Manuals: Submit Operations and Maintenance Manuals as specified in the DDC General Conditions including manufacturer's descriptive literature including installation and operation instructions, controls, accessories, maintenance and repair data, and parts lists.

1.4 QUALITY ASSURANCE

A. Refer to DDC General Conditions Section 01 33 00 "Submittal Procedures."

B. Provide equipment from a company specializing in the design and manufacture of vehicle exhaust systems which has a minimum of 3 years experience, and issues complete catalog data on these products

1.5 DELIVERY, STORAGE, AND HANDLING

A. Shipping and Handling: Comply with the manufacturer's instructions for rigging, unloading and transportation of units.

B. Storage and Protection: Store equipment in its original shipping crates or containers, with labeling in place until time of installation. Store equipment in clean, dry place and protect equipment from physical damage.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Nedelman.
2. Movex.
3. Ari-hetra.
4. Or approved equal.

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Selkirk Metalbestos.
2. Van Packer.
3. DuraVent.
4. Or approved equal.

2.2 MATERIALS

A. Overview: Provide hose reels complete with hose, nozzle and accessories. Hose reels to be ducted to single central blower. (4) reels to one blower, (3) reels to one blower.

B. Recoil Hose Reel: The reel shall be comprised of 12ga. support steel coated with a 15 micron thickness aluminum alloy finish for corrosion resistance; drum shall be 16ga material similar to support steel. The drum ends shall be formed from a 1/8" steel material. The rewind motor mechanism shall be capable of lifting 95 lbs. The motorized mechanism shall be located outside and offset from drum mechanism. The motorized mechanism shall be a direct drive to the drum 115/1/60 1/3HP. Reel will be equipped with hose guide to ensure hose freely moves and coils on reel uniformly, reel must be capable of handling 6" x 50' of hose. Pendant shall have up / down and fan stop start control

C. Locking Suction Nozzle: The suction nozzle shall be a circular EPDM (Ethylene propylene Diene Monomer) rubber type that will accept up 7" dia. Tailpipe and connection to flex hose is 6" dia. The EPDM rubber end shall be a minimum 8 ½" long and ½" thick. The overall length of nozzle shall be 12" long. The connection to hose is via galvanized rotating connection 16ga. with 360 degree ball bearing rotation to eliminate hose kinking and ease of connection for operator. The nozzle to have a debris screen with 1 ¼" square screen (screen shall not hinder airflow). The attachment mechanism shall be a spring loaded flap valve. Handle to be 4" long with 2 ½" heat isolation handle. (1) Nozzle required per hose reel.

D. Exhaust Hose: Each hose reel shall be supplied with high temperature hose capable of withstanding 1200 degrees. Each hose shall be 6" dia. x 50' long (continuous). The hose construction shall be two ply consisting of an inner ply of Silicon coated glass material and an outer layer Silicon coated nomex with wear strip. The unit shall have a spring steel helix for structure integrity that shall embedded between the ply of materials. The two ply construction shall be Hi-Temp bonded and reinforced for superior flex fatigue. The hose shall be attached to nozzle and hose reel via stainless adjustable clamps with rubber band cover

E. Exhaust blower: The exhaust blower shall be capable of delivering 800 cfm per hose reel. The blower will be powered by a 460 3ph. TEFC motor Blower wheel to be radial type direct drive operating at 3500 rpm. The wheel to be dynamically balanced. Housing is constructed of 10 gauge steel with gray enamel paint inside and outside. The wheel shall be aluminum non-sparking type. The blower to be supplied with slip inlet collar, vibration isolators, duct silencer on discharge, starter with wall mount stop/start and service disconnect switch. The contactor will be responsible for all electrical wiring from the disconnect to the blower motor of unit. Stop/start will be located in shop at the City of New York's discretion.

F. Ductwork and hanging material: The contractor shall supply all ductwork and hanging material necessary to install above equipment and duct reels to central blower and outside building with stack. Duct work to be Stainless Steel with minimum of 22-gauge thickness. Minimum connection to hose reel is 6" dia. Main trunk line shall increase by minimum of 1" dia, increments after branch is made to hose reel. All branches shall be 45 degree (no bull head or 90 degree taps shall be accepted) All elbows shall be smooth bore type and connections of duct shall be done with rivets or self tapping screws with a high temp flexible caulk bead to insure no air leaks. All hanging material shall be galvanized Unistrut type channel minimum of 12ga. with locking clamps and fittings 12 ga.

G. Control Box: NEMA 4 control box for wall mounting. The unit has a Motor starter, motor protector and dry contacts for BMS system. All components are UL approved. Box shall be 14 ga. metal with epoxy coated paint. Furnish and install all necessary components for a complete, operating, and acceptable system with responsibility as follows:

1. Startup of the system
2. All corrections / modification of deficiencies discovered during the installed
3. Testing as required for a fully operational system
4. Instruction and O & M manuals

PART 3 - EXECUTION

3.1 EXECUTION REQUIREMENTS

A. Refer to DDC General Conditions for executions requirements.

3.2. EXAMINATION

A. Examine vehicle exhaust system at the time of delivery for damaged or missing components. Do not proceed with installation of units until all items found defective have been corrected.

3.3 INSTALLATION

A. Install all units in accordance with manufacturer's instructions. Make all necessary adjustments to equipment to provide complete and satisfactory operation upon completion of installation.

B. Connect to electrical service.

C. Install fan on vibration isolation. Refer to Section 23 05 48 "Vibration and Seismic Controls."

D. Install ductwork/fume vents in accordance with manufacturer's installation instructions and UL listing. Maintain minimum clearances from combustibles as specified in UL listing.

E. Install ductwork/fume vents with minimum number of joints. Align them accurately at connections, with internal surfaces smooth. Seal joints between sections of positive pressure gas vents in accordance with the manufacturer's installation instructions, and using only sealants recommended by manufacturer.

F. Support ductwork/fume vents from building structures, rigidly, with suitable ties, braces, hangers and anchors to hold to shape and prevent buckling. Support ductwork/fume vents to adjacent structural surfaces or at floor penetrations at 12 foot spacing. Refer to SMACNA HVAC Duct Construction Standards - Metal and Flexible for equivalent duct support configuration and size. Install concrete inserts for support of breechings, gas vents, chimneys, and stacks in coordination with formwork.

G. Support ductwork/fume vents at the intervals recommended by the manufacturer to support the weight of the vent and all accessories, without exceeding loading of appliances.

H. Install ductwork/fume stacks level and plumb.

I. Thermal Expansion: Install expansion joints on ductwork/fume vents to allow for thermal expansion.

3.4 FIELD QUALITY CONTROL

A. Manufacturer's Field Services: Provide the services of a qualified representative of the manufacturer to inspect the installation of the vehicle exhaust system, certify that it meets the manufacturer's recommendations, and instruct the operating personnel in their operation and maintenance.

B. Temporary Closure: At ends of ductwork/fume vents which are not completed or connected to equipment, provide a temporary closure to prevent the entrance of dust and debris until installations are completed.

END OF SECTION 231217

SECTION 232113
Hydronic Piping

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The following documents apply to all required work for the Project: (1) the Contract Drawings, (2) the Specifications, (3) the General Conditions, (4) the Addendum and (5) the Contract (City of New York Standard Construction Contract).

B. LEED General Requirements.
   1. Refer to DDC General Conditions.
      a. Section 01 33 00 "Submittal Procedures."
      b. Section 01 81 13.04 "Sustainable Design Requirements for LEED v4 Buildings."
      c. Section 01 74 19 "Construction Waste Management and Disposal."

1.2 SUMMARY

A. This Section includes pipe and fitting materials, joining methods, special-duty valves, and specialties for the following:

1. Hot-water heating and Glycol heating piping.
2. Makeup-water piping.
3. Condensate-drain piping.
4. Blowdown-drain piping.
5. Air-vent piping.
6. Safety-valve-inlet and -outlet piping.

B. Related Sections include the following:

1. Division 23 Section 23 21 13 "Hydronic Pumps" for pumps, motors, and accessories for hydronic piping.

1.3 PERFORMANCE REQUIREMENTS

A. Hydronic piping components and installation shall be capable of withstanding the following minimum working pressure and temperature:

1. Hot-Water Heating Piping: 200 psig at 250 deg F.
2. Makeup-Water Piping: 80 psig at 150 deg F.
3. Condensate-Drain Piping: 150 deg F.
4. Blowdown-Drain Piping: 200 deg F.
5. Air-Vent Piping: 200 deg F.
6. Safety-Valve-Inlet and -Outlet Piping: Equal to the pressure of the piping system to which it is attached.
7. Valves. Include flow and pressure drop curves based on manufacturer's testing for calibrated-orifice balancing valves and automatic flow-control valves.
8. Air control devices.
9. Hydronic specialties.

B. Shop Drawings: Detail, at 3/8"=1'-0" scale, the piping layout, fabrication of pipe anchors, hangers, supports for multiple pipes, alignment guides, expansion joints and loops, and attachments of the same to the building structure. Detail location of anchors, alignment guides, and expansion joints and loops.
C. Field quality-control test reports.
D. Operation and Maintenance Data: For air control devices, hydronic specialties, and special-duty valves to include in emergency, operation, and maintenance manuals.
E. Environmental Sustainability Documentation: Contractor shall submit for approval, a fully completed Environmental Building Materials Certification Form and backup documentation from the manufacturer or supplier of each type used in this section. Such backup documentation shall be typewritten on the manufacturer's letterhead or product data sheet published by the manufacturer.

1. Adhesives and Sealants
2. Paints and Coatings
3. Brazing: Certify brazing procedures, brazers, and operations in accordance with ASME Boiler and Pressure Vessel Code, Section IX, for shop and job-site brazing of piping work.
4. New York City Building Code: Comply with the New York City Building and Mechanical Code.

1.4 QUALITY ASSURANCE

A. Refer to DDC General Conditions Section 01 40 00 "Quality Requirements."

1.5 SUBMITTAL PROCEDURES

A. Refer to DDC General Conditions Section 01 33 00 "Submittal Procedures."

PART 2 - PRODUCTS

2.1 COPPER TUBE AND FITTINGS

A. Drawn-Temper Copper Tubing: ASTM B 88, Type L
B. DWV Copper Tubing: ASTM B 306, Type DWV.
C. Wrought-Copper Fittings: ASME B16.22.

1. Basis-of-Design Product: Subject to compliance with requirements, provide Victaulic Company of America or a comparable product by one of the following:

   a. Anvil International, Inc.
   b. Grinnell Mechanical Products, Tyco Fire & Building Products.
   c. Or approved equal.

2. Grooved-End Copper Fittings: ASTM B 75, copper tube or ASTM B 584, bronze casting.
3. Grooved-End-Tube Couplings: Rigid pattern, unless otherwise indicated; gasketed fitting. Ductile-iron housing with keys matching pipe and fitting grooves, prelubricated EPDM gasket rated for minimum 230 deg F for use with housing, and steel bolts and nuts. Victaulic Style 607 QuickVic.

4. Basis-of-Design Product: Subject to compliance with requirements, provide Victaulic Company of America or a comparable product by one of the following:

   a. Anvil International, Inc.
   b. Tyco Fire & Building Products.
   c. National Fittings, Inc.
   d. S. P. Fittings; a division of Star Pipe Products.
   e. Or approved equal.

5. Joint Fittings: ASTM A 536, Grade 65-45-12 ductile iron; ASTM A 47/A 47M, Grade 32510 malleable iron; ASTM A 53/A 53M, Type F, E, or S, Grade B fabricated steel; or ASTM A 106, Grade B steel fittings with grooves or shoulders constructed to accept grooved-end couplings; with nuts, bolts, locking pin, locking toggle, or lugs to secure grooved pipe and fittings.
6. Couplings: Ductile- or malleable-iron housing and synthetic rubber gasket of central cavity pressure-responsive design; with nuts, bolts, locking pin, locking toggle, or lugs to secure grooved pipe and fittings.

D. Steel Pipe Nipples: ASTM A 733, made of same materials and wall thicknesses as pipe in which they are installed.

2.2 JOINING MATERIALS

A. Pipe-Flange Gasket Materials: Suitable for chemical and thermal conditions of piping system contents.
   1. ASME B16.21, nonmetallic, flat, asbestos free, 1/8-inch maximum thickness unless thickness or specific material is indicated.
      a. Full-Face Type: For flat-face, Class 125, cast-iron and cast-bronze flanges.
      b. Narrow-Face Type: For raised-face, Class 250, cast-iron and steel flanges.
B. Flange Bolts and Nuts: ASME B18.2.1, carbon steel, unless otherwise indicated.
C. Solder Filler Metals: ASTM B 32, lead-free alloys. Include water-flushable flux according to ASTM B 813.
D. Brazing Filler Metals: AWS A5.8, BCuP Series, copper-phosphorus alloys for joining copper with copper; or BAg-1, silver alloy for joining copper with bronze or steel.
E. Welding Filler Metals: Comply with AWS D10.12/D10.12M for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.
F. Gasket Material: Thickness, material, and type suitable for fluid to be handled and working temperatures and pressures.

2.3 DIELECTRIC FITTINGS

A. Description: Combination fitting of copper-alloy and ferrous materials with threaded, solder-joint, plain, or weld-neck end connections that match piping system materials.
B. Insulating Material: Suitable for system fluid, pressure, and temperature.
C. Dielectric Unions:
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. Watts Regulator Co.; a division of Watts Water Technologies, Inc.
      b. Zurn Plumbing Products Group; AquaSpec Commercial Products Division.
      c. Calpico, Inc.
      d. Or approved equal.

2. Factory-fabricated union assembly, for 250-psig minimum working pressure at 200 deg F.

D. Dielectric Flanges:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Watts Regulator Co.; a division of Watts Water Technologies, Inc.
   b. Zurn Plumbing Products Group; AquaSpec Commercial Products Division
   c. Calpico, Inc.
   d. Or approved equal.
2. Factory-fabricated companion-flange assembly, for 150- or 300-psig minimum working pressure as required to suit system pressures.

E. Dielectric-Flange Kits:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following
   a. Advance Products & Systems, Inc.
   b. Calpico, Inc.
   c. Central Plastics Company.
   d. Pipeline Seal and Insulator, Inc.
   e. Or approved equal.
2. Companion-flange assembly for field assembly. Include flanges, full-face- or ring-type neoprene or phenolic gasket, phenolic or polyethylene bolt sleeves, phenolic washers, and steel backing washers.
3. Separate companion flanges and steel bolts and nuts shall have 150- or 300-psig minimum working pressure where required to suit system pressures.

F. Dielectric Couplings:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Calpico, Inc.
   b. Lochinvar Corporation.
   c. Watts Regulator Co.
   d. Or approved equal.
2. Galvanized-steel coupling with inert and noncorrosive thermoplastic lining; threaded ends; and 300-psig minimum working pressure at 225 deg F.

G. Dielectric Nipples:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following
   a. Perfection Corporation; a subsidiary of American Meter Company.
   b. Precision Plumbing Products, Inc.
   c. Sioux Chief Manufacturing Company, Inc.
   d. Victaulic Company of America.
   e. Or approved equal
2. Electroplated steel nipple with inert and noncorrosive, thermoplastic lining; plain, threaded, or grooved ends; and 300-psig minimum working pressure at 225 deg F.

2.4 VALVES

A. Gate, Globe, Check, Ball, and Butterfly Valves: Comply with requirements specified in Division 23 Section 23 05 23 "General-Duty Valves for HVAC Piping."
B. Automatic Temperature-Control Valves, Actuators, and Sensors: Comply with requirements specified in Division 23 Section 23 09 00 "Instrumentation and Control for HVAC."
C. Bronze, Calibrated-Orifice, Balancing Valves:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Armstrong Pumps, Inc.

b. Bell & Gossett Domestic Pump; a division of ITT Industries.
c. Flow Design Inc.
d. Griswold Controls.
e. Taco.
f. Or approved equal.

2. Body: Bronze, ball or plug type with calibrated orifice or venturi.
3. Ball: Brass or stainless steel.
4. Plug: Resin.
5. Seat: PTFE.
6. End Connections: Threaded or socket.
7. Pressure Gage Connections: Integral seals for portable differential pressure meter.
8. Handle Style: Lever, with memory stop to retain set position.
9. CWP Rating: Minimum 125 psig.
10. Maximum Operating Temperature: 250 deg F.

D. Cast-Iron or Steel, Calibrated-Orifice, Balancing Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Armstrong Pumps, Inc.
   b. Bell & Gossett Domestic Pump; a division of ITT Industries.
   c. Flow Design Inc.
   d. Griswold Controls.
   e. Taco.
   f. Tour & Andersson; available through Victaulic Company of America.
   g. Or approved equal.
2. Body: Cast-iron or steel body, ball, plug, or globe pattern with calibrated orifice or venturi.
3. Ball: Brass or stainless steel.
4. Stem Seals: EPDM O-rings.
5. Disc: Glass and carbon-filled PTFE.
6. Seat: PTFE.
7. End Connections: Flanged or grooved.
8. Pressure Gage Connections: Integral seals for portable differential pressure meter.
9. Handle Style: Lever, with memory stop to retain set position.
10. CWP Rating: Minimum 125 psig.
11. Maximum Operating Temperature: 250 deg F.

E. Diaphragm-Operated Safety Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Amtrol, Inc.
   b. Armstrong Pumps, Inc.
   c. Bell & Gossett Domestic Pump; a division of ITT Industries.
   d. Conbraco Industries, Inc, Apollo Valves.
   e. Spence Engineering Company, Inc.
   f. Watts Regulator Co.; a division of Watts Water Technologies, Inc.
   g. Or approved equal

2. Body: Bronze or brass.
3. Disc: Glass and carbon-filled PTFE.
4. Seat: Brass.
5. Stem Seals: EPDM O-rings.
6. Diaphragm: EPT.
7. Wetted, Internal Work Parts: Brass and rubber.
8. Inlet Strainer: removable without system shutdown.
9. Valve Seat and Stem: Noncorrosive.
10. Valve Size, Capacity, and Operating Pressure: Comply with ASME Boiler and Pressure Vessel Code: Section IV, and selected to suit system in which installed, with operating pressure and capacity factory set and field adjustable.

F. Automatic Flow-Control Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Flow Design Inc.
   b. Griswold Controls.
   c. Flomatic
   d. Or approved equal.
2. Body: Brass or ferrous metal.
3. Piston and Spring Assembly: Stainless steel, tamper proof, self cleaning, and removable.
4. Combination Assemblies: Include bonze or brass-alloy ball valve.
5. Identification Tag: Marked with zone identification, valve number, and flow rate.
6. Size: Same as pipe in which installed.
7. Performance: Maintain constant flow, plus or minus 5 percent over system pressure fluctuations.
8. Minimum CWP Rating: 300 psig.
9. Maximum Operating Temperature: 250 deg F.

2.5 AIR CONTROL DEVICES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Bell & Gossett Domestic Pump; a division of ITT Industries.
2. Hoffman Specialty
3. Taco
4. Amtrol
5. Armstrong
6. Or approved equal.

B. Manual Air Vents:

1. Body: Bronze.
2. Internal Parts: Nonferrous.
3. Operator: Screwdriver or thumbscrew.
4. Inlet Connection: ½ in
5. Discharge Connection: 1/8 in.
6. CWP Rating: 150 psig.
7. Maximum Operating Temperature: 240 deg F.

C. Automatic Air Vents:

1. Body: Bronze or cast iron.

2. Internal Parts: Nonferrous.
3. Operator: Noncorrosive metal float.
4. Inlet Connection: ½ in.
5. Discharge Connection: ¼ in.
6. CWP Rating: 150 psig.
7. Maximum Operating Temperature: 240 deg F.

D. Diaphragm-Type Expansion Tanks:

1. Tank: Welded steel, rated for 125-psig working pressure and 375 deg F maximum operating temperature. Factory test with taps fabricated and supports installed and labeled according to ASME Boiler and Pressure Vessel Code: Section VIII, Division 1.
2. Diaphragm: Securely sealed into tank to separate air charge from system water to maintain required expansion capacity.
3. Air-Charge Fittings: Schrader valve, stainless steel with EPDM seats.

E. In-Line Air Separators:

1. Tank: One-piece cast iron with an integral weir constructed to decelerate system flow to maximize air separation.
2. Maximum Working Pressure: Up to 175 psig.
3. Maximum Operating Temperature: Up to 300 deg F.

2.6 HYDRONIC PIPING SPECIALTIES

A. Y-Pattern Strainers:

1. Body: ASTM A 126, Class B, cast iron with bolted cover and bottom drain connection.
2. End Connections: Threaded ends for 2 inch and smaller; flanged ends for 2-1/2 inch and larger.
3. Strainer Screen: 40-mesh startup strainer, and perforated stainless-steel basket with 50 percent free area.
4. CWP Rating: 125 psig.

B. Basket Strainers:

1. Body: ASTM A 126, Class B, high-tensile cast iron with bolted cover and bottom drain connection.
2. End Connections: Threaded ends for 2 inch and smaller; flanged ends for 2-1/2 inch and larger.
3. Strainer Screen: 40-mesh startup strainer, and perforated stainless-steel basket with 50 percent free area.
4. CWP Rating: 125 psig.

C. Grooved End Y-Pattern Strainers;

1. Body: ASTM A536, ductile iron.
2. Strainer Screen: 0.125 inch diameter perforations, stainless-steel basket.
3. CWP Rating: 300 psig.

D. Grooved End T-Pattern Strainers;

1. Body: ASTM A536 ductile iron or ASTM A53 carbon steel.
2. Strainer Screen: 0.125 inch diameter perforations, Type 304 stainless-steel basket.
3. CWP Rating: 750 psig.

E. Stainless-Steel Bellow, Flexible Connectors:

1. Body: Stainless-steel bellows with woven, flexible, bronze, wire-reinforcing protective jacket.
2. End Connections: Threaded or flanged to match equipment connected.

3. Performance: Capable of 3/4-inch misalignment.
4. CWP Rating: 150 psig.
5. Maximum Operating Temperature: 250 deg F.

F. Spherical, Rubber, Flexible Connectors:

1. Body: Fiber-reinforced rubber body.
2. End Connections: Steel flanges drilled to align with Classes 150 and 300 steel flanges.
3. Performance: Capable of misalignment.
4. CWP Rating: 150 psig.
5. Maximum Operating Temperature: 250 deg F.

G. Expansion fittings are specified in Division 23 Section "Expansion Fittings and Loops for HVAC Piping."

PART 3 - EXECUTION

3.1. EXECUTION REQUIREMENTS

A. Refer to DDC General Conditions for execution requirements.

3.2 PIPING APPLICATIONS

A. Hot-water heating piping, aboveground, 2 inch and smaller shall be the following:

1. Type L, hard drawn-temper copper tubing, wrought-copper fittings, and soldered joints.

B. Hot-water heating piping, aboveground, 2 inch to 3 inch shall be one of the following:

1. Type L, hard drawn-temper copper tubing, wrought-copper fittings, and soldered joints.
2. Schedule 40 steel pipe; grooved, mechanical joint coupling and fittings; and grooved, mechanical joints.

C. Hot-water heating piping, aboveground, 4 inch and larger, shall be the following:

1. Schedule 40 steel pipe, wrought-steel fittings and wrought-cast or forged-steel flanges and flange fittings, and welded and flanged joints.
2. Schedule 40 steel pipe; grooved, mechanical joint coupling and fittings; and grooved, mechanical joints.

D. Makeup-water piping installed aboveground shall be the following:

1. Type L, hard drawn-temper copper tubing, wrought-copper fittings, and soldered joints.

E. Condensate-Drain Piping: Type L, hard drawn-temper copper tubing, wrought-copper fittings, and soldered joints.

F. Blowdown-Drain Piping: Same materials and joining methods as for piping specified for the service in which blowdown drain is installed.

G. Air-Vent Piping:

1. Inlet: Same as service where installed with metal-to-plastic transition fittings for plastic piping systems according to the piping manufacturer's written instructions.
2. Outlet: Type K, annealed-temper copper tubing with soldered or flared joints.

H. Safety-Valve-Inlet and -Outlet Piping for Hot-Water Piping: Same materials and joining methods as for piping specified for the service in which safety valve is installed with metal-to-plastic transition fittings for plastic piping systems according to the piping manufacturer's written instructions.

3.3 VALVE APPLICATIONS

A. Install shutoff-duty valves at each branch connection to supply mains, and at supply connection to each piece of equipment.
B. Install calibrated-orifice, balancing valves at each branch connection to return main.
C. Install calibrated-orifice, balancing valves in the return pipe of each heating or cooling terminal.
D. Install check valves at each pump discharge and elsewhere as required to control flow direction.
E. Install safety valves at hot-water generators and elsewhere as required by ASME Boiler and Pressure Vessel Code. Install drip-pan elbow on safety-valve outlet and pipe without valves to the outdoors; and pipe drain to nearest floor drain or as indicated on Drawings. Comply with ASME Boiler and Pressure Vessel Code: Section VIII, Division 1, for installation requirements.
F. Install pressure-reducing valves at makeup-water connection to regulate system fill pressure.

3.4 PIPING INSTALLATIONS

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Piping shown on the drawings shall be considered as diagrammatic for clearness and may or may not, in all parts, be shown in its true position. This fact does not, in any way, relieve the Contractor from full responsibility for the proper erection of a system of piping in every aspect suitable for the work intended. Indicate piping locations and arrangements if such were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on Coordination Drawings.
B. Drawings indicate generally sizes and locations of pipelines, but the right is reserved to direct changes in details of pipe work as necessitated by actual conditions. Piping shall be of sizes as recommended by the unit manufacturer. Any pipe size not shown shall be in proportion to the load carried at the same resistance as similar piping, or of size as directed.
C. Piping shall be accurately cut to measurement established at the construction site and shall be worked into place without springing or forcing, properly clearing openings, structural members and other equipment. Overhead piping shall be run as high as possible under structural members.
D. Ream pipes and tubes. Clean off scale and dirt, inside and outside, before assembly. Remove welding slag or other foreign material from piping.
E. Install piping in concealed locations, unless otherwise indicated and except in equipment rooms and service areas.
F. Exposed piping shall be run perpendicular and/or parallel to floors, walls, etc. Piping and valves shall be grouped neatly and shall be run so as to avoid reducing headroom or passage clearance
G. No piping or work of any kind shall be concealed or covered until all required tests have been satisfactorily completed and the work has been approved by the Commissioner as is required by code.
H. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.
I. Protect entire installation from damage during construction and be responsible for all damage until final acceptance of the work. All pipes shall be protected with suitable coverings as soon as they are set. All open ends of pipes shall be closed by a plug fitting to prevent obstruction and damage.
J. Grooved joint piping system:

1. Piping systems shall be installed in accordance with the manufacturer's guidelines and recommendations.
2. Piping systems shall not be installed in concealed areas with limited access.
3. All grooved couplings, fittings, valves, and specialties shall be the products of a single manufacturer.
4. Grooving tools shall be of the same manufacturer as the grooved components.

5. The gasket style and elastomeric material (grade) shall be verified as suitable for the intended service as specified. Gaskets shall be molded and produced by same manufacturer.
6. Grooved end shall be clean and free from indentations, projections, and roll marks in the area from pipe end to groove for proper gasket sealing.
7. A manufacturer factory-trained field representative shall provide on-site training for contractor's field personnel in the proper use of grooving tools and installation of grooved piping products. Factory-trained representative shall periodically review the product installation.
8. Contractor shall remove and replace any improperly installed products

K. All openings in floors shall be covered and protected during the course of construction.
L. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.
M. Install piping to permit valve servicing.
N. Install piping at indicated slopes.
O. Install piping free of sags and bends.
P. Install fittings for changes in direction and branch connections.
Q. Install piping to allow application of insulation.
R. Select system components with pressure rating equal to or greater than system operating pressure.
S. Install groups of pipes parallel to each other, spaced to permit applying insulation and servicing of valves.
T. Install drains, consisting of a tee fitting, ¾ inch ball valve, and short ¾ inch threaded nipple with cap, at low points in piping system mains and elsewhere as required for system drainage.
U. Install piping at a uniform grade of 0.2 percent upward in direction of flow.
V. Reduce pipe sizes using eccentric reducer fitting installed with level side up.
W. Install branch connections to mains using tee fittings in main pipe, with the branch connected to the bottom of the main pipe. For up-feed risers, connect the branch to the top of the main pipe.
X. Install valves according to Division 23 Section 23 05 23 "General-Duty Valves for HVAC Piping."
Y. Install unions in piping, 2 inch and smaller, adjacent to valves, at final connections of equipment, and elsewhere as indicated.
Z. Install flanges in piping, 2 ½ inch and larger, at final connections of equipment and elsewhere as indicated.
AA. Install strainers on inlet side of each control valve, pressure-reducing valve, solenoid valve, in-line pump, and elsewhere as indicated. Install ¾ inch nipple and ball valve in blowdown connection of strainers 2 inch and larger. Match size of strainer blowoff connection for strainers smaller than 2 inch.
BB. Install expansion loops, expansion joints, anchors, and pipe alignment guides as specified in Division 23 Section 23 05 16 "Expansion Fittings and Loops for HVAC Piping."
CC. Identify piping as specified in Division 23 Section 23 05 53 "Identification for HVAC Piping and Equipment."

3.5 HANGERS AND SUPPORTS

A. Hanger, support, and anchor devices are specified in Division 23 Section 23 05 29 "Hangers and Supports for HVAC Piping and Equipment." Comply with the following requirements for maximum spacing of supports.
B. Seismic restraints are specified in Division 23 Section 23 05 48 "Vibration and Seismic Controls for HVAC Piping and Equipment."
C. Install the following pipe attachments:
   1. Adjustable steel clevis hangers for individual horizontal piping less than 20 feet long.
   2. Adjustable roller hangers and spring hangers for individual horizontal piping 20 feet or longer.
   3. Pipe Roller: MSS SP-58, Type 44 for multiple horizontal piping 20 feet or longer, supported on a trapeze.
   4. Spring hangers to support vertical runs.

5. Provide copper-clad hangers and supports for hangers and supports in direct contact with copper pipe.
6. On plastic pipe, install pads or cushions on bearing surfaces to prevent hanger from scratching pipe.

D. Install hangers for piping with the following maximum spacing and minimum rod sizes:

1. Up to 1-1/2 inches: Maximum span, 6 feet; minimum rod size, 3/8 inch.
2. 2 inches and larger: Maximum span, 9 feet; minimum rod size, 1/2 inch.

E. Support vertical runs at roof, at each floor, and at 10-foot intervals between floors.

3.6 PIPE JOINT CONSTRUCTION

A. Join pipe and fittings according to the following requirements and Division 23 Sections specifying piping systems.
B. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.
C. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.
D. Soldered Joints: Apply ASTM B 813, water-flushable flux, unless otherwise indicated, to tube end. Construct joints according to ASTM B 828 or CDA's "Copper Tube Handbook," using lead-free solder alloy complying with ASTM B 32.
E. Brazed Joints: Construct joints according to AWS's "Brazing Handbook," "Pipe and Tube" Chapter, using copper-phosphorus brazing filler metal complying with AWS A5.8.
F. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:

1. Apply appropriate tape or thread compound to external pipe threads unless dry seal threading is specified.
2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.

G. Welded Joints: Construct joints according to AWS D10.12/D10.12M, using qualified processes and welding operators according to Part 1 "Quality Assurance" Article.
H. Flanged Joints: Select appropriate gasket material, size, type, and thickness for service application. Install gasket concentrically positioned. Use suitable lubricants on bolt threads.
I. Grooved Joints: Assemble joints with coupling and gasket, lubricant, and bolts. Cut or roll grooves in ends of pipe based on pipe and coupling manufacturer's written instructions for pipe wall thickness. Use grooved-end fittings and rigid, grooved-end-pipe couplings.

3.7 HYDRONIC SPECIALTIES INSTALLATION

A. Install automatic air vents at high points of system piping in mechanical equipment rooms only. Manual vents at heat-transfer coils and elsewhere as required for air venting.
B. Install piping from boiler air outlet, air separator, or air purger to expansion tank with a 2 percent upward slope toward tank.
C. Install in-line air separators in pump suction. Install drain valve on air separators 2 inch and larger.
D. Install expansion tanks on the floor. Vent and purge air from hydronic system, and ensure tank is properly charged with air to suit system Project requirements.

3.8 TERMINAL EQUIPMENT CONNECTIONS

A. Sizes for supply and return piping connections shall be the same as or larger than equipment connections.
B. Install control valves in accessible locations close to connected equipment.
C. Install bypass piping with globe valve around control valve. If parallel control valves are installed, only one bypass is required.

D. Install ports for pressure gages and thermometers at coil inlet and outlet connections according to Division 23 Section 23 05 19 "Meters and Gages for HVAC Piping."

3.9 FIELD QUALITY CONTROL

A. Prepare hydronic piping according to ASME B31.9 and as follows:

1. Leave joints, including welds, uninsulated and exposed for examination during test.
2. Provide temporary restraints for expansion joints that cannot sustain reactions due to test pressure. If temporary restraints are impractical, isolate expansion joints from testing.
3. Flush hydronic piping systems with clean water; then remove and clean or replace strainer screens.
4. Isolate equipment from piping. If a valve is used to isolate equipment, its closure shall be capable of sealing against test pressure without damage to valve. Install blinds in flanged joints to isolate equipment.
5. Install safety valve, set at a pressure no more than one-third higher than test pressure, to protect against damage by expanding liquid or other source of overpressure during test.

B. Perform the following tests on hydronic piping:

1. Use ambient temperature water as a testing medium unless there is risk of damage due to freezing. Another liquid that is safe for workers and compatible with piping may be used.
2. While filling system, use vents installed at high points of system to release air. Use drains installed at low points for complete draining of test liquid.
3. Isolate expansion tanks and determine that hydronic system is full of water.
4. Subject piping system to hydrostatic test pressure that is not less than 1.5 times the system's working pressure. Test pressure shall not exceed maximum pressure for any vessel, pump, valve, or other component in system under test. Verify that stress due to pressure at bottom of vertical runs does not exceed 90 percent of specified minimum yield strength or 1.7 times "SE" value in Appendix A in ASME B31.9, "Building Services Piping."
5. After hydrostatic test pressure has been applied for at least 2 hours, examine piping, joints, and connections for leakage. Eliminate leaks by tightening, repairing, or replacing components, and repeat hydrostatic test until there are no leaks.
6. Prepare written report of testing.

C. Perform the following before operating the system:

1. Open manual valves fully.
2. Inspect pumps for proper rotation.
3. Set makeup pressure-reducing valves for required system pressure.
4. Inspect air vents at high points of system and determine if all are installed and operating freely (automatic type), or bleed air completely (manual type).
5. Set temperature controls so all coils are calling for full flow.
6. Inspect and set operating temperatures of hydronic equipment, such as boilers, chillers, cooling towers, to specified values.
7. Verify lubrication of motors and bearings.

END OF SECTION 232113

SECTION 232116
Hydronic Piping Specialties

PART 1 - GENERAL

1.1. RELATED DOCUMENTS

A. The following documents apply to all required work for the Project: (1) the Contract Drawings, (2) the Specifications, (3) the General Conditions, (4) the Addendum and (5) the Contract (City of New York Standard Construction Contract)

B. LEED General Requirements.
   1. Refer to DDC General Conditions.
      a. Section 01 33 00 "Submittal Procedures."
      b. Section 01 81 13.04 "Sustainable Design Requirements for LEED v4 Buildings"

1.2. SUMMARY

A. Section Includes:
   1. Hydronic specialty valves.
   2. Air-control devices.
   3. Strainers.
   4. Connectors.
   5. Glycol water system

1.3. SUBMITTAL PROCEDURES

A. Refer to DDC General Conditions Section 01 33 00 "Submittal Procedures".

1.4. SUBMITTALS

A. Product Data: For each type of product:
   1. Include construction details and material descriptions for hydronic piping specialties.
   2. Include rated capacities, operating characteristics, and furnished specialties and accessories.
   3. Include flow and pressure drop curves based on manufacturer's testing for calibrated-orifice balancing valves and automatic flow-control valves.
   4. Operation and Maintenance Data: For hydronic piping specialties to include in emergency, operation, and maintenance manuals

1.5. MAINTENANCE MATERIAL SUBMITTALS

A. Differential Pressure Meter: For each type of balancing valve and automatic flow control valve, include flowmeter, probes, hoses, flow charts, and carrying case.

1.6. QUALITY ASSURANCE

A. Refer to DDC General Conditions Section 01 40 00 "Quality Requirements."

B. Pipe Welding: Qualify procedures and operators according to ASME Boiler and Pressure Vessel Code: Section IX.

C. Safety Valves and Pressure Vessels: Shall bear the appropriate ASME label. Fabricate and stamp air separators and expansion tanks to comply with ASME Boiler and Pressure Vessel Code: Section VIII, Division 1.

PART 2 - PRODUCTS

2.1. HYDRONIC SPECIALTY VALVES

A. Bronze or Brass, Calibrated-Orifice, Balancing Valves:

1. Basis-of-Design Product: Subject to compliance with requirements, provide Hays Fluid Controls; Venturi Type Manual Balancing Valve or a comparable product by one of the following:

    a. Flow Design, Inc.
    b. Griswold Controls.
    c. Oventrop Corporation.
    d. Tour & Andersson; available through Victaulic Company.
    e. Or approved equal.

2. Body: Bronze or brass, ball or plug type with calibrated orifice or venturi.
3. Ball: Brass or stainless steel.
4. Plug: Resin.
5. Seat: PTFE.
6. End Connections: Threaded or socket.
7. Pressure Gage Connections: Integral seals for portable differential pressure meter.
8. Handle Style: Lever, with memory stop to retain set position.
9. CWP Rating: Minimum 125 psig.
10. Maximum Operating Temperature: 250 deg F.

B. Cast-Iron or Steel, Calibrated-Orifice, Balancing Valves:

1. Basis-of-Design Product: Subject to compliance with requirements, provide Hays Fluid Controls; Series CBVF Combination Butterfly/Venturi with Flange or a comparable product by one of the following:

    a. Flow Design, Inc.
    b. Griswold Controls.
    c. Oventrop Corporation.
    d. Red White Valve Corp.
    e. Tour & Andersson; available through Victaulic Company.
    f. Or approved equal.

2. Body: Cast-iron or steel body, ball, plug, or globe pattern with calibrated orifice or venturi.
3. Ball: Combination butterfly valve, brass, or stainless steel.
4. Stem Seals: EPDM O-rings.

5. Disc, NPS 2-1/2 to NPS 8: Aluminum-bronze sand casting, ASTM B148 C95800.
6. Seat: PTFE, bonded EPDM.
7. End Connections: Flanged or grooved.
8. Pressure Gage Connections: Integral seals for portable differential pressure meter.
9. Handle Style: Combination infinite/10-position memory stop plate, a one-piece disc/shaft, and a triple shaft bearing.
10. CWP Rating: Minimum 125 psig.
11. Maximum Operating Temperature: 250 deg F.

C. Diaphragm-Operated Safety Valves: ASME labeled.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. AMTROL, Inc.
   b. Apollo Valves; Conbraco Industries, Inc.
   c. Armstrong Pumps, Inc.
   d. Bell & Gossett; a Xylem brand.
   e. Spence Commissionering Company, Inc.
   f. WATTS.
   g. Or approved equal.

2. Body: Bronze or brass.
3. Disc: Glass and carbon-filled PTFE.
4. Seat: Brass.
5. Stem Seals: EPDM O-rings.
6. Diaphragm: EPT.
7. Wetted, Internal Work Parts: Brass and rubber.
8. Inlet Strainer: removable without system shutdown.
9. Valve Seat and Stem: Noncorrosive.
10. Valve Size, Capacity, and Operating Pressure: Comply with ASME Boiler and Pressure Vessel Code: Section IV, and selected to suit system in which installed, with operating pressure and capacity factory set and field adjustable.

D. Automatic Flow-Control Valves:

1. Basis-of-Design Product: Subject to compliance with requirements, provide Hays Fluid Controls; Mesurflo or a comparable product by one of the following:

   a. Flow Design, Inc.
   b. Griswold Controls.
   c. Oventrop.
   d. Or approved equal.

2. Body: Brass or ferrous metal.
3. Flow Control Assembly: Mesurflo elastomeric diaphragm and polyphenylsulfone orifice plate, within 2- to 80-psig differential pressure operating ranges. The corrosion-resistant, tamper-proof, self-

cleaning, and removable flow control assembly device shall be warranted for the life of the HVAC system in which it was originally installed, provided only water-based hydronic fluids are used at usual HVAC temperatures and installed according to product installation and operation specifications.

4. Combination Assemblies: Include bronze or brass-alloy ball valve.
5. Identification Tag: Marked with zone identification, valve number, and flow rate.
6. Size: Same as pipe in which installed.
7. Performance: Maintain constant flow at a minimum of plus or minus 10 percent, of system pressure fluctuations.
8. Minimum CWP Rating: 400 psig.
9. Maximum Operating Temperature: 225 deg F.

2.2. AIR-CONTROL DEVICES

A. Air vents aid in system filling. Air removal after initial startup is accomplished by air separator or boiler dip-tube.

B. Leakage from automatic air vents may cause damage to ceilings and other finished surfaces. Manual air vents may be preferred over automatic air vents in finished spaces.

C. Manual Air Vents:

1. Basis-of-Design Product: Subject to compliance with requirements, provide Hays Fluid Controls or a comparable product by one of the following:

   a. AMTROL, Inc.
   b. Armstrong Pumps, Inc.
   c. HCI; Hydronics Components Inc.
   d. NuTech Hydronic Specialty Products.
   e. TACO Comfort Solutions, Inc.
   f. Or approved equal.

2. Body: Bronze or brass.
3. Internal Parts: Nonferrous.
4. Operator: Wrench or thumbscrew.
5. Inlet Connection: NPS 1/2.
6. Discharge Connection: NPS 1/8.
7. CWP Rating: 150 psig.
8. Maximum Operating Temperature: 225 deg F.

D. Automatic Air Vents:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. AMTROL, Inc.
   b. Armstrong Pumps, Inc.
   c. Bell & Gossett; a Xylem brand.
   d. Nexus Valve, Inc.
   e. NuTech Hydronic Specialty Products.
   f. Spirotherm, Inc.

g. TACO Comfort Solutions, Inc.
h. Or approved equal.

2. Body: Bronze or cast iron.
3. Internal Parts: Nonferrous.
4. Operator: Noncorrosive metal float.
5. Inlet Connection: NPS 1/2.
6. Discharge Connection: NPS 1/4.
7. CWP Rating: 150 psig.
8. Maximum Operating Temperature: 240 deg F.

E. Expansion Tanks:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. AMTROL, Inc.
b. Armstrong Pumps, Inc.
c. Bell & Gossett; a Xylem brand.
d. Flo Fab Inc.
e. TACO Comfort Solutions, Inc.
f. Or approved equal.

2. Tank: Welded steel, rated for 125-psig working pressure and 375 deg F maximum operating temperature, with taps in bottom of tank for tank fitting and taps in end of tank for gage glass. Tanks shall be factory tested after taps are fabricated and shall be labeled according to ASME Boiler and Pressure Vessel Code: Section VIII, Division 1.
3. Air-Control Tank Fitting: Cast-iron body, copper-plated tube, brass vent tube plug, and stainless-steel ball check, 100-gal. unit only; sized for compression-tank diameter. Provide tank fittings for 125-psig working pressure and 250 deg F maximum operating temperature.
4. Tank Drain Fitting: Brass body, nonferrous internal parts; 125-psig working pressure and 240 deg F maximum operating temperature; constructed to admit air to compression tank, drain water, and close off system.
5. Gage Glass: Full height with dual manual shutoff valves, 5"-inch- diameter gage glass, and slotted-metal glass guard.

F. Bladder-Type Expansion Tanks:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. AMTROL, Inc.
b. Armstrong Pumps, Inc.
c. Bell & Gossett; a Xylem brand.
d. Flo Fab Inc.
e. TACO Comfort Solutions, Inc.
f. Or approved equal.

2. Tank: Welded steel, rated for 125-psig working pressure and 375 deg F maximum operating temperature. Factory test after taps are fabricated and supports installed and are labeled according to ASME Boiler and Pressure Vessel Code: Section VIII, Division 1.
3. Bladder: Securely sealed into tank to separate air charge from system water to maintain required expansion capacity.
4. Air-Charge Fittings: Schrader valve, stainless steel with EPDM seats.

G. Coalescing-Type Air and Dirt Separators:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Armstrong Pumps, Inc.
   b. Bell & Gossett; a Xylem brand.
   c. Spirotherm, Inc.
   d. Or approved equal.
2. Tank: Fabricated steel tank; ASME constructed and stamped for 125-psig working pressure and 270 deg F maximum operating temperature.
3. Coalescing Medium: Stainless steel.
4. Air Vent: Threaded to the top of the separator.
5. Inline Inlet and Outlet Connections: Threaded for NPS 2 (DN 50) and smaller; Class 150 flanged connections for NPS 2-1/2 (DN 65) and larger.
6. Blowdown Connection: Threaded to the bottom of the separator.
7. Size: Match system flow capacity.

H. Tangential-Type Air Separators:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. AMTROL, Inc.
   b. Armstrong Pumps, Inc.
   c. Bell & Gossett; a Xylem brand.
   d. TACO Comfort Solutions, Inc.
   e. Or approved equal.
2. Tank: Welded steel; ASME constructed and labeled for 125-psig minimum working pressure and 375 deg F maximum operating temperature.
3. Air Collector Tube: Perforated stainless steel, constructed to direct released air into expansion tank.
4. Tangential Inlet and Outlet Connections: Threaded for NPS 2 and smaller; flanged connections for NPS 2-1/2 and larger.
5. Blowdown Connection: Threaded.
6. Size: Match system flow capacity.

I. In-Line Air Separators:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. AMTROL, Inc.
b. Armstrong Products, Inc.
c. Bell & Gossett; a Xylem brand.
d. Spirotherm, Inc.
e. TACO Comfort Solutions, Inc.
f. Or approved equal

2. Tank: One-piece cast iron with an integral weir constructed to decelerate system flow to maximize air separation.
3. Maximum Working Pressure: Up to 175 psig.
4. Maximum Operating Temperature: Up to 300 deg F.

J. Air Purgers:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. AMTROL, Inc.
b. Armstrong Pumps, Inc.
c. Bell & Gossett; a Xylem brand.
d. TACO Comfort Solutions, Inc.
e. Or approved equal.

2. Body: Cast iron with internal baffles that slow the water velocity to separate the air from solution and divert it to the vent for quick removal.
3. Maximum Working Pressure: 150 psig.
4. Maximum Operating Temperature: 250 deg F.

2.3. STRAINERS

A. Y-Pattern Strainers:

1. Basis-of-Design Product: Subject to compliance with requirements, provide Hays Fluid Controls or comparable product by one of the following:

a. Flow Design, Inc.
b. Griswold Controls.
c. HCI; Hydronics Components Inc.
d. Or approved equal.

2. Body: Brass or ASTM A 126, Class B, with bolted cover and bottom drain connection.
3. End Connections: Threaded ends for NPS 2 and smaller; flanged ends for NPS 2-1/2 and larger.
4. Strainer Screen: Stainless-steel, 20-mesh strainer, or perforated stainless-steel basket.
5. CWP Rating: 125 psig.

2.4. CONNECTORS

A. Stainless-Steel Bellow, Flexible Connectors:

1. Body: Stainless-steel bellows with woven, flexible, bronze, wire-reinforcing protective jacket.
2. End Connections: Threaded or flanged to match equipment connected.
3. Performance: Capable of 3/4-inch misalignment.
4. CWP Rating: 150 psig.
5. Maximum Operating Temperature: 250 deg F.

2.5 GLYCOL WATER SYSTEM

A. Each glycol system consists of piping, fittings, isolation/control/relief valves, pressure gauges, pressure switches, pumps, expansion tank, operating controls and accessories for glycol refill and charging the hydronic coil with glycol-water solution.

B. Pumps: positive displacement type, bronze construction, shaft seals, close coupled electric motors with built-in thermal overload protection.

C. Glycol- water solution: pre-mixed corrosion inhibited, propylene, 40% selected for freeze protection.

D. Corrosion inhibitor: formulated chemical treatment product that is designated to passivate hydronic piping and equipment metal surfaces, and buffer the formation of acids.

E. Water quality: mixture dilution water that contains less than 25 ppm of chlorides, less than 25 ppm of sulfates and total hardness less than 100 ppm CACO3 is acceptable.

PART 3 - EXECUTION

3.1. EXECUTION REQUIREMENTS

A. Refer to DDC General Conditions for execution requirements.

3.2. VALVE APPLICATIONS

A. Install shut off-duty valves at each branch connection to supply mains and at supply connection to each piece of equipment.

B. Install calibrated-orifice, balancing valves at each branch connection to return main.

C. Install calibrated-orifice, balancing valves in the return pipe of each heating or cooling terminal.

D. Install check valves at each pump discharge and elsewhere as required to control flow direction.

E. Install safety valves at hot-water generators and elsewhere as required by ASME Boiler and Pressure Vessel Code. Install drip-pan elbow on safety-valve outlet and pipe without valves to the outdoors; pipe drain to nearest floor drain or as indicated on Drawings. Comply with ASME Boiler and Pressure Vessel Code: Section VIII, Division 1, for installation requirements.

F. Install pressure-reducing valves at makeup-water connection to regulate system fill pressure.

3.3. HYDRONIC SPECIALTIES INSTALLATION

A. Install manual air vents at high points in piping, at heat-transfer coils, and elsewhere as required for system air venting.

B. Install automatic air vents at high points of system piping in mechanical equipment rooms only. Install manual vents at heat-transfer coils and elsewhere as required for air venting.

C. Install piping from boiler air outlet, air separator, or air purger to expansion tank with a 2 percent upward slope toward tank.

D. Install in-line air separators in pump suction. Install drain valve on air separators NPS 2 (DN 50) and larger.

E. Install tangential air separator in pump suction. Install blowdown piping with gate or full-port ball valve; extend full size to nearest floor drain.

F. Install expansion tanks above the air separator. Install tank fitting in tank bottom and charge tank. Use manual vent for initial fill to establish proper water level in tank.
   1. Install tank fittings that are shipped loose.
   2. Support tank from floor or structure above with sufficient strength to carry weight of tank, piping connections, fittings, plus tank full of water. Do not overload building components and structural members.

G. Install expansion tanks on the floor. Vent and purge air from hydronic system, and ensure that tank is properly charged with air to suit system Project requirements.

END OF SECTION 232116

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SECTION 232123
Hydronic Pumps

PART 1 - GENERAL

1.1. RELATED DOCUMENTS

A. The following documents apply to all required work for the Project: (1) the Contract Drawings, (2) the Specifications, (3) the General Conditions, (4) the Addendum and (5) the Contract (City of New York Standard Construction Contract).

B. LEED General Requirements.

1. Refer to DDC General Conditions.

a. Section 01 33 00 "Submittal Procedures."

b. Section 01 74 19 "Construction Waste Management and Disposal."

c. Section 01 81 19 "Indoor Air Quality Requirements for LEED Buildings."

1.2. SUMMARY

A. General: Provide all plant, labor, tools, appliances, equipment, materials and services required for the work indicated on the drawings and specified in this section.

B. This Section includes but not limited to the following:

1. Close-coupled, in-line centrifugal pumps.

1.3. DEFINITIONS

A. Buna-N: Nitrile rubber.

B. EPT: Propylene terpolymer.

1.4. SUBMITTALS

A. Refer to DDC General Conditions Section 01 33 00 "Submittal Procedures".

B. Product Data: Include certified performance curves and rated capacities, operating characteristics, furnished specialties, final impeller dimensions, and accessories for each type of product indicated. Indicate pump's operating point on curves.

C. Shop Drawings: Show pump layout and connections. Include setting drawings with templates for installing foundation and anchor bolts and other anchorages.

1. Wiring Diagrams: Power, signal, and control wiring.

D. Operation and Maintenance Data: For pumps to include in emergency, operation, and maintenance manuals.

1.5. QUALITY ASSURANCE

A. Refer to DDC General Conditions Section 01 40 00 "Quality Requirements".

B. Source Limitations: Obtain hydronic pumps through one source from a single manufacturer.

C. Product Options: Drawings indicate size, profiles, and dimensional requirements of hydronic pumps and are based on the specific system indicated. Refer to DDC General Condition Section "Product Requirements."

D. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to is required by code, and marked for intended use.

E. UL Compliance: Comply with UL 778 for motor-operated water pumps.

F. HI Compliance: Design, manufacture, and install HVAC pumps in accordance with HI "Hydraulic Institute Standards".

G. Performance Certification: Provide pumps whose performances, under specified operating conditions, are certified by manufacturer.

1.6. DELIVERY, STORAGE, AND HANDLING

A. Manufacturer's Preparation for Shipping: Clean flanges and exposed machined metal surfaces and treat with anticorrosion compound after assembly and testing. Protect flanges, pipe openings, and nozzles with wooden flange covers or with screwed-in plugs.

B. Store pumps in dry location.

C. Acquire protective covers for flanges and protective coatings during storage.

D. Protect bearings and couplings against damage from sand, grit, and other foreign matter.

E. Comply with pump manufacturer's written rigging instructions.

1.7. COORDINATION

A. Coordinate size and location of concrete bases. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified in Division 03.

PART 2 - PRODUCTS

2.1. CLOSE-COUPLED, IN-LINE CENTRIFUGAL PUMPS

A. Manufacturers:

1. Armstrong Pumps Inc.
2. Bell & Gossett; Div. of ITT Industries.
3. Flo-Fab.
4. Taco, Inc.
5. Weinman; Div. of Crane Pumps & Systems.
6. Or approved equal.

B. Description: Factory-assembled and -tested, centrifugal, overhung-impeller, close-coupled, in-line pump as defined in HI 1.1-1.2 and HI 1.3; designed for installation with pump and motor shafts mounted horizontally or vertically. Rate pump for 140-psig minimum working pressure and a continuous water temperature of 250 deg F.

C. Pump Construction:

1. Casing: Radially split, cast iron, with replaceable bronze wear rings, threaded gage tappings at inlet and outlet, and threaded connections.
2. Impeller: ASTM B 584, cast bronze; statically and dynamically balanced, keyed to shaft, and secured with a locking cap screw. Trim impeller to match specified performance.
3. Pump Shaft: Carbon Steel
4. Mechanical Seal: Carbon rotating ring against a ceramic seat held by a stainless-steel spring, and bellows and gasket. Include water slinger on shaft between motor and seal.
5. Pump Bearings: Oil lubricated; bronze-journal or thrust type.

D. Motor: Single speed, with grease-lubricated ball bearings, unless otherwise indicated; and rigidly mounted to pump casing. Comply with requirements in Division 23 Section 23 05 13 "Common Motor Requirements for HVAC Equipment." Pumps 1 HP and larger shall be NEMA premium efficiency rated.

2.2. PUMP SPECIALTY FITTINGS

A. Suction Diffuser: Angle pattern, 175-psig pressure rating, cast-iron body and end cap, pump-inlet fitting; with bronze startup and bronze or stainless-steel permanent strainers; bronze or stainless-steel straightening vanes; drain plug; and factory-fabricated support.

PART 3 - EXECUTION

3.1. EXECUTION REQUIREMENTS

A. Refer to DDC General Conditions for execution requirements.

3.2. EXAMINATION

A. Examine equipment foundations and anchor-bolt locations for compliance with requirements for installation tolerances and other conditions affecting performance of work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.3. CONCRETE BASES

A. Install concrete bases of dimensions indicated for pumps and controllers. Refer to Division 23 Section 23 05 00 "Common Work Results for HVAC."

1. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch centers around full perimeter of base.
2. For supported equipment, install epoxy-coated anchor bolts that extend through concrete base and anchor into structural concrete floor.
3. Place and secure anchorage devices. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
4. Install anchor bolts to elevations required for proper attachment to supported equipment.

B. Cast-in-place concrete materials and placement requirements are specified in Division 03.

3.4. PUMP INSTALLATION

A. Comply with HI 1.4.

B. Install pumps with access for periodic maintenance including removal of motors, impellers, couplings, and accessories.

C. Independently support pumps and piping so weight of piping is not supported by pumps and weight of pumps is not supported by piping.

D. Install continuous-thread hanger rods and spring hangers of sufficient size to support pump weight. Vibration isolation devices are specified in Division 23 Section 21 05 48 "Vibration and Seismic Controls for HVAC Piping and Equipment." Fabricate brackets or supports as required. Hanger and support materials are specified in Division 23 Section 23 05 29 "Hangers and Supports for HVAC Piping and Equipment."

E. Suspend vertically mounted, in-line centrifugal pumps independent of piping. Install pumps with motor and pump shafts vertical. Use continuous-thread hanger rods and spring hangers of sufficient size to support pump weight. Vibration isolation devices are specified in Division 21 Section 21 05 48 "Vibration and Seismic Controls for Fire-Suppression Piping and Equipment." Hanger and support materials are specified in Division 23 Section 23 05 29 "Hangers and Supports for Plumbing Piping and Equipment."

F. Automatic Condensate Pump Units: Install units for collecting condensate and extend to open drain.

3.5. CONNECTIONS

A. Piping installation requirements are specified in other Section 23 05 00 Common Work Results for HVAC. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Install piping adjacent to machine to allow service and maintenance.

C. Connect piping to pumps. Install valves that are same size as piping connected to pumps.

D. Install suction and discharge pipe sizes equal to or greater than diameter of pump nozzles.

E. Install separate shutoff, balancing and check valve on discharge side of pumps.

F. Install suction diffuser and shutoff valve on suction side of pumps.

G. Install flexible connectors on suction and discharge sides of base-mounted pumps between pump casing and valves.

H. Install pressure gages on pump suction and discharge, at integral pressure-gage tapping, or install single gage with multiple input selector valve.

I. Ground equipment according to Division 26 Section 26 05 26 "Grounding and Bonding for Electrical Systems."

J. Connect wiring according to Division 26 Section 26 05 19 "Low-Voltage Electrical Power Conductors and Cables."

3.6. STARTUP

A. Complete installation and startup checks according to manufacturer's written instructions.

B. Check piping connections for tightness.

C. Lubricate pumps before start-up.

3.7. DEMONSTRATION

A. Engage a factory-authorized service representative to instruct the City of New York's maintenance personnel to adjust, operate, and maintain hydronic pumps. Refer to DDC General Condition Section "Demonstration and Owners Pre-Acceptance Orientation."

END OF SECTION 232123

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SECTION 232300
Refrigerant Piping

PART 1 - GENERAL

1.1. RELATED DOCUMENTS

A. The following documents apply to all required work for the Project: (1) the Contract Drawings, (2) the Specifications, (3) the General Conditions, (4) the Addendum and (5) the Contract (City of New York Standard Construction Contract).

1.2. SUMMARY

A. This Section includes refrigerant piping used for air-conditioning applications.

1.3. PERFORMANCE REQUIREMENTS

A. Line Test Pressure for Refrigerant R-410A:

1. Suction Lines for Air-Conditioning Applications: 300 psig.
2. Hot-Gas and Liquid Lines: 535 psig.

1.4. SUBMITTALS

A. Refer to DDC General Conditions Section 01 33 00 "Submittal Procedures."

B. Product Data: For each type of valve and refrigerant piping specialty indicated. Include pressure drop, based on manufacturer's test data, for the following:

1. Thermostatic expansion valves.
2. Solenoid valves.
3. Hot-gas bypass valves.
4. Filter dryers.
5. Strainers.
6. Pressure-regulating valves.

C. Shop Drawings: Show layout of refrigerant piping and specialties, including pipe, tube, and fitting sizes, flow capacities, valve arrangements and locations, slopes of horizontal runs, oil traps, double risers, wall and floor penetrations, and equipment connection details. Show interface and spatial relationships between piping and equipment.

1. Shop Drawing Scale: 3/8 inch equals 1 foot.

D. Field quality-control test reports.

E. Operation and Maintenance Data: For refrigerant valves and piping specialties to include in maintenance manuals.

1.5. QUALITY ASSURANCE

A. Refer to DDC General Conditions Section 01 40 00 "Quality Requirements."

B. Comply with ASHRAE 15, "Safety Code for Refrigeration Systems."

C. Comply with ASME B31.5, "Refrigeration Piping and Heat Transfer Components."

1.6. PRODUCT STORAGE AND HANDLING

A. Store piping in a clean and protected area with end caps in place to ensure that piping interior and exterior are clean when installed.

1.7. COORDINATION

A. Coordinate size and location of roof curbs, equipment supports, and roof penetrations. These items are specified in Section 077100 "Roof Specialties and Accessories."

PART 2 - PRODUCTS

2.1. COPPER TUBE AND FITTINGS

A. Copper Tube: ASTM B 88, Type L.

B. Wrought-Copper Fittings: ASME B16.22.

C. Wrought-Copper Unions: ASME B16.22.

D. Solder Filler Metals: ASTM B 32. Use 95-5 tin antimony or alloy HB solder to join copper socket fittings on copper pipe.

E. Brazing Filler Metals: AWS A5.8.

F. Flexible Connectors:

1. Body: Tin-bronze bellows with woven, flexible, tinned-bronze-wire-reinforced protective jacket.
2. End Connections: Socket ends.
3. Offset Performance: Capable of minimum 3/4-inch misalignment in minimum 7-inch- long assembly.
4. Pressure Rating: Factory test at minimum 500 psig.
5. Maximum Operating Temperature: 250 deg F.

2.2. VALVES AND SPECIALTIES

A. Manufacturers: Subject to compliance with requirements by one of the following:

1. Mueller Industries
2. Sporian Co
3. Superior Valve Co.
4. Or Approved Equal

B. Diaphragm Packless Valves:

1. Body and Bonnet: Forged brass or cast bronze; globe design with straight-through or angle pattern.
2. Diaphragm: Phosphor bronze and stainless steel with stainless-steel spring.
3. Operator: Rising stem and hand wheel.
4. Seat: Nylon.
5. End Connections: Socket, union, or flanged.
6. Working Pressure Rating: 500 psig.
7. Maximum Operating Temperature: 275 deg F.

C. Packed-Angle Valves:

1. Body and Bonnet: Forged brass or cast bronze.
2. Packing: Molded stem, back seating, and replaceable under pressure.
3. Operator: Rising stem.
4. Seat: Nonrotating, self-aligning polytetrafluoroethylene.
5. Seal Cap: Forged-brass or valox hex cap.
6. End Connections: Socket, union, threaded, or flanged.
7. Working Pressure Rating: 500 psig.
8. Maximum Operating Temperature: 275 deg F.

D. Check Valves:

1. Body: Ductile iron, forged brass, or cast bronze; globe pattern.
2. Bonnet: Bolted ductile iron, forged brass, or cast bronze; or brass hex plug.
3. Piston: Removable polytetrafluoroethylene seat.
4. Closing Spring: Stainless steel.
5. End Connections: Socket, union, threaded, or flanged.
6. Maximum Opening Pressure: 0.50 psig.
7. Working Pressure Rating: 500 psig.
8. Maximum Operating Temperature: 275 deg F.

E. Service Valves:

1. Body: Forged brass with brass cap including key end to remove core.
2. Core: Removable ball-type check valve with stainless-steel spring.
3. Seat: Polytetrafluoroethylene.
4. End Connections: Copper spring.
5. Working Pressure Rating: 500 psig.

F. Solenoid Valves: Comply with ARI 760 and UL 429; listed and labeled by an NRTL.

1. Body and Bonnet: Plated steel.

2. Solenoid Tube, Plunger, Closing Spring, and Seat Orifice: Stainless steel.
3. Seat: Polytetrafluoroethylene.
4. End Connections: Threaded.
5. Electrical: Molded, watertight coil in NEMA 250 enclosure of type required by location with 1/2-inch conduit adapter, and 115-V ac coil.
6. Working Pressure Rating: 400 psig.
7. Maximum Operating Temperature: 240 deg F.

G. Safety Relief Valves: Comply with ASME Boiler and Pressure Vessel Code; listed and labeled by an NRTL.

1. Body and Bonnet: Ductile iron and steel, with neoprene O-ring seal.
2. Piston, Closing Spring, and Seat Insert: Stainless steel.
3. Seat Disc: Polytetrafluoroethylene.
4. End Connections: Threaded.
5. Working Pressure Rating: 400 psig.
6. Maximum Operating Temperature: 240 deg F.

H. Thermostatic Expansion Valves: Comply with ARI 750.

1. Body, Bonnet, and Seal Cap: Forged brass or steel.
2. Diaphragm, Piston, Closing Spring, and Seat Insert: Stainless steel.
3. Packing and Gaskets: Non-asbestos.
4. Capillary and Bulb: Copper tubing filled with refrigerant charge.
5. Suction Temperature: 40 deg F.
6. Superheat: Adjustable.
7. Reverse-flow option.
8. End Connections: Socket, flare, or threaded union.
9. Working Pressure Rating: 400 psig.

I. Angle-Type Strainers:

1. Body: Forged brass or cast bronze.
2. Drain Plug: Brass hex plug.
3. Screen: 100-mesh monel.
4. End Connections: Socket or flare.
5. Working Pressure Rating: 500 psig.
6. Maximum Operating Temperature: 275 deg F.

2.3. REFRIGERANTS

A. Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include the following:

1. Atofina Chemicals, Inc.
2. DuPont Company; Fluorochemicals Div.
3. Honeywell, Inc.; Genetron Refrigerants.
4. INEOS Fluor Americas LLC.

5. Or Approved Equal.

B. ASHRAE 34, R-410A: Pentafluoroethane/Difluoromethane.

PART 3 - EXECUTION

3.1. EXECUTION REQUIREMENTS

A. Refer to DDC General Conditions for execution requirements.

3.2. PIPING APPLICATIONS FOR REFRIGERANT R-410A

A. Suction Lines 1-1/2 inch and Smaller for Conventional Air-Conditioning Applications: Copper, Type ACR, annealed-temper tubing and wrought-copper fittings with brazed or soldered joints.

B. Hot-Gas and Liquid Lines: Copper, Type ACR L, annealed- or drawn-temper tubing and wrought-copper fittings with brazed or soldered joints.

C. Safety-Relief-Valve Discharge Piping: Copper, Type ACR L, annealed- or drawn-temper tubing and wrought-copper fittings with brazed or soldered joints.

3.3. VALVE AND SPECIALTY APPLICATIONS

A. Install service valves for gage taps at inlet and outlet of hot-gas bypass valves and strainers if they are not an integral part of valves and strainers.

B. Install a check valve at the compressor discharge and a liquid accumulator at the compressor suction connection.

C. Except as otherwise indicated, install valves on inlet and outlet side of filter dryers.

D. Install thermostatic expansion valves as close as possible to distributors on evaporators.

1. Install valve so diaphragm case is warmer than bulb.
2. If external equalizer lines are required, make connection where it will reflect suction-line pressure at bulb location.

E. Install safety relief valves where required by ASME Boiler and Pressure Vessel Code. Pipe safety-relief-valve discharge line to outside according to ASHRAE 15.

F. Install moisture/liquid indicators in liquid line at the inlet of the thermostatic expansion valve or at the inlet of the evaporator coil capillary tube.

G. Install strainers upstream from and adjacent to the following unless they are furnished as an integral assembly for device being protected:

1. Solenoid valves.

2. Thermostatic expansion valves.
3. Hot-gas bypass valves.
4. Compressor.

H. Install filter dryers in liquid line between compressor and thermostatic expansion valve.

I. Install flexible connectors at compressors.

3.4. PIPING INSTALLATION

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems; indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on Shop Drawings.

B. Install refrigerant piping according to ASHRAE 15.

C. Install piping in concealed locations unless otherwise indicated and except in equipment rooms and service areas.

D. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

E. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.

F. Install piping adjacent to machines to allow service and maintenance.

G. Install piping free of sags and bends.

H. Install fittings for changes in direction and branch connections.

I. Select system components with pressure rating equal to or greater than system operating pressure.

J. Refer to Section 230900 "Instrumentation and Control for HVAC" and 230993 "Sequence of Operation for HVAC Controls" for solenoid valve controllers, control wiring, and sequence of operation.

K. Install piping as short and direct as possible, with a minimum number of joints, elbows, and fittings.

L. Arrange piping to allow inspection and service of refrigeration equipment. Install valves and specialties in accessible locations to allow for service and inspection. Install access doors or panels as specified in Section 083113 "Access Doors" if valves or equipment requiring maintenance is concealed behind finished surfaces.

M. Install refrigerant piping in protective conduit where installed belowground.

N. Install refrigerant piping in rigid or flexible conduit in locations where exposed to mechanical injury.

O. Slope refrigerant piping as follows:

1. Install horizontal hot-gas discharge piping with a uniform slope downward away from compressor.
2. Install horizontal suction lines with a uniform slope downward to compressor.
3. Install traps and double risers to entrain oil in vertical runs.
4. Liquid lines may be installed level.

P. When brazing or soldering, remove solenoid-valve coils and sight glasses; also remove valve stems, seats, and packing, and accessible internal parts of refrigerant specialties. Do not apply heat near expansion-valve bulb.

Q. Install pipe sleeves at penetrations in exterior walls and floor assemblies.

R. Seal penetrations through fire and smoke barriers according to Section 078413 "Penetration Firestops and Smokeseals"

S. Install piping with adequate clearance between pipe and adjacent walls and hangers or between pipes for insulation installation.

T. Install sleeves through floors, walls, or ceilings, sized to permit installation of full-thickness insulation.

U. Seal pipe penetrations through exterior walls according to Section 079201 "Exterior Joint Sealants" for materials and methods.

V. Identify refrigerant piping and valves according to Section 230553 "Identification for HVAC Piping and Equipment."

3.5. PIPE JOINT CONSTRUCTION

A. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.

B. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.

C. Soldered Joints: Construct joints according to ASTM B 828 or CDA's "Copper Tube Handbook."

D. Brazed Joints: Construct joints according to AWS's "Brazing Handbook," Chapter "Pipe and Tube."

1. Use Type BcuP, copper-phosphorus alloy for joining copper socket fittings with copper pipe.
2. Use Type BAg, cadmium-free silver alloy for joining copper with bronze or steel.

E. Threaded Joints: Thread steel pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:

1. Apply appropriate tape or thread compound to external pipe threads unless dry-seal threading is specified.
2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.

F. Steel pipe can be threaded, but threaded joints must be seal brazed or seal welded.

G. Welded Joints: Construct joints according to AWS D10.12/D10.12M.

H. Flanged Joints: Select appropriate gasket material, size, type, and thickness for service application. Install gasket concentrically positioned. Use suitable lubricants on bolt threads.

3.6. HANGERS AND SUPPORTS

A. Hanger, support, and anchor products are specified in Section 230529 "Hangers and Supports for HVAC Piping and Equipment."

B. Install the following pipe attachments:

1. Adjustable steel clevis hangers for individual horizontal runs less than 20 feet long.
2. Roller hangers and spring hangers for individual horizontal runs 20 feet or longer.
3. Pipe Roller: MSS SP-58, Type 44 for multiple horizontal piping 20 feet or longer, supported on a trapeze.
4. Spring hangers to support vertical runs.
5. Copper-clad hangers and supports for hangers and supports in direct contact with copper pipe.

C. Install hangers for copper tubing with the following maximum spacing and minimum rod sizes:

1. Up to 1-1/2 inches: Maximum span, 6 feet; minimum rod size, 3/8 inch.
2. 2 inches and larger: Maximum span, 9 feet; minimum rod size, 1/2 inch.

D. Support multifloor vertical runs at least at each floor.

3.7. FIELD QUALITY CONTROL

A. Perform tests and inspections and prepare test reports.

B. Tests and Inspections:

1. Comply with ASME B31.5, Chapter VI.
2. Test refrigerant piping, specialties, and receivers. Isolate compressor, condenser, evaporator, and safety devices from test pressure if they are not rated above the test pressure.
3. Test high- and low-pressure side piping of each system separately at not less than the pressures indicated in Part 1 "Performance Requirements" Article.

    a. Fill system with nitrogen to the required test pressure.
    b. System shall maintain test pressure at the manifold gage throughout duration of test.
    c. Test joints and fittings with electronic leak detector or by brushing a small amount of soap and glycerin solution over joints.
    d. Remake leaking joints using new materials and retest until satisfactory results are achieved.

3.8. SYSTEM CHARGING

A. Charge system using the following procedures:

1. Install core in filter dryers after leak test but before evacuation.
2. Evacuate entire refrigerant system with a vacuum pump to 500 micrometers. If vacuum holds for 12 hours, system is ready for charging.
3. Break vacuum with refrigerant gas, allowing pressure to build up to 2 psig.
4. Charge system with a new filter-dryer core in charging line.

3.9. ADJUSTING

A. Adjust high- and low-pressure switch settings to avoid short cycling in response to fluctuating suction pressure.

B. Adjust set-point temperature of air-conditioning or chilled-water controllers to the system design temperature.

C. Perform the following adjustments before operating the refrigeration system, according to manufacturer's written instructions:

1. Open shutoff valves in condenser water circuit.
2. Verify that compressor oil level is correct.
3. Open compressor suction and discharge valves.
4. Open refrigerant valves except bypass valves that are used for other purposes.
5. Check open compressor-motor alignment and verify lubrication for motors and bearings.

D. Replace core of replaceable filter dryer after system has been adjusted and after design flow rates and pressures are established.

END OF SECTION 232300

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SECTION 232500
HVAC Water Treatment

PART 1 - GENERAL

1.1. RELATED DOCUMENTS

A. The following documents apply to all required work for the Project: (1) the Contract Drawings, (2) the Specifications, (3) the General Conditions, (4) the Addendum and (5) the Contract (City of New York Standard Construction Contract).

1.2. SUMMARY

A. This Section includes the following HVAC water-treatment systems:

1. Bypass chemical-feed equipment and controls.
2. Chemical treatment test equipment.
3. HVAC water-treatment chemicals.

1.3. DEFINITIONS

A. EEPROM: Electrically erasable, programmable read-only memory.

B. Low Voltage: As defined in NFPA 70 for circuits and equipment operating at less than 50 V or for remote-control, signaling power-limited circuits.

1.4. PERFORMANCE REQUIREMENTS

A. Water quality for HVAC systems shall minimize corrosion, scale buildup, and biological growth for optimum efficiency of HVAC equipment without creating a hazard to operating personnel or the environment.

B. Base HVAC water treatment on quality of water available at Project site, HVAC system equipment material characteristics and functional performance characteristics, and operating personnel capabilities.

C. Closed hydronic systems, including hot-water heating system have the following water qualities:

1. pH: Maintain a value within 8.5 to 9.5.
2. Soluble Copper: Maintain a maximum value of 0.20 ppm.
3. TDS: Maintain a maximum value of 10 ppm.
4. Iron Bacteria: Maintain a maximum value of 0.2 organisms/ml.
5. Water Conditioning Company may submit recommendations for changes in the aforementioned chemicals or concentrations to the Commissioner for approval. Do not make any changes in treatment concentrations, chemicals or methods without the written permission of the Commissioner.

D. Document all cleaning, passivating and fill procedures. Final test results shall include concentrations for the following parameters: pH, inhibitors, glycol, bacteria, iron, copper, suspended solids, phosphate (steel inhibitor), azoles (copper inhibitor).

E. Passivation for Galvanized Steel: For the first 60 days of operation.

1. pH: Maintain a value within 7.5-8.0.
2. Calcium Carbonate Hardness: Maintain a value within 125-200 ppm.
3. Calcium Carbonate Alkalinity: Maintain a value within 125-200 ppm.

1.5. QUALITY ASSURANCE

A. Refer to DDC General Conditions Section 01 40 00 "Quality Requirements".

B. Provide the services of an independent professional water conditioning company for the testing and chemical treatment of heating and air conditioning water systems installed under the Work of this Contract, as approved by the Commissioner.

C. Upon the request of the Commissioner, the water conditioning company shall provide a list of at least three (3) installations of similar capacity in New York.

D. The water conditioning company shall make an analysis of the year round raw water supply to the building and recommend the chemical dosages to be used and shall periodically check, at least six (6) times a year, on the effectiveness of the treatment.

E. The water conditioning company shall instruct operating personnel, selected by the Commissioner in the procedures and tests required to maintain chemical control, and shall during the period of the guarantee make at least six (6) periodic visits to check the effectiveness and adequacy of the chemical treatment.

F. HVAC Water-Treatment Service Provider Qualifications: An experienced HVAC water-treatment service provider capable of analyzing water qualities, installing water-treatment equipment, and applying water treatment as specified in this Section.

G. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by an acceptable testing agency and marked for intended use.

1.6. SUBMITTAL PROCEDURES

A. Refer to DDC General Conditions Section 01 33 00 "Submittal Procedures".

1.7. SUBMITTALS

A. Product Data: Include rated capacities, operating characteristics, furnished specialties, and accessories for the following products:

1. Bypass feeders.
2. Injection pumps.

3. pH controllers.
4. Chemical solution tank
5. Chemical material safety data sheets.

6. Shop Drawings: Pretreatment and chemical treatment equipment showing tanks, maintenance space required, and piping connections to HVAC systems. Include plans, elevations, sections, details, and attachments to other work. Wiring Diagrams: Power and control wiring.

B. Field quality-control test reports.

C. Operation and Maintenance Data: For sensors, injection pumps, and controllers to include in emergency, operation, and maintenance manuals.

D. Other Informational Submittals:

1. Water-Treatment Program: Written sequence of operation on an annual basis for the application equipment required to achieve water quality defined in the "Performance Requirements" Article above.
2. Water Analysis: Illustrate water quality available at Project site.
3. Passivation Confirmation Report: Verify passivation of galvanized-steel surfaces, and confirm this observation in a letter to the Commissioner.

1.8. GUARANTEE SERVICE

A. Scope of Guarantee Service: Provide chemicals and service program to maintain water conditions required above to inhibit corrosion, scale formation, and biological growth for heating, hot-water piping and equipment. Services and chemicals shall be provided for a period of one year from date of Substantial Completion, and shall include the following:

1. Initial water analysis and HVAC water-treatment recommendations.
2. Glycol solution concentration for heat exchangers shall be performed at starting of heating season.
3. Startup assistance to flush the systems, clean with detergents, and initially fill systems with required chemical treatment prior to operation.
4. Periodic field service and consultation.
5. Customer report charts and log sheets.
6. Laboratory technical analysis.
7. Analyses and reports of all chemical items concerning safety and compliance with government regulations.

PART 2 - PRODUCTS

2.1. MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Ampion Corp.
2. Anderson Chemical Co, Inc.
3. Aqua-Chem, Inc.; Cleaver-Brooks Div.
4. Barclay Chemical Co.; Water Management, Inc.
5. Boland Trane Services
6. GE Betz.
7. GE Osmonics.
8. H-O-H Chemicals, Inc.
9. Metro Group. Inc. (The); Metropolitan Refining Div.
10. ONDEO Nalco Company.
11. Watcon, Inc.
12. Or approved equal.

2.2. CHEMICAL EQUIPMENT

A. Manual chemical feed Equipment

1. Bypass Feeders: Steel, with corrosion-resistant exterior coating, minimum 3-1/2-inch fill opening in the top, and 3/4 inch bottom inlet and top side outlet. Quarter turn or threaded fill cap with gasket seal and diaphragm to lock the top on the feeder when exposed to system pressure in the vessel.

    1. Capacity: 5 gal.
    2. Minimum Working Pressure: 150psig.

B. pH Controller:

1. Microprocessor-based controller, 1 percent accuracy in a range from zero to 14 units. Incorporate solid-state integrated circuits and digital LCD display in NEMA 250, Type 12 enclosure with gasketed and lockable door
2. Digital display and touch pad for input.
3. Sensor probe adaptable to sample stream manifold.
4. High, low, and normal pH indication.
5. High or low pH alarm light, trip points field adjustable; with silence switch.
6. Hand-off-auto switch for acid pump.
7. Internal adjustable hysteresis or deadband.

C. Chemical Solution Tanks:

1. Chemical-resistant reservoirs fabricated from high-density opaque polyethylene with minimum 110 percent containment vessel.
2. Molded cover with recess for mounting pump.
3. Capacity: 30 gal

D. Chemical Solution Injection Pumps:

1. Self-priming, positive-displacement; rated for intended chemical with minimum 25 percent safety factor for design pressure and temperature.
2. Adjustable flow rate.
3. Metal and thermoplastic construction.
4. Built-in relief valve.
5. Fully enclosed, continuous-duty, single-phase motor. Comply with requirements in Division 23 Section 23 05 13 "Common Motor Requirements for HVAC Equipment."

E. Chemical Solution Tubing: Polyethylene tubing with compression fittings and joints except ASTM A 269, Type 304, stainless steel for steam boiler injection assemblies.

F. Injection Assembly:

1. Quill: Minimum NPS 1/2 with insertion length sufficient to discharge into at least 25 percent of pipe diameter.
2. Ball Valve: Two-piece, stainless steel as described in "Stainless-Steel Pipes and Fittings" Article below; and selected to fit quill.
3. Packing Gland: Mechanical seal on quill of sufficient length to allow quill removal during system operation.
4. Assembly Pressure/Temperature Rating: Minimum 600 psig at 200 deg F.

2.3. CHEMICAL TREATMENT TEST EQUIPMENT

A. Test Kit: Manufacturer-recommended equipment and chemicals in a wall-mounting cabinet for testing pH, TDS, inhibitor, chloride, alkalinity, and hardness;.

B. Corrosion Test-Coupon Assembly: Constructed of corrosive-resistant material, complete with piping, valves, and mild steel and copper coupons. Locate copper coupon downstream from mild steel coupon in the test-coupon assembly.

2.4. CHEMICALS.

A. Chemicals shall be as recommended by water-treatment system manufacturer that are compatible with piping system components and connected equipment, and that can attain water quality specified in Part 1 "Performance Requirements" Article.

B. Water Softener Chemicals:

1. Mineral: High-capacity, sulfonated-polystyrene ion-exchange resin that is stable over entire pH range with good resistance to bead fracture from attrition or shock. Resin exchange capacity minimum 30,000 grains/cu. ft. of calcium carbonate of resin when regenerated with 15 lb of salt.
2. Salt for Brine Tanks: High-purity sodium chloride, free of dirt and foreign material. Rock and granulated forms are not acceptable.

PART 3 - EXECUTION

3.1. EXECUTION REQUIREMENTS

A. Refer to DDC General Conditions for execution requirements.

3.2. INSTALLATION

A. Install chemical application equipment on concrete bases, level and plumb. Maintain manufacturer's recommended clearances. Arrange units so controls and devices that require servicing are accessible. Anchor chemical tanks and floor-mounting accessories to substrate.

B. Install seismic restraints for equipment and floor-mounting accessories and anchor to building structure. Refer to Division 23 Section "Vibration and Seismic Controls for HVAC Piping and Equipment" for seismic restraints.

C. Install water testing equipment on wall near water chemical application equipment.

D. Install interconnecting control wiring for chemical treatment controls and sensors.

E. Mount sensors and injectors in piping circuits.

F. Bypass Feeders: Install in closed hydronic systems, including hot-water heating and equipped with the following:

1. Install bypass feeder in a bypass circuit around circulating pumps, unless otherwise indicated on Drawings.
2. Install test-coupon assembly in bypass circuit around circulating pumps, unless otherwise indicated on Drawings.
3. Install a gate or full-port ball isolation valves on inlet, outlet, and drain below feeder inlet.
4. Install a swing check on inlet after the isolation valve.

3.3. CONNECTIONS

A. Piping installation requirements are specified in other Division 23 Section 23 05 00 Common Work Results for HVAC. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Install piping adjacent to equipment to allow service and maintenance.

C. Make piping connections between HVAC water-treatment equipment and dissimilar-metal piping with dielectric fittings. Dielectric fittings are specified in Division 23 Section 23 05 00 "Common Work Results for HVAC."

D. Install shutoff valves on HVAC water-treatment equipment inlet and outlet. Metal general-duty valves are specified in Division 23 Section 23 05 23 "General-Duty Valves for HVAC Piping."

E. Confirm applicable electrical requirements in Division 26 Sections for connecting electrical equipment.

F. Ground equipment according to Division 26 Section 26 05 26 "Grounding and Bonding for Electrical Systems."

G. Connect wiring according to Division 26 Section 26 05 19 "Low-Voltage Electrical Power Conductors and Cables."

3.4. FIELD QUALITY CONTROL

A. Perform tests and inspections and prepare test reports.

1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.

B. Remove and replace malfunctioning units and retest as specified above.

C. Sample boiler water at one-week intervals after boiler startup for a period of five weeks, and prepare test report advising Commissioner of changes necessary to adhere to Part 1 "Performance Requirements" Article for each required characteristic. Sample boiler water at four-week intervals following the testing noted above to show that automatic chemical-feed systems are maintaining water quality within performance requirements specified in this Section.

D. At four week intervals following Substantial Completion, perform separate water analyses on hydronic systems to show that manual chemical-feed systems are maintaining water quality within performance requirements specified in this Section. Submit written reports of water analysis advising Commissioner of changes necessary to adhere to Part 1 "Performance Requirements" Article.

E. Comply with ASTM D 3370 and with the following standards:

1. Silica: ASTM D 859.
2. Steam System: ASTM D 1066.
3. Acidity and Alkalinity: ASTM D 1067.
4. Iron: ASTM D 1068.
5. Water Hardness: ASTM D 1126.

3.5. DEMONSTRATION

A. Engage a factory-authorized service representative to instruct the City of New York maintenance personnel to adjust, operate, and maintain HVAC water-treatment systems and equipment.

B. Instruction: Provide a "how-to-use" self-contained breathing apparatus video that details exact operating procedures of equipment.

END OF SECTION 232500

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SECTION 233113
Metal Ducts

PART 1 - GENERAL

1.1. RELATED DOCUMENTS

A. The following documents apply to all required work for the Project: (1) the Contract Drawings, (2) the Specifications, (3) the General Conditions, (4) the Addendum and (5) the Contract (City of New York Standard Construction Contract).

B. LEED General Requirements.

1. Refer to DDC General Conditions.
   a. Section 01 33 00 "Submittal Procedures."
   b. Section 01 74 19 "Construction Waste Management and Disposal."
   c. Section 01 81 19 "Indoor Air Quality Requirements for LEED Buildings."

1.2. SUMMARY

A. Work Included: The work includes, but is not necessarily limited to the following:

1. Ductwork as specified herein, as indicated on the drawings, and as needed for a complete and proper installation.

B. Related Work: The following related items are specified in other sections of the specifications.

1.	Common Work Results for HVAC	Section 230500
2.	Vibration and Seismic Controls for HVAC Piping and Equipment	Section 230548
3.	Ductwork Insulation	Section 230701
4.	Air Duct Accessories	Section 233300
5.	Dampers	Section 233301
6.	Registers, Diffusers and Grilles	Section 233713
7.	Instrumentation and Control for HVAC	Section 230900
8.	Testing for HVAC	Section 230593
9.	Balancing for HVAC	Section 230594

1.3. QUALITY ASSURANCE

A. Refer to DDC General Conditions Section 01 40 00 "Quality Requirements."

B. Manufacturer's Qualifications

1. Firms regularly engaged in manufacture of metal ductwork products of types, materials and sizes required, whose products have been in satisfactory use in similar service for not less than 3 years.

C. Installer's Qualifications

1. Firm with at least 3 years of successful installation experience on projects with ductwork systems similar to that required for project.

1.4. CODES AND STANDARDS

A. SMACNA Standards: Comply with SMACNA's HVAC Duct Construction Standards, Metals and Flexible" for fabrication and installation of metal ductwork.

1. NFPA Compliance: Comply with NFPA 90A "Standard for the Installation of Air Conditioning and Ventilating Systems" and NFPA 90B "Standard for the Installation of Warm Air Heating and Air Conditioning Systems".

1.5. SUBMITTALS

A. Refer to DDC General Conditions Section 01 33 00 "Submittal Procedures."

B. Product Data

1. Submit manufacturer's product data including gages, materials, type of joints, sealing materials and installation instruction for metal ductwork materials and products.

C. Shop Drawings:

1. Submit scaled layout drawings (3/8" = 1'-0") of metal ductwork and fittings including, but not limited to, duct sizes, locations, elevations, slopes of horizontal runs, wall and floor penetrations and connections. Show modifications of indicated requirements made to conform to local shop practice, and how those modifications ensure that free area, materials and rigidity are not reduced.
2. Layouts should include all the room plans, mechanical equipment rooms, etc.
3. Method of attachment of duct hangers to building construction all with all the support details.
4. Coordinate shop drawings with related trades prior to submission.

D. Maintenance Data

1. Submit maintenance data and parts lists for metal ductwork materials and products. Include this data, product data and shop drawings in maintenance manual

1.6. DELIVERY, STORAGE AND HANDLING

A. Protection

1. Protect shop-fabricated and factory-fabricated ductwork, accessories and purchased products from damage during shipping, storage and handling. Prevent end damage, dirt and moisture from entering ducts and fittings.

B. Storage

1. Where possible, store ductwork inside and protect from weather. Where necessary to store outside, store above grade and enclose with waterproof wrapping.

C. During construction, cover the duct openings with sheet metal blanks. Blanks shall be removed just prior to the grilles and end section installation.

PART 2 - PRODUCTS

2.1. MATERIALS

A. Sheet Metal:

1. Aluminum: ASTM B-209, Alloy 3003, Temper H-14.
2. Copper: ASTM B-370.
3. Galvanized Steel: ASTM A527 lock forming quality-galvanizing; ASTM A525 coating designation G-90.
4. Monel: ASTM B-127.
5. Stainless Steel: AISI Type 304.

B. Gauge of Metal:

1. Galvanized steel sheets for ducts, etc., shall be in accordance with the following table, except otherwise specified:
   a. Up to 30 inches (either dimension) — No. 24 gauge
   b. 30 Inches to 54 inches (either dimension) — No. 22 gauge
   c. 54 Inches to 72 inches (either dimension) — No. 20 gauge
   d. 72 Inches and over (either dimension) — No. 16 gauge

C. Duct Hangers:

1. Strap Hangers: Same material as ducts except that hangers for stainless steel duct in unfinished spaces may be galvanized steel.
2. Rod Type Hangers: Mild low carbon steel, unless otherwise specified; fully threaded or threaded each end, with 2 removable nuts each end for positioning and locking rod in place. Unless stainless steel, galvanized or cadmium plated; shop coat with read lead or zinc chromate primer paint.

D. Miscellaneous Ductwork Materials:

1. Sheet metal screws, machine bolts, rivets and nuts, tinned, cadmium plated or approved rust resistant. Bolts shall be button-head stove bolts, 1/4 x 3/4 inch unless otherwise specified.
2. Welding Studs: Erico Fastening Systems, capacitor discharge, low carbon steel, copper flashed.
3. Structural (carbon) steel shapes and steel plates: ASTM A36 shop primed.
4. Stainless steel shapes and plates: ASTM A276 and ASTM A666.
5. Machine Bolt Expansion Anchors:
   a. Non-caulking single unit type: FS FF-S-325, Group II, Type 2, Class, Style 1.
   b. Non-caulking double unit type: FS FF-S-325, Group II, Type 2, Class 2, Style 2.
   c. Self-drilling type: FS FF-3-325, Group III, Types 1 and 2.
6. Duct Liner: Fibrous glass, complying with Thermal Insulation Manufacturers Association (TIMA) AHC-101; of thickness indicated on the drawings.

7. Duct Liner Adhesive: Comply with ASTM C 916 "Specifications for Adhesives for Duct Thermal Insulation".

8. Duct Liner Adhesive: Comply with SMACNA HVAC Duct Construction Standards, Article S2.11.

9. Duct Sealant: Non-hardening, non-migrating mastic or liquid elastic sealant, type applicable for fabrication/installation detail, as compounded and recommend by manufacturer specifically for sealing joints and seams in ductwork.

10. Duct Cement: Non-hardening migrating mastic or liquid neoprene based cement, type applicable for fabrication/installation detail, as compounded and recommended by manufacturer specifically for cementing fitting components, or longitudinal seams in ductwork.

11. Flexible Ducts: Either spiral-wound spring steel with flameproof vinyl sheathing or corrugated aluminum; complying with UL 181. Where installed in unconditioned spaces other than return air plenums, provide 1" thick continuous flexible fiberglass sheath with vinyl vapor barrier jacket.

12. Seams and Joints: Duct seams and joints shall be made in accordance with SMACNA Standards, except as noted. All ducts exposed to weather or located on the roof shall have their transverse joints sealed with tape to make the joints airtight. Tape shall be 1-1/2 inch wide synthetic rubber sealant.

2.2. FABRICATION - GENERAL

A. Fabricate ductwork from galvanized sheet metal of the gauges specified, except as follows:

1. Angles used in conjunction with various types of ductwork shall be fabricated of the same material as the ductwork. Ducts shall be assembled in accordance with SMACNA or ASHRAE Standards.

B. Dissimilar Metals

1. Separate dissimilar metals used for ductwork with gaskets. No separation is required between screws or rivets and the materials they are inserted in.

C. Fabricate duct fittings to match adjoining ducts, and to comply with duct requirements as applicable to fittings. Fabricate elbows with center line radius equal to associated duct width; and fabricate fittings to include turning valves in elbows where shorter radius is necessary. Limit angular tapers to 30 degrees for diverging concentric transition and 60 degrees for converging concentric transition unless otherwise shown on the drawings.

D. Fabricate ductwork with accessories installed during fabrication to the greatest extent possible. Refer to Section 233300 – "Air Duct Accessories" for accessory requirements and Section 233301 -"Dampers" for damper requirement.

E. Fabricate ductwork with a duct liner where indicated on the drawings. Laminate liner to internal surfaces of duct in accordance with instructions by manufacturers of lining and adhesive, and fasten with mechanical fasteners.

F. Provide sleeves and flanges at ductwork penetrations of inside walls, except fire walls where fire dampers (Refer to Section 233301 - "Dampers") are installed. Extend ductwork insulation and vapor barrier through the ductwork sleeve. Sleeves shall be two inches larger than the ductwork plus its insulation.

PART 3 - EXECUTION

3.1. EXECUTION REQUIREMENTS

A. Refer to DDC General Conditions for execution requirements.

3.2. INSPECTION

A. Examine areas and conditions under which metal ductwork is to be installed. Do not proceed with work until unsatisfactory conditions have been corrected.

3.3. INSTALLATION - GENERAL

A. Install ductwork to allow maximum headroom. Properly fabricate seams, brace, stiffen, support and render ducts mechanically airtight. Adjust ducts to suit job conditions. Dimensions may be changed as approved, if cross sectional area is maintained.

B. Pitch horizontal ducts connected to hoods downward toward hood not less than 1 inch in 10 feet.

C. Provide necessary transformation pieces and flexible fiberglass connections (Refer to Section 233300- "Air Duct Accessories" of this specification) for ductwork connected to air handling equipment or air inlet and outlet devices.

D. Field Fabrication

1. Complete fabrication of work at project as necessary to match shop-fabrication work and accommodate installation requirements.

E. Routing

1. Locate ductwork runs, except as otherwise indicated on the drawings, vertically and horizontally and avoid diagonal runs wherever possible. Locate runs as indicated by diagrams, details and notations or, if not otherwise indicated, run ductwork in shortest route which does not obstruct useable space or block access for servicing building equipment. Hold ducts close to walls, overhead construction, columns, and other structural and permanent enclosure elements of the building. Limit clearance to 1/2" where furring is indicated for enclosure or concealment of ducts, but allow for insulation thickness, if any. Where possible, locate insulated ductwork for minimum of 1" clearance outside of insulation. In finished and occupied spaces, conceal ductwork from view, by location in mechanical shafts, furred wall construction or above suspended ceilings. Do not encase horizontal runs in solid partitions, except where specifically indicated. Coordinate layouts with suspended ceiling and lighting layouts and similar finished work.

F. Electrical Equipment Spaces

1. Do not route ductwork through electric service room and equipment spaces.

G. Penetrations

1. Where ducts pass through interior partitions and are exposed to view, conceal space between construction opening and duct or duct insulation with sheet metal flanges of same gauge as duct. Overlap opening on 4 sides by at least 1 1/2". Where ducts pass through fire-rated floors, walls or partitions, provide firestopping between duct and fire dampers in accordance with requirements of 07 84 13 Firestops and Smokeseals.

H. Coordination

1. Coordinate duct installation with installation of accessories, dampers, equipment, controls and other associated work of ductwork system.

3.4. INSTALLATION OF DUCT LINER

A. Install duct liner in accordance with SMACNA HVAC Duct Construction Standards.

3.5. INSTALLATION OF FLEXIBLE DUCTS

A. Maximum Length

1. For any duct run using flexible ductwork, do not exceed 5'-0" extended length.

B. Installation

1. Install in accordance with Section III of SMACNA's "HVAC Duct Construction Standards, Metal and Flexible" and manufacturer's specifications.

3.6. SEALING SEAMS, JOINTS AND PENETRATIONS

A. Seal ductwork in accordance with the SMACNA Manual except for the following:

1. Ductwork Specified to be Insulated: Conform with Seal Class A for all pressure classes.
2. Cooking Equipment Exhaust Ductwork: Conform with NFPA 96.
3. Horizontal Ductwork for Dishwashing Exhaust:
   a. Continuously seal transverse joints vaporite along bottom, and up both sides 2 inches minimum.
   b. Continuously seal longitudinal seams vaporite if seams are approved to be located at bottom of duct.

3.7. HANGER AND SUPPORT

A. All ducts shall be run at the levels indicated on the drawings, as close to the ceiling as possible, excepting where pipes or electric conduits are indicated as passing above them. They shall be installed within enclosing work (hung ceiling or furring) indicated on the drawings and shall not interfere with its construction. Horizontal ducts shall be supported on galvanized steel hangers. For duct having a cross-sectional area of 4-square feet or less, the hangers shall be located near each duct joint and shall be spaced not more than 8-feet apart. For ducts having a cross-sectional area greater than 4-square feet, the hangers shall be located near each duct joint and duct brace, and shall be spaced not more than 4-feet apart. Where one duct is run below another duct of greater width, the lower duct shall be hung from the braces of the upper duct by means of strap hangers bolted to the braces of the upper duct. The braces of the upper duct. The braces of the upper duct shall be increased in thickness in such cases.

B. Inserts

1. When the floor and/or roof slab construction for the project is of conventional reinforced poured concrete type, the following directions apply: Overhead ductwork shall be supported by hangers secured to inserts before the floor slabs are poured. Inserts shall be approved by the New York City Department of Buildings. Attachment of hangers to existing slabs of this type of construction shall be made with NYC DOB approved self-drilling concrete anchors.

2. When the floor and/or roof slab construction are pre-cast concrete slabs. The following directions apply; overhead ductwork shall be supported by hangers secured to the precast slabs.

C. Vertical ducts shall be supported at each floor level with steel angle braces extending around duct and with an end of an angle extending beyond duct and resting on the floor construction at each corner of the duct. Supporting angles shall be 1" x 1" x 1/8" for ducts up to 30-inches (in either dimension). 1-1/4" x 1-1/4" x 1/8" from 30 to 60 inches and 1-1/2" x 1-1/2" x 1/8" 60 inches and above.

3.8. HANGERS FOR DUCTS

A. Install hangers for ducts as specified in the SMACNA Manual with the following exceptions:

1. Rectangular ducts up to 42 inches wide, not having welded or soldered seams, and supported from overhead construction shall have strap hangers extended down each side of the duct and turned under bottom of duct a minimum of 2 inches. Secure hanger to duct with 3 full thread sheet metal screws, one in the bottom and 2 in the side of the duct.

2. Rectangular ducts 43 inches wide and over, and all sizes of duct with welded or soldered seams, and supported from overhead construction; use trapeze hangers.

3. Prime coat plain steel rods threaded at the site immediately after installation with zinc chromate primer paint.

3.9. UPPER HANGER ATTACHMENTS

A. General:

1. Secure hanger attachments to structural steel or steel bar joists wherever possible
2. Do not use drive-in beam clamps, flat bars or bent rods, as upper hanger attachments.
3. Do not attach hangers to steel deck which are not to receive concrete fill.
4. Do not attach hangers to cast in place concrete planks less than 2-3/4 inches thick.
5. Avoid damage to reinforcing members in concrete construction.
6. Metallic fasteners installed with electrically operated or power driven tools may be used as upper hanger attachments, in accordance with the SMACNA Manual, with the following exceptions:
   a. Do not use power driven drive pins or expansion nails.
   b. Do not attach power driven or welded studs to structural steel less than 3/16 inch thick.
   c. Do not support a load, in excess of 250 lbs. from any single welded or power driven stud.
   d. Do not use power driven fasteners in cast in place concrete.

B. Attachment to Steel Frame Construction

1. Provide intermediate structural steel members where required by ductwork support spacing. Select steel members for use as intermediate supports based on a minimum safety factor of 5.
2. Secure upper hanger attachments to steel bar joists at panel point of joists.
3. Do not drill holes in main structural steel members.

C. Attachment to Cast in Place Concrete:

1. Secure hangers to overhead construction with self-drilling type expansion anchors and machine bolts.
2. Secure hanger attachments required to be supported form wall or floor construction with single unit expansion anchors or self-drilling type expansion anchors and machine bolts.

3.10. DUCT RISER SUPPORTS, UNDER 2 INCHES W.G.

A. Unless otherwise specified or shown on the drawings, support vertical rectangular duct by means of two steel angles, secured to duct and resting on floor slab or adjacent structural steel member at every other floor through which the duct passes. Size supports as follows:

Max. Side Dimension (Inches)	Support Angle (Inches)	Secure to Duct With	Min. Bearing at Each End (Inches)
36	1 x 1 x 1/8	Screws	2
48	1-1/2 x 1-1/2 x 1/8	Bolts	3

3.11. OPENINGS IN WALLS AND FLOORS

A. In Walls

1. In general, form openings in walls for the passage of ducts. Coordinate the exact location and size (including clearances) of each opening required. The openings shall be cut, framed and provided with sufficiently strong lintels. The jambs shall be built square and plumb and shall be finished to match the adjoining work.

B. In Floors

1. When the floor and/or roof slab construction for the project is the composite metal deck type, consisting of corrugated sheet steel and reinforced concrete, the following directions apply: Any opening, which is not framed by structural steel beams on all sides (refer to the structural steel drawings) and which is required in steel decking for the installation of HVAC work shall be cut by the HVAC installer. Openings shall be made by installing the proper size form (prior to the pouring of concrete) and cutting the metal deck when the ducts are to be installed. Holes greater than 6 inches but less than 30 inches in any dimension must be reinforced. Holes 6-inches or less in any dimension need not be reinforced.

2. When the floor or roof slab construction for the project is precast concrete, concrete type, the following directions apply: provide openings in the slabs for the passage of ducts.

3.12. FIELD QUALITY CONTROL

A. Leakage Tests

1. After duct system is completed, test for duct leakage in accordance with SMACNA HVAC Air Duct Leakage Test Manual. Seal ductwork in accordance with the SMACNA Manual to confirm to Seal Class A. All leakage tests to be performed by NEBB-certified Testing and Balancing Contractor.

3.13. CONNECTIONS

A. General

1. Connect metal ductwork to equipment as indicated, provide flexible connection for each ductwork connected to equipment mounted on vibration isolators, and/or equipment containing rotating machinery. (Refer to Section 233300 - "Ductwork Accessories", for flexible connectors).

B. Coordinate to ensure that access doors have been provided in hung ceilings and any other required places for proper operation and maintenance.

3.14. ADJUSTING AND CLEANING

A. Clean ductwork internally of dust and debris as it is installed. Clean external surfaces of foreign substances which might cause corrosive deterioration of metal or where ductwork is to be painted might interface with painting or cause paint deterioration.

B. Paint the ductwork as per Section 099000- "Painting and Finishing."

C. Balancing

1. Refer to Section 230594- "Balancing for HVAC." Seal any leaks in ductwork that become apparent in balancing process.

END OF SECTION 233113

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SECTION 233300
Air Duct Accessories

PART 1 - GENERAL

1.1. RELATED DOCUMENTS

A. The following documents apply to all required work for the Project: (1) the Contract Drawings, (2) the Specifications, (3) the General Conditions, (4) the Addendum and (5) the Contract (City of New York Standard Construction Contract).

1.2. SUMMARY

A. Work Included: The work includes, but is not necessarily limited to, the following:

1. All the duct accessories specified herein, as shown on the drawings along with all the auxiliary work needed for a complete and proper installation. The types of ductwork accessories specified in this section include the following: turning vanes, duct hardware, duct access doors and flexible connections.

B. Related Work: The following related items are specified herein and in other sections of the specifications:

1.	Common Work Results for HVAC	Section 230500
2.	Identification for HVAC Piping and Equipment	Section 230553
3.	Metal Ducts	Section 233113
4.	Instrumentation and Control for HVAC	Section 230900
5.	Sequence of Operations for HVAC Controls	Section 230993
6.	Testing for HVAC	Section 230593
7.	Balancing for HVAC	Section 230594

1.3. QUALITY ASSURANCE

A. Refer to DDC General Conditions Section 01 40 00 "Quality Requirements."

B. Manufacturer's Qualifications: Firms regularly engaged in manufacture of ductwork accessories of types and sizes required whose products have been in satisfactory use in similar service for not less than 3 years.

C. Codes and Standards:

1. SMACNA Compliance: Comply with applicable portions of SMACNA "HVAC Duct Construction Standards, Metal and Flexible".

2. Industry Standards: Comply with ASHRAE recommendations pertaining to construction of ductwork accessories, except as otherwise indicated on the drawings.

3. NFPA Compliance: Comply with applicable provisions of NFPA 90A "Air Conditioning and Ventilating Systems", pertaining to installation of ductwork accessories.

1.4. SUBMITTALS

A. Refer to DDC General Conditions Section 01 33 00 "Submittal Procedures."

1. Product Data: Submit manufacturer's catalog sheets product data for each type of ductwork accessory, including dimensions capacities, and materials of construction; and installation instructions.

2. Shop Drawings: Submit manufacturer's assembly-type shop drawings for each type of ductwork accessory showing interfacing requirements with ductwork, method of fastening or support, and methods of assembly of components. Submit SMACNA Figure Numbers for each shop fabricated item.

3. Maintenance Data: Submit manufacturer's maintenance data including parts lists for each type of duct accessory. Include this data, product data, and shop drawings in maintenance manual; in accordance with requirements of DDC General Conditions.

PART 2 - PRODUCTS

2.1. MATERIALS AND MANUFACTURERS

A. Turning Vanes:

1. Fabricated Turning Vanes: Provide fabricated turning vanes and vane runners, constructed in accordance with SMACNA "HVAC Duct Construction Standards".

2. Acoustic turning Vanes: Provide acoustic turning vanes constructed of airfoil shaped aluminum extrusions with perforated faces and fiberglass fill.

3. Manufacturer: Subject to compliance with the specification requirements, provide turning vanes of one of the following:

a. Anemostat Products Div; Dynamics Corp of America. Duro Dyne Corp.
b. Tuttle & Bailey, Hart & Cooley Mfg. Co.
c. Titus Product, Div. of Phillips Inds.
d. Or Approved Equal

B. Duct Hardware:

1. Provide test hole fittings for making air readings, on both (opposite) sides of discharge duct from all supply and exhaust fans, at set dampers on supply branch ducts, and at other locations where shown on the drawings for the proper adjusting and testing of the ventilating systems. No test hole fittings are required for roof type or other propeller type fans. Each fitting shall consist of an aluminum casting similar in design to that shown on the Detail

Drawings. If required, provide test hole fitting for microprocessor type of instrument reading either local or remote.

2. Manufacturer: Subject to compliance with the specification requirements, provide duct hardware of one of the following:

   a. Duro Dyne Corp.
   b. Young Regulator Co.
   c. Titus Product, Div. of Phillips Inds.
   d. Or Approved Equal

C. Duct Access Doors:

1. General: Provide where indicate, duct access doors of size indicated and at locations required to permit inspections, operation and maintenance of all valves, all coils, controls, fire dampers, fire/smoke dampers, automatic or motorized dampers, or other apparatus concealed behind the sheet metal work.

2. Construction: Construct of same or greater gage as ductwork served, provide insulated doors for insulated ductwork. Provide flush frames for uninsulated ductwork, extended frames for externally insulated duct. Provide one size hinged, other side with one handle-type latch for doors 12" high and smaller, 2 handle-type latches for larger doors.

3. Refer to Section 083113 Access Doors: specifications for access doors for access to valves, dampers and all the equipment mentioned above which are concealed in walls, furring and hung ceilings, or as indicated on the drawings.

4. Manufacturer: Subject to compliance with requirements, provide duct access doors of one of the following:

   a. Air Balance Inc.
   b. Duro Dyne Corp.
   c. Rushkin Mfg. Co.
   d. Or Approved Equal

D. Fan Connections (Flexible Connections)

1. Provide an air-tight fabric neck at the inlet and at the outlet connection of all air handling unit, supply fans and exhaust fans and where ductwork connects to any vibration isolation equipments.
2. Necks shall be not less than 3-inches nor more than 10 inches in width and both sides shall be secured in a crimped lock seam for the entire perimeter to galvanized sheet steel bands 3-inches in width. This assembly shall be securely fastened to ducts and to fans, and the joints shall be made airtight. Necks shall not be oiled or painted. Neck fabric shall be one of the following materials:

a. Cotton duck, 10-ounces per square yard minimum weight (treated for fire, water, and mildew resistance).

b. Flameproof elastomeric coated glass fabric, weighing not less than 14-ounces per square yard, having a tensile strength of 200 psi (minimum) and having a heat resistance of up to 500 degrees F.

c. Close woven glass cloth, double neoprene coated, 28-ounces per square yard minimum weight.

3. Manufacturer: Subject to compliance with the specification requirements, provide fans connections of one of the following:

a. Duro Dyne Corp.
b. Flexaust (The) Co.
c. Rushkin Mfg. Co.
d. Or Approved Equal

E. Heat and Smoke Detecting Devices

1. Install heat detecting devices and smoke detecting devices in the ductwork at various locations or as indicated on the drawings. Provide access door in the duct near each detector. Operate the fans of the ventilating systems concerned, for the purpose of testing the heat and smoke detectors when so requested.

2. Inform of the proper temperature setting required for each heat detector. This temperature shall be approximately 40 degrees F (but not more than 50 degrees F) higher than the operating temperature of the system in which the heat detector is located.

PART 3 - EXECUTION

3.1. EXECUTION REQUIREMENTS

A. Refer to DDC General Conditions for execution requirements.

3.2. INSPECTION

A. Examine areas and conditions under which ductwork accessories will be installed. Do not proceed with work until unsatisfactory conditions have been corrected in manner acceptable to the Commissioner.

3.3. INSTALLATION OF DUCTWORK ACCESSORIES

A. Install ductwork accessories in accordance with manufacturer's installation instructions, with applicable portions of details of construction as shown in SMACNA standards, and in accordance with recognized industry practices to ensure that products serve intended function.

B. Install turning vanes in square or rectangular 90 degree elbows in supply and exhaust air systems, and elsewhere as indicated on the drawings.

C. Install access doors to open against system air pressure, with latches operable from either side, except outside only where duct is too small for person to enter.

D. Coordinate with other work, including ductwork, as necessary to interface installation of ductwork accessories properly with other work.

3.4. FIELD QUALITY CONTROL

A. Operate installed ductwork accessories to demonstrate compliance with requirements. Test for air leakage while system is operating. Restore or replace faulty accessories, as required to obtain proper operation and leakproof performance.

3.5. ADJUSTING AND CLEANING

A. Adjusting: Adjusting ductwork accessories for proper settings.

B. Label access doors in accordance with Section 230553 "Identification for HVAC Piping and Equipment".

C. Cleaning: Clean factory-finished surfaces. Restore any marred or scratched surfaces with manufacturer's touch-up paint.

END OF SECTION 233300

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SECTION 233301
Dampers

PART 1 - GENERAL

1.1. RELATED DOCUMENTS

A. The following documents apply to all required work for the Project: (1) the Contract Drawings, (2) the Specifications, (3) the General Conditions, (4) the Addendum and (5) the Contract (City of New York Standard Construction Contract).

1.2. SUMMARY

A. Work Included: The work includes, but is not necessarily limited to the following:

1. All dampers specified herein, as indicated the drawings or as needed for a complete and proper installation.

1.3. RELATED WORK

A. The following related items are specified in other sections of the specification:

1.	Common Work Results for HVAC	Section 230500
2.	Identification for HVAC Piping and Equipment	Section 230553
3.	Metal Ducts	Section 233113
4.	Air Duct Accessories	Section 233300
5.	Testing for HVAC	Section 230593
6.	Balancing for HVAC	Section 230594
7.	Instrumentation and Control for HVAC	Section 230900
8.	Sequence of Operations for HVAC Controls	Section 230993

1.4. QUALITY ASSURANCE

A. Refer to DDC General Conditions Section 01 40 00 "Quality Requirements."

B. Manufacturer's Qualifications: Firms regularly engaged in manufacturer of dampers, of types and sizes required, whose products have been in satisfactory in similar service for not less than three (3) years.

C. Codes and Standards:

1. SMACNA Compliance: Comply with applicable portions of SMACNA "HVAC Duct Construction Standards, Metal and Flexible".

2. UL Compliance: Construct, test and label fire damper in accordance with UL Standard 555 "Fire Dampers and Ceiling Dampers".

1.5. SUBMITTAL PROCEDURES

A. Refer to DDC General Conditions Section 01 33 00 "Submittal Procedures."

1.6. SUBMITTALS

A. Product Data: Submit catalog sheets data for each type of damper, including dimensions, and materials of construction and installation instructions.

B. Shop Drawings: Submit manufacturer's assembly-type shop drawings for each type of damper showing interfacing requirements with ductwork, method of fastening or support, and methods of assembly of components.

C. Maintenance Data: Submit manufacturer's maintenance data including parts lists for each type of dampers. Include this data, product data, and shop drawings in maintenance manual.

PART 2 - PRODUCTS

2.1. MANUFACTURERS

A. Manufacturer: Subject to compliance with requirements, provide dampers of one of the following:

1. Air Balance, Inc.
2. Penn Ventilator Co.
3. Ruskin Mfg. Co.
4. Or approved equal.

B. Volume Control Dampers

1. Opposed blade type, frames of all welded construction utilizing channel iron members in galvanized steel ducts, extruded members in aluminum ducts and stainless steel in stainless steel ducts. Fabricate frames of 2 inch wide x 1/2 inch legs x 1/8 inch thick (minimum) members for dampers less than 10 sq.ft. in size and 2 inch wide x 1 inch leg x 1/8 inch thick (minimum) for larger sizes. Fabricate blades from No. 16 gage (minimum) metal, of same material as duct in which installed with 3 horizontal grooves, 2 turned edges and trunnion mounted in brass sleeve or ball bearings. Space bearings on maximum 48 inch centers. Single blade dampers are unacceptable for duct over 11 inches in height. Weld motor

mounting bracket to damper frame for electric motor operated dampers. Provide cable operated dampers at all branches where access doors cannot be installed.

C. Splitter Dampers

1. Fabricate dampers of same material as duct in which installed with rolled or hemmed edges. Provide blades in ducts having a maximum side dimension less than 24 inches of same gage as duct, and in ducts having a maximum side dimension 24 inches and over provide blades 2 gages heavier than duct.

2.2. DAMPER MOTORS

A. Manufacturers:

1. Barber-Colman Co.
2. Honeywell Inc.
3. Johnson Controls, Inc.
4. Or Approved Equal

B. Two position spring return capacitor type gear motor with nylon bearings and oil immersed gear train, designed to operate on 120V, 60Hz, 1 phase service. Furnish suitable damper linkage with each motor.

1. Operation: When motor is energized, damper blades open when de-energized spring return closes damper.

2.3. FIRE AND SMOKE DAMPERS

A. Fire Dampers

1. Provide fire dampers of types and sizes indicated on the drawings. Construct casings of galvanized steel with bonded red acrylic enamel finish. Provide fusible link rated at 160 degrees to 165 degrees F unless otherwise indicated. Provide damper with positive lock in closed position and with the following additional features:

a. Blade Material: Steel, match casing.

B. Fire/Smoke Dampers

1. Provide motor-driven fire smoke dampers in types and sizes indicated on the drawings, with casing constructed of galvanized steel, fire rated at 212 degrees F, stainless steel negator spring to assure positive closing when mounted in either vertical or horizontal position together with stainless steel jamb gasket to provide a Class II fire retardant smoke seal. The damper shall also close upon power interruption from the smoke detectors. Dampers operators shall be electric motors equipped with instant closure clutch, stainless steel cable damper blade linkage, motor mounting brackets, and long wire leads for connecting to smoke detector. Damper shall have the following construction feature:

a. Unit Assembly: Motor mounted outside air stream.

2.4. AUTOMATIC DAMPERS

A. Install automatic dampers supplied by the automatic control system manufacturer. Notch end of rod and label duct or casing to indicate open or closed position.

PART 3 - EXECUTION

3.1. EXECUTION REQUIREMENTS

A. Refer to DDC General Conditions for execution requirements.

3.2. INSPECTION

A. Examine areas and conditions under which dampers will be installed. Do not proceed with work until unsatisfactory conditions have been corrected.

3.3. INSTALLATION

A. Install damper in accordance with manufacturer's installation instructions.

B. Install access doors and fire rated access door as required.

C. Coordinate with other work, including ductwork, as necessary to interfere installation of damper properly with other work. Dampers shall but depend on duct and ductwork hangers for their support.

3.4. FIELD QUALITY CONTROL

A. Operate damper to demonstrate compliance with requirements. Test for air leakage while system is operating. Restore or replace faulty components, as required to obtain proper operation and leakproof performance.

3.5. ADJUSTING

A. Adjust damper for proper settings, install fusible links in fire dampers and adjust for proper action.

B. Label access doors in accordance with Section 230553: "Identification for HVAC Piping and Equipment".

C. Final positioning of manual dampers is specified in Section 230594: "Balancing for HVAC".

END OF SECTION 233301

SECTION 233416
Centrifugal HVAC Fans

PART 1 - GENERAL

1.1. RELATED DOCUMENTS

A. The following documents apply to all required work for the Project: (1) the Contract Drawings, (2) the Specifications, (3) the General Conditions, (4) the Addendum and (5) the Contract (City of New York Standard Construction Contract).

B. LEED General Requirements:

1. Refer to DDC General Conditions.
   a. Section 01 33 00 "Submittal Procedures."
   b. Section 01 81 19 "Indoor Air Quality Requirements for LEED Buildings."
   c. Section 01 91 13 General Commissioning Requirements for MEP Systems.

1.2. SUMMARY

A. Work Included: The work includes, but is not necessarily limited to, the following:

1. Power centrifugal fans as specified herein, as indicated on the drawings, and as required for a complete and proper installation.

B. Related Work: The following related items are specified in other sections of the specifications:

1.	Metal Ducts	Section 233113
2.	Instrumentation and Control for HVAC	Section 230900
3.	Sequence of Operations for HVAC Controls	Section 230993
4.	Common Motor Requirements for HVAC Equipment	Section 230513
5.	Testing for HVAC	Section 230593
6.	Balancing for HVAC	Section 230594

1.3. QUALITY ASSURANCE

A. Refer to DDC General Conditions Section 01 40 00 "Quality Requirements."

B. Manufacturer's Qualifications: Firms regularly engaged in manufacture of centrifugal fans of types and sizes required, whose products have been in satisfactory use in similar service for not less than 3 years.

C. Code and Standards:

1. AMCA Compliance: Provide centrifugal fans bearing the AMCA Certified Ratings Seal. Sound rate centrifugal fans in accordance with AMCA 300 "Test Code for Sound Rating Air Moving Devices".

2. UL Compliance: Provide centrifugal fan electrical components, which have been listed and labeled by UL.

3. ASHRAE Compliance: Test and rate centrifugal fans in accordance with ASHRAE 51 (AMCA 210) "Laboratory methods of Testing Fans for Rating".

1.4. SUBMITTAL PROCEDURES

A. Refer to DDC General Conditions Section 01 33 00 "Submittal Procedures."

1.5. SUBMITTALS

A. Submit manufacturer's product data for power centrifugal fans, including specifications, capacity ratings, and fan performance curves with operating point clearly indicated, gages and finishes of materials, dimensions, weights, accessories furnished, and installation instructions.

B. Shop Drawings: Submit assembly-type shop drawings showing fan dimensions, required clearances, construction details, and field connection details.

C. Wiring Diagrams: Submit manufacturer's electrical requirements for power supply wiring to fan units. Submit manufacturer's wiring diagrams for interlock and control wiring. Clearly differentiate between portions of wiring that are factory installed and portions to be field installed.

D. Test Reports: Submit for each fan, complete performance curves showing Static Pressure vs CFM; HP vs CFM and efficiency vs CFM. Curves shall show operator all she rated RPM and at 20% above and below the rated RPM. In addition submit the noise rating in decibels (flat response without network), at the design (flat response without network), at the design operation point for each fan.

E. Maintenance Data: Submit maintenance instructions, including lubrication instructions, motor and drive replacement, and spare parts lists. Include this data, product data, shop drawings, and wiring diagrams in maintenance manuals.

1.6. DELIVERY, STORAGE AND HANDLING

A. Deliver centrifugal fans with factory-installed shipping skids and lifting lugs; pack components in factory-fabricated protective containers.

B. Handle centrifugal fans carefully to avoid damage to components, enclosures and finish. Do not install damaged components, replace and return damaged components to manufacturer.

C. Store centrifugal fans in clean dry place and protect from weather and construction traffic.

D. Comply with manufacturer's rigging and installation instructions for unloading centrifugal fans and moving them to final location.

1.7. SITE CONDITIONS

A. Examine the drawings, visit the site, and take measurements to make sure that the equipment will fit in the spaces allocated, and that the equipment can be brought to the site.

PART 2 - PRODUCTS

2.1. FANS

A. General

1. Fans shall be of type, capacity, motor location, discharge location, rotation and constructed for Class 1 operating limits, unless otherwise indicated. Fans shall be guaranteed not to overload the motor under any condition. Unless otherwise called for, all fans shall be arrangement No. 3 or as noted on the drawings.

2. Select fans for the air quantities and static pressure indicated on the drawings, of size and speed so as to allow for a change in volume, without operating in an unstable range.

3. The requirements of this Section do not apply to centrifugal fans incorporated in catalogued completed packaged units, unless otherwise indicated.

2.2. CENTRIFUGAL FANS

A. General

1. Provide centrifugal fans of sizes and arrangement, and of capacities and having accessories as scheduled and as indicated on the drawings.

B. Fan Units

1. Provide factory-assembled and tested fan units consisting of housing, wheel, fan shaft, bearings, and side support structure. Clean condition and prime paint sheet metal parts prior to final assembly. Apply final coat of enamel to exterior surfaces after assembly (Refer to Painting - Section 09900). Each fan shall bear the Certified Ratings Performance Seal of the AMCA, do not cover the seal with paint. All outdoor installed fans shall be weatherproof construction.

C. Housings

1. Provide curved scroll housings; lockseam construction for sizes 36" and smaller and spot welded construction for sizes 36" to 60".

D. Wheels

1. Provide backwardly inclined plate-type blades for sizes 22" and smaller, non-power-overloading backwardly inclined air foil blades for sizes 24" and larger. Weld blades to wheel rim and hub plate. Key wheels to shafts. Statically and dynamically balance wheels after assembly.

E. Shafts

1. Construct of solid hot-rolled steel, turned and polished.

F. Provide either oil lubricated babbitted sleeve bearings or grease lubricated ball (or roller) bearings, in accordance with the following requirements.

1. Sleeve Bearings: These bearings shall be lined with the best grade babbitted metal and shall be self-lubricated by means or ring oilers. An oil cup and an oil gauge with shield shall be provided for each bearing and shall be installed in an accessible location. Graphite

impregnated bearings will not be accepted. Wearing surfaces of each bearing shall be self-aligning, easy of adjustment and larger enough to operate with minimum heating. They shall be enclosed in heavy wrought or cast iron standards, securely bolted in place. Bearings on the drive side of fans shall be non-expansion type, and those on the opposite side shall be expansion type.

2. Ball or Roller Bearings

a. These bearings shall be designed for heavy duty service. Bearings on drive side of fans shall be non-expansion type, and those on the opposite side shall be expansion type. Bearings shall be self-aligning pillow-block type with either single row ball or double row spherical roller in one-piece or two-piece cast iron housing.

b. Fan manufacturer shall certify that bearings being furnished have been selected in accordance with bearing manufacturer's recommendation for a minimum B-10 life of 40,000 hours (average life of 200,000 hours), based on the optimum speed range of the fan's AMCA class. Calculations of bearing manufacturer shall be supplied, if required.

c. Each bearing shall be equipped with a lubrication pressure fitting, provided with pressure relief feature to prevent excessive pressure build-up on the seals. Contractor shall furnish to the Commissioner one pound of recommend lubricant for each fan, and one lubrication gun for the entire project.

d. Each fan having a wheel diameter of 27 inches or less shall have two ball bearings, either in a single pillow block or in separate pillow blocks.

e. Manufacturers:

1. Dodge Manufacturing Co.
2. Fafnir Bearing Co.
3. Link-Belt Co.
4. Sealmaster
5. SKF Industries
6. Or Approved Equal

G. Motors

1. Provide energy efficient motors in accordance with Section 230513 "Common Motor Requirements for HVAC Equipment".

H. Drive

1. Provide multiple matched V-belt drive with minimum 1.4 times rated motor horsepower. Provide adjustable pitch sheave on motor shaft, selected for midpoint at design conditions.

I. Vibration Control

1. Provide as specified on Section 230548 "Vibration and Seismic Controls for HVAC Piping and Equipment."

J. Accessories

1. Provide the following accessories as indicated and/or scheduled on the drawings:
2. Access Doors: Provide access door in scroll housing, with latch-type handles, flush mounted.
3. Extended Grease Lines: Extend grease lines from bearings to outside of inlet duct flange, terminate with grease fitting.
4. Heat Slingers: Provide metal disc between bearings and fan wheel, to dissipate heat from shaft.
5. Shaft Seals: Provide tight seal around shaft on drive side.
6. Belt Guards: Provide ventilated belt guards with tachometer opening for fan speed measurements, in accordance with OSHA requirements.
7. For fans mounted on the roof, provide outdoor construction design and protective weather hood with stamped vents over motor and drive compartment.

K. Manufacturers

1. Subject to compliance and approval with requirements, manufacturers offering centrifugal fans which may be incorporated in the work include the following:
   a. Greenheck
   b. Cook
   c. Penn Ventilator Co. Inc.
   d. Or approved equal.

2.3. INLINE CENTRIFUGAL FANS

A. General: Provide inline centrifugal fans of sizes and arrangement as indicated and of capacities and having accessories as scheduled all as indicated on the drawings.

B. Fans shall be of the duct mounted centrifugal belt driven in-line type.

C. The fan housing shall be of the square design constructed of heavy gauge galvanized steel and shall include square duct mounting collars.

D. Fan construction shall include two removable access panels located perpendicular to the motor mounting panel. The access panels must be of sufficient size to permit easy access to all interior components.

E. The fan wheel shall be centrifugal backward inclined, constructed of aluminum and shall include a wheel cone carefully matched to the inlet cone for precise running tolerances. Wheels shall be statically and dynamically balanced.

F. Motors shall be heavy duty ball bearing type, carefully matched to the fan load and furnished at the specified voltage, phase and enclosure. Motors and drives shall be mounted out of the air stream. Motors shall be readily accessible for maintenance.

G. Precision ground and polished fan shafts shall be mounted in permanently sealed, lubricated pillow block ball bearings. Bearings shall be selected for a minimum (L50) life in excess of 200,000 hours at maximum cataloged operating speed.

H. Drives shall be sized for a minimum of 150% of driven horsepower.

I. Pulleys shall be of the fully machined cast iron type, keyed and securely attached to the wheel and motor shafts.

J. Motor pulleys shall be adjustable for final system balancing. A NEMA 1 disconnect switch shall be provided as standard. Factory wiring shall be provided from motor to the handy box.

K. Each fan shall bear a permanently affixed manufacturer's nameplate containing the model number and individual serial number for future identification.

L. Gas room ventilation fan shall be explosion proof construction.

2.4 BACKWARD-INCLINED CENTRIFUGAL FANS

A. Description: Factory-fabricated, -assembled, -tested, and -finished, belt-driven centrifugal fans consisting of housing, wheel, fan shaft, bearings, motor and disconnect switch, drive assembly, and support structure.

B. Housings: Formed panels to make curved-scroll housings with shaped cutoff; with doors or panels to allow access to internal parts and components.

C. Panel Bracing: Steel angle- or channel-iron member supports for mounting and supporting fan scroll, wheel, motor, and accessories. Split housings are an optional configuration.

1. Horizontally split, bolted-flange housing.

2. Spun inlet cone with flange.

3. Outlet flange.

D. Backward-Inclined Wheels: Single-width-single-inlet and double-width-double-inlet construction with curved inlet flange, backplate, backward-inclined blades welded or riveted to flange and backplate; cast-iron or cast-steel hub riveted to backplate and fastened to shaft with set screws.

E. Shafts: Statically and dynamically balanced and selected for continuous operation at maximum rated fan speed and motor horsepower, with final alignment and belt adjustment made after installation.

1. Turned, ground, and polished hot-rolled steel with keyway. Ship with a protective coating of lubricating oil. Designed to operate at no more than 70 percent of first critical speed at top of fan's speed range.

F. Prelubricated and Sealed Shaft Bearings: Self-aligning, pillow-block-type ball bearings.

G. Belt Drives: Factory mounted, with final alignment and belt adjustment made after installation.

H. Scroll Access Doors: Shaped to conform to scroll, with quick-opening latches and gaskets.

1. Cleanout Door: Bolted gasketed door allowing access to fan scroll, of same material as housing.

2. Companion Flanges: Rolled flanges for duct connections of same material as housing.

3. Variable Inlet Vanes: With blades supported at both ends with two permanently lubricated bearings of same material as housing. Variable mechanism terminating in single control lever with control shaft

for double-width fans. Discharge Dampers: Assembly with opposed blades constructed of two plates formed around and to shaft, channel frame, and sealed ball bearings; with blades linked outside of airstream to single control lever of same material as housing.

4. Inlet Screens: Grid screen of same material as housing.

5. Shaft Cooler: Metal disk between bearings and fan wheel, designed to dissipate heat from shaft.

6. Spark-Resistant Construction: AMCA 99.

7. Shaft Seals: Airtight seals installed around shaft on drive side of single-width fans.

8. Weather Cover: Enameled-steel sheet with ventilation slots, bolted to housing.

I. Motors: Comply with requirements in Division 23 Section 23 05 13 "Common Motor Requirements for HVAC Equipment."

2.5 SHOP PAINTING

A. Fans and steel fabrication shall be factory coated with one coat of zinc chromate primer and one coat of machine enamel on both the exterior and interior surfaces, except the name plates. Apply finish paint after erection.

B. For roof mounted fans, all steel components shall be coated with thermally fused epoxy.

2.6 SHOP TESTS

A. Balance fan wheels statically and dynamically prior to final operating tests with motor and drive in place.

B. Test, rate and certify fans in accordance with AMCA Standard 210 at an AMCA approved laboratory; fans shall bear AMCA seals. In lieu of shop performance tests, unless otherwise specified in the Schedules shown on the drawings, certified performance characteristic curves of prototype fans of similar units may be submitted for approval.

C. Sound rate fans in accordance with AMCA Standard 300; fans shall bear AMCA seals. Sound rating shall be based upon actual fan tests or upon prototype tests of similar units.

PART 3-EXECUTION

3.1 EXECUTION REQUIREMENTS

A. Refer to DDC General Conditions for execution requirements.

3.2 INSTALLATION

A. Examine areas and conditions under which fans are to be installed. Do not proceed with work until satisfactory conditions have been corrected.

B. General: Install fans in the location indicated on the drawings and in accordance with manufacturer's installation instructions, and with recognized industry practices, to ensure that centrifugal fans comply with requirements and serve intended purposes.

C. Access: Provide access and service space around centrifugal fans as indicated, but in no case less than that recommended by manufacturer.

D. Isolation: Set centrifugal fans on vibration isolators; fasten in accordance with manufacturer's installation instructions.

E. Electrical Wiring: Install electrical devices furnished by manufacturer but not specified to be factory-mounted. Furnish copy of manufacturer's wiring diagram submittal. Verify that electrical wiring installation is in accordance with manufacturer's submittal and installation requirements of project specifications. Ensure that rotation is in direction indicated and intended for proper performance. Do not proceed with centrifugal fan start-up until wiring installation is acceptable. Interlock wiring between fan units; and between fans and field-installed control devices. Provide control wiring between field-installed controls, indicated devices and fan starters.

F. Controls: Provide controls specified under Section 230900 "Instrumentation and Control for HVAC".

G. Ductwork Connections: Provide flexible connections on inlet and outlet duct connections as required.

H. Coordinate all trades to ensure that the installation of fans is not in conflict with the work performed by other trades.

3.3. FIELD QUALITY CONTROL

A. Upon completion of installation of centrifugal fans, and after motor has been energized with normal power source, test equipment to demonstrate compliance with requirements. Where possible, field correct malfunctioning equipment, then retest to demonstrate compliance. Replace equipment, which cannot be satisfactorily corrected.

3.3 ADJUSTING AND CLEANING

A. Start-up, test, and adjust centrifugal fans in presence of manufacturer's authorized representative.

END OF SECTION 233416

SECTION 233433
Air Curtains

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes air curtains with hot-water heat and glycol heating fluid.

1.3 QUALITY ASSURANCE

A. Refer to DDC General Conditions Section 01 40 00 "Quality Requirements".

B. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in the City of New York and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of air curtains that are similar to those indicated for this Project in material, design, and extent.

C. Product Options: Drawings indicate size, profiles, and dimensional requirements of air curtains and are based on the specific product indicated. Refer to Division 01 Section "Product Requirements."

D. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by an acceptable testing agency and marked for intended use.

E. Comply with AMCA 220, "Test Methods for Air Curtain Units," for airflow, outlet velocity, and power consumption.

F. Comply with ARI 410, "Forced-Circulation Air-Cooling and Air-Heating Coils," for components, construction, and rating.

1. Certify coils according to ARI 410.

G. Comply with NSF 37, "Air Curtains for Entranceways in Food and Food Service Establishments."

1.4 SUBMITTAL PROCEDURES

A. Refer to DDC General Conditions Section 01 33 00 "Submittal Procedures".

1.5 SUBMITTALS

A. Product Data: Include rated capacities, operating characteristics, furnished specialties, and accessories for each unit.

B. Shop Drawings: Signed and sealed by a qualified professional engineer.

1. Design Calculations: Calculate requirements for selecting vibration isolators and seismic restraints.
2. Include plans, elevations, sections, details, and attachments to other work.
3. Wiring Diagrams: Power, signal, and control wiring.

C. Coordination Drawings: Plans and details drawn to scale and coordinating penetrations of exterior walls.
D. Samples for Initial Selection: For units with factory-applied color finishes.

E. Operation and Maintenance Data: For air curtains to include in maintenance manuals.
F. Warranties: Special warranties specified in this Section.

1.6 COORDINATION

A. Coordinate layout and installation of air curtains and suspension system components with other construction, including light fixtures, fire-suppression-system components, and partition assemblies.
B. Coordinate installation of wall penetrations and louvers. These items are specified in Division 08 Section "Louvers and Vents."

1.7 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of air curtains that fail in materials or workmanship within specified warranty period.
1. Warranty Period (Water or Steam Heating Units): Five years.

1.8 EXTRA MATERIALS

A. Furnish extra materials described below, before construction begins, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Furnish one set of filters and fan belts for each unit.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Berner International Corp.
2. Marley Engineered Products.
3. Mars Air Products; Mars Air Door Division.

4. Or approved equal

2.2 MATERIALS

A. Housing Materials: Galvanized steel with electrostatically applied epoxy enamel finish over powdered mirror.
B. Housing Materials: One-piece, molded, high-impact, white polymer material.
C. Housing Materials: Heavy-gage, electroplated-zinc steel with welded construction and polyester-coated finish.
D. Housing Materials: Heavy-gage, aluminum construction.

1. Anodized Finish: Match finish and color of adjacent architectural metals. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
2. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.

a. Class II, Clear Anodic Finish: AA-M12C22A31 (Mechanical Finish: nonspecular as fabricated; Chemical Finish: etched, medium matte; Anodic Coating: Architectural Class II, clear coating 0.010 mm or thicker) complying with AAMA 611.

3. Mounting Brackets: Steel, for wall mounting.

E. Intake Louvers: Integral part of the housing. Discharge Nozzle: Integral part of the housing, containing adjustable air-directional vanes with 15 degree sweep front to back.

2.3 FANS

A. Fans: Galvanized steel statically and dynamically balanced.
B. Fan Drives: Belt, equipped with belt guards and adjustable sheaves and pulleys for adjusting air-outlet velocity.

2.4 MOTORS

A. Motor Type: single speed TEFC
B. Bearings: Permanently sealed, lifetime, pre-lubricated, ball bearings.
C. Disconnect: Internal power cord with plug and receptacle.

2.5 WATER/GLYCOL COILS

A. Description: Continuous-circuit coil.
B. Piping Connections: Threaded on same end.
C. Tubes: Copper, complying with ASTM B 75

1. Tube Diameter: 5/8"

D. Fins: Aluminum with fin spacing
E. Fin and Tube Joint: Silver brazed.

F. Headers: Seamless copper tube with brazed joints, prime coated
G. Frames: Galvanized-steel channel frame
H. Ratings: According to ASHRAE 33.

1. Working-Pressure Ratings: 200 psig, 325 deg F

I. Source Quality Control: Test to 300 psig and to 200 psig underwater.

2.6 FILTERS

A. Disposable Panel Filters: Factory-fabricated, viscous-coated, flat-panel-type, disposable air filters with glass-fiber media sprayed with nonflammable adhesive in galvanized-steel frame.
B. Washable Panel Filters: Removable, stainless-steel, baffle-type filters with spring-loaded fastening; with minimum 0.0781-inch thick, stainless-steel filter frame.
C. Mounting Frames: Welded, galvanized steel with gaskets and fasteners and suitable for bolting together into built-up filter banks.

2.7 ACCESSORIES

A. Built-in Thermostat: Line voltage, factory installed and wired to the junction box on air curtain.
B. Automatic Door Switch: Plunger type installed in door area to activate air curtain when door opens and to deactivate air curtain when door closes.
C. Start-Stop, Push-Button Switch: Manually activates and deactivates air curtain.
D. Time-Delay Relay: Factory installed and adjustable to allow air curtain to operate from 0.5 seconds to 10 hours.
E. Motor-Control Panel: Complete with motor starter, 115-V ac transformer with primary and secondary fuses, terminal strip, and NEMA 250, Type 1enclosure.
F. Mounting Brackets: Adjustable mounting brackets for drum-type roll-up doors.

PART 3 - EXECUTION

3.1 EXECUTION REQUIREMENTS

A. Refer to DDC General Conditions for execution requirements.

3.2 EXAMINATION

A. Examine areas and conditions where air curtains will be installed for compliance with requirements for installation tolerances and other conditions affecting performance.
B. Examine roughing-in for hot-water/ glycol piping systems to verify actual locations of piping connections before air-curtain installation.
C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.3 INSTALLATION

A. Install air curtains with clearance for equipment service and maintenance.

3.4 CONNECTIONS

A. Piping installation requirements are specified in other Division 23 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.
B. Install piping adjacent to air curtain to allow service and maintenance.
C. Breaching: Comply with applicable requirements in Division 23 Section, "Breechings, Chimneys, and Stacks." Connect breaching to full size at flue outlet.
D. Ground equipment according to Division 26 Section "Grounding and Bonding for Electrical Systems."
E. Connect wiring according to Division 26 Section "Low-Voltage Electrical Power Conductors and Cables."

3.5 FIELD QUALITY CONTROL

A. Perform the following field tests and inspections and prepare test reports:

1. After installing air curtains completely, perform visual and mechanical check of individual components.
2. After electrical circuitry has been energized, start unit to confirm motor rotation and unit operation. Certify compliance with test parameters.
3. Test gas train and verify that there are no gas leaks.
4. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

B. Repair or replace malfunctioning units and retest as specified above.

3.6 ADJUSTING

A. Adjust belt tension.
B. Adjust motor and fan speed to achieve specified airflow.
C. Adjust discharge louver and dampers to regulate airflow.
D. Adjust air-directional vanes.

3.7 DEMONSTRATION

A. Engage a factory-authorized service representative to instruct the City of New York's maintenance personnel to adjust, operate, and maintain air curtains.

END OF SECTION 233433

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SECTION 233713
Diffusers, Registers and Grilles

PART 1 - GENERAL

1.1. RELATED DOCUMENTS

A. The following documents apply to all required work for the Project: (1) the Contract Drawings, (2) the Specifications, (3) the General Conditions, (4) the Addendum and (5) the Contract (City of New York Standard Construction Contract).

1.2. SUMMARY

A. Work Included: The work includes, but is not necessarily limited to the following:

1. Provide all air inlets and outlets as specified herein, as indicated on the drawings, and as needed for a complete and proper installation.

B. Related Work:

The following related items are specified in other sections of the specifications:

1.	Metal Ducts	Section 233113
2.	Air Duct Accessories	Section 233300
3.	Testing for HVAC	Section 230593
4.	Balancing for HVAC	Section 230594

1.3. QUALITY ASSURANCE

A. Refer to DDC General Conditions Section 01 40 00 "Quality Requirements."

B. Manufacturer's Qualifications: Firms regularly engaged in manufacture of registers, grilles and diffusers of types and sizes required, whose products have been in satisfactory use in similar service for not less than 3 years.

C. Codes and Standards:

1. ARI Compliance: Test and rate air outlets in accordance with ARI Standard 650 "Standard Air Outlets and Inlets".

2. ASHRAE Compliance: Test and rate air outlets and inlets in accordance with ASHRAE 70 "Method of Testing for Rating the Air Flow Performance of Outlets and Inlets".

3. ADC Seal: Provide air outlets and inlets bearing ADC certified Rating Seal.

1.4. SUBMITTALS

A. Refer to DDC General Conditions Section 01 33 00 "Submittal Procedures."

B. Product Data: Submit manufacturer's catalog sheet product data for air outlets and inlets including the following:

1. Schedule of air outlets and inlets indicating drawing, designation, room location, number furnished, model number, size, and accessories furnished.

2. Data sheet for each type of air outlet and inlet, and accessory furnished; indicating construction, finish and mounting details.

3. Performance data for each type of air outlet and inlet furnished, including blade setting angle, cfm, pressure drop, temperature and velocity traverses, throw and drop, and noise criteria ratings. Indicate selections on data.

C. Shop Drawings: Submit assembly-type shop drawing for each type of air outlet and inlet, indicating materials and methods of assembly of components.

D. Maintenance Data: Submit maintenance data, including cleaning instructions for finished, and spare parts lists. Include this data, product data, and shop drawings in maintenance manuals.

1.5. DELIVERY, STORAGE AND HANDLING

A. Deliver air outlets and inlets wrapped in factory-fabricated fiber-board type containers. Identify on outside of container type of outlet or inlet and location to be installed. Avoid crushing or bending and prevent dirt and debris from entering and settling in devices.

B. Store air outlets and inlets in original cartons and protect from weather and construction work traffic. Where possible, store indoors; when necessary to store outdoors, store above grade and enclose with waterproof wrapping.

PART 2 - PRODUCTS

2.1. MANUFACTURERS

A. Subject to compliance with requirements, provide products by of one of the following:

1. Titus Products Div.
2. Anemostat Products Div.
3. Carnes
4. Tuttle and Bailey
5. Or Approved Equal

2.2. FABRICATION

A. Return or Exhaust Registers: Return or exhausts registers shall be equipped with an opposed blade or multi-shutter volume control device of steel, with the blades linked to operate in unison. This device shall be attached to the back of the register flange, and shall be adjustable for required air volumes by use of a screw driver, Allen wrench, (or other approved means) through the front face of the register. Opening area through the blades in each case shall be not less than the opening area of the register.

B. Supply Registers

1. The volume of air delivered through each supply register shall be controlled as follows: Where the branch duct connection is more than 2 feet long, an opposed blade volume control shall be secured to the back of the register flange. Where the branch duct connection, and opposed blade volume control shall be secured to the back of register flange. Each opposed blade volume control shall have its blades linked so as to operate in unison. Volume control shall be adjustable for required air volume by use of a screw driver, Allen wrench, (or other approved means) through the front face of the register.

2. All supply registers shall be constructed so that the bars can be adjusted to such positions as to produce the distribution of the air called for on the drawings. All supply registers shall be adjustable horizontally and vertically; the registers shall have double cores with the bars of each core adjustable.

C. Fire Damper Registers (Supply & Return/Exhaust)

1. Where the drawings indicate a fire damper register (6x6 T.R.W/FD) to be installed, Contractor shall supply a register, an interlocking blade type fire damper and a volume control device, all assembled and installed as required. Register volume control shall be as specified.

D. Air Diffusers:

1. Air diffusers shall be of the square or rectangular type as indicated on the drawings and shall be of the size to deliver the cubic feet of air per minute required. Diffusers shall be made of steel with baked enamel finish in a color as selected by the Commissioner.

2. Each diffuser shall be securely fastened to the ductwork by screws equally spaced around the collar. Contractor shall furnish proper size No. 14 gauge galvanized steel frames for the air diffusers to be installed in gypsum board ceilings and shall deliver them to the Contractor who shall install them.

3. Each square diffuser shall be provided with equalizing deflector vanes and with a splitter damper for volume control. Splitter damper shall be operable from the face of the diffuser.

E. Exhaust or transfer grilles shall be the same kind as return exhaust registers without volume balancing damper.

PART 3 - EXECUTION

3.1. EXECUTION REQUIREMENTS

A. Refer to DDC General Conditions for execution requirements.

3.2. INSPECTION

A. Examine areas and conditions under which registers and diffusers are to be installed. Do not proceed with work until unsatisfactory conditions have been corrected.

3.3. INSTALLATION

A. Install air outlets and inlets in accordance with manufacturers written instructions.

B. Coordinate with other work, including ductwork and duct accessories, as necessary to interface installation of air outlets and inlets with other work.

C. Coordinate the proper frame style with the ceiling construction.

D. Coordinate the air outlet and inlet location with the reflected ceiling plans, lighting plans, sections and/or details.

E. Coordinate the color requirements for all registers and diffusers with the Commissioner.

END OF SECTION 233713

SECTION 235100
HVAC Breeching, Chimneys and Stack

PART 1 - GENERAL

1.1. RELATED DOCUMENTS

A. The following documents apply to all required work for the Project: (1) the Contract Drawings, (2) the Specifications, (3) the General Conditions, (4) the Addendum and (5) the Contract (City of New York Standard Construction Contract).

B. LEED General Requirements:

1. Refer to DDC General Conditions.
   a. Section 01 33 00 "Submittal Procedures."
   b. Section 01 81 13.04 "Sustainable Design Requirements for LEED v4 Buildings."
   c. Section 01 74 19 "Construction Waste Management and Disposal."
   d. Section 01 81 19 "Indoor Air Quality Requirements for LEED Buildings."

1.2. SUMMARY

A. Work Included: The work includes, but is not necessarily limited to, the following:

1. Stainless steel AL29-4C double wall vent for gas-fired boilers and double wall gas-fired generator vent, as indicated on the drawings, and as required for a complete and proper installation

1.3. QUALITY ASSURANCE

A. Refer to DDC General Conditions Section 01 40 00 "Quality Requirements."

B. Welding: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code--Steel," for hangers and supports and AWS D9.1/D9.1M, "Sheet Metal Welding Code," for shop and field welding of joints and seams in vents, and stacks.

C. Certified Sizing Calculations: Manufacturer shall certify venting system sizing calculations

D. Codes and Standards:

1. NFPA: Comply with NFPA 211 "Standard for Chimneys, Fireplaces, Vents and Solid Fuel Burning Appliances".
2. UL: Comply with applicable portions of UL safety standards; provide products which have been UL listed and labeled.
3. SMACNA: Comply with SMACNA Low Pressure Duct Standards for fabricated breeching.

4. ASHRAE: Comply with the ASHRAE Equipment Handbook, for chimneys, gas vents, and fireplace systems, material requirements and design criteria.
5. Comply with the 2014 NYC Building Code

1.4. SUBMITTALS

A. Refer to DDC General Conditions Section 01 33 00 "Submittal Procedures."

B. Product Data: Submit product data including materials, dimensions, weights and accessories.

C. Shop Drawings

1. Submit shop drawings showing fabrication and installation details for breechings, chimneys and stacks. Include plans, elevations, sections, details and attachments. Detail assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components such as anchors, pipe guides and vent caps, hangers and seismic restraints and location and size of each field connection. Shop drawings shall indicate:

   a. Layout of each boiler and generator vent.

2. Maintain on site copies of approved shop drawings that are complete, as outlined above. Work shall not proceed without approvals.

D. Quality Control Submittals:

1. Certificates: Submit certificates of materials compliance with specified ASTM, UL and ASHRAE requirements.
2. Certificates: Submit Welder=s Qualification Certificates.

E. New York City Department of Environmental Protection: Submit copy of Bureau of Air Resources approval of application and plans.

1. Manufacturer Seismic Qualification Certification: Submit certification that factory-fabricated vents, and stacks; accessories; and components will withstand seismic forces defined in Section 230548 "Vibration and Seismic Controls for HVAC Piping and Equipment." Include the following:

   a. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
   b. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified and the unit will be fully operational after the seismic event."
   c. Dimensioned Outline Drawings of Vents and Stacks: Identify center of gravity and locate and describe mounting and anchorage provisions.
   d. Detailed description of anchorage devices on which the certification is based and their installation requirements.

1.5. PROJECT CONDITIONS

A. Should conditions at the site necessitate a change in the arrangement of the breeching from that shown on the working drawings, Contractor shall submit for approval, a detailed drawing (to scale) of the proposed change. In such a case, Contractor shall not begin to fabricate the vent until the Contractor's drawing has been approved by the Commissioner.

1.6. WARRANTY

A. Submit manufacturers ten (10) year warranty for the venting from the date of Substantial Completion.

PART 2 - PRODUCTS

2.1. MANUFACTURERS AND MATERIALS

A. Stainless Steel Vents

1. Manufacturers: Subject to compliance with requirements, provide all stainlees steel, positive/negative pressure vents of one of the following:

    a. Heat-Fab
    b. Selkirk Metalbestos
    c. Van Packer
    d. Or approved equal

2. Description: UL-labeled manufacturer approved stainless steel vent for boiler vent; double wall for 1400 deg F for generator vent, to comply with NFPA 211.
3. Construction: Stainless steel, (UL 1738)
4. Accessories: UL-labeled tees, elbows, increasers, heater outlet connectors, storm collar, support assembly, thimbles, fire stop spacers, and fasteners fabricated of similar materials and designs as vent pipe straight sections.
5. Sealant: Manufacturer's standard high-temperature sealant.
6. Insulating Fill: Manufacturer's standard high-temperature insulation fill material in annular space surrounding chimney liner including high-temperature, ceramic-fiber insulation required to seal chimney at top and bottom.
7. Inner Shell: ASTM A 959, Type 29-4C stainless steel.for boiler vent; inner shell and outer jacket separated by at least a 1/2-inch airspace.
8. Inner shell: ASTM A 666, Type 304/Type 316 stainless steel for generator vent.
9. Outer Jacket: Stainless steel.
10. Termination with exit cone for boiler vent and flip for generator vent.

PART 3 - EXECUTION

3.1. EXECUTION REQUIREMENTS

A. Refer to DDC General Conditions for execution requirements.

3.2. INSTALLATION

A. Install all stainless steel gas vent and stack in accordance with manufacturer's installation instructions and UL listing. Maintain minimum clearances from combustibles specified in UL listing.

B. Seal joints between sections of positive pressure vent in accordance with manufacturer's installation instructions, and using only sealants recommended by manufacturer.

C. Support vent at intervals recommended by the manufacturer to support the weight of the breeching and all accessories, without exceeding loading of appliances.

D. The vent installer shall provide all test holes required for the implementation of the performance test sufficiently in advance of the scheduled inspection in accordance and in compliance with the requirements of the New York City Department of Environmental protection and Division of Air Resources All test holes shall be kept closed with a stainless steel sheet metal, screw or other acceptable method when not being used for testing purposes and shall be marked in such a way that their location can be readily determined.

3.3 GUYING AND BRACING MATERIALS

Cable: Three galvanized, stranded wires of the following thickness:

Minimum Size: 1/4 inch in diameter.
For ID Sizes 4 to 15 Inches: 5/16 inch

Pipe: Three galvanized steel, NPS 1-1/4

Angle Iron: Three galvanized steel, 2 by 2 by 0.25 inch

3.3. ADJUSTING AND CLEANING

A. Clean the vent internally during installation, to remove dust and debris.

3.4. PROTECTION

A. Temporary Closure

1. At ends of the vents which are not completed or connected to equipment, provide temporary closures which will prevent entrance of dust and debris until installation is completed.

END OF SECTION 235100

SECTION 235233
Condensing Boilers

PART 1 - GENERAL

1.1. RELATED DOCUMENTS

A. The following documents apply to all required work for the Project: (1) the Contract Drawings, (2) the Specifications, (3) the General Conditions, (4) the Addendum and (5) the Contract (City of New York Standard Construction Contract).

B. LEED / EPP General Requirements:
   1. Refer to – DDC Standard General Conditions.
      a. Section 01 33 00 "Submittal Procedures."
      b. Section 01 81 13.04 "Sustainable Design Requirements for LEED v4 Buildings."
      c. Section 01 91 13 General Commissioning Requirements for MEP Systems."

1.2. SUMMARY

A. Section includes gas-fired, water-tube condensing boilers, trim, and accessories for generating hot water.

1.3. QUALITY ASSURANCE

A. Refer to DDC General Conditions Section 01 40 00 "Quality Requirements".

1.4. SUBMITTAL PROCEDURES

A. Refer to DDC General Conditions Section 01 33 00 "Submittal Procedures".

1.5. SUBMITTALS

A. Product Data: For each type of product.

   1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for boilers.
   2. Include rated capacities, operating characteristics, and furnished specialties and accessories.

B. Shop Drawings: For boilers, boiler trim, and accessories.

   1. Include plans, elevations, sections, and mounting attachment details.

   2. Include details of equipment assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.

   3. Include diagrams for power, signal, and control wiring.

1.6. INFORMATIONAL SUBMITTALS

A. Source quality-control reports.
B. Field quality-control reports.
C. Sample Warranty: For special warranty.
D. Other Informational Submittals:

1. ASME Stamp Certification and Report: Submit "A," "S," or "PP" stamp certificate of authorization, as required by is required by code, and document hydrostatic testing of piping external to boiler.
2. CSA B51 pressure vessel Canadian Registration Number (CRN).

1.7. CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For boilers to include in emergency, operation, and maintenance manuals.

1.8. WARRANTY

A. Manufacturer's Warranty: Verify available warranties and warranty periods for units and components.
   1. Warranty Period for Fulton EDR+ 5000 Water-Tube Condensing Boilers: 25 years from date of Substantial Completion. Standard Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of boilers that fail in materials or workmanship within specified warranty period.
   2. Warranty Period for the Pressure Vessel and Heat Exchanger: The boiler manufacturer shall warranty against failure due to:
      a. Flue gas condensate corrosion, and/or defective material or workmanship for a period of ten (10) years, non-prorated, from the date of shipment from the factory.
      b. Thermal shock for the lifetime of the boiler.
   3. Warranty Period for the Burner: The boiler manufacturer shall warranty the burner against defective material or workmanship for a period of five (5) years, non-prorated, from the date of shipment from the factory.
   4. Warranty Period for all other components: The boiler manufacturer will repair or replace any part of the boiler that is found to be defective in workmanship or material within eighteen (18) months of shipment from the factory or twelve (12) months from start-up, whichever comes first.
   5. Warranties are only valid provided the boiler is installed, controlled, operated and maintained in accordance with the Installation, Operation and Maintenance Manual.

PART 2 - PRODUCTS

2.1. PERFORMANCE REQUIREMENTS

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
B. ASME Compliance: Fabricate and label boilers, ASME H Stamp, to comply with the latest edition of the ASME Boiler and Pressure Vessel Code.
C. "ASHRAE/IES 90.1 Compliance" Paragraph below may be required to comply with Project requirements or is required by code and is required for sustainable design systems.
D. ASHRAE/IES 90.1 Compliance: Boilers shall have minimum efficiency according to "Gas and Oil Fired Boilers - Minimum Efficiency Requirements."
E. DOE Compliance:

1. Boiler thermal and combustion efficiencies shall be certified and listed by AHRI.
2. Boiler AFUE shall be certified and listed by AHRI.

F. CSA Compliance: Test boilers for compliance with the latest edition of ANSI Z 21.13/CSA 4.9.
G. Air Quality Compliance: Meets or exceeds the requirements of the most stringent air quality management codes, including SCAQMD and BAAQMD.
H. Mounting Base: For securing boiler to concrete base.

1. Seismic Fabrication Requirements: Fabricate mounting base and attachment to boiler pressure vessel, accessories, and components with reinforcement strong enough to withstand seismic forces defined in Section 230548 "Vibration and Seismic Controls for HVAC" when mounting base is anchored to building structure.

2.2. WATER-TUBE CONDENSING BOILERS – 1,600 TO 6,000 MBH

A. Basis-of-Design Product: Subject to compliance with requirements, provide Fulton EDR+ Model ENDURA 5000 boiler or comparable product by one of the following:
    1. Fulton, Inc.
    2. RBI; A Division of Mestek, Inc.
    3. Thermal Solutions LLC.
    4. Aerco.
    5. Or approved equal

B. Description: Factory-fabricated, -assembled, and -pressure tested, duplex stainless steel firetube condensing boiler with heat exchanger sealed pressure tight, built on a steel base; including flue gas vent; combustion air intake connections, water supply, water return, condensate drain, and controls. The boiler, burner and controls shall be completely factory assembled as a self-contained unit. Each boiler shall be neatly finished, thoroughly tested, and properly packaged for shipping. Closed-loop water heating service only.

C. Heat Exchanger

1. The heat exchanger is defined as the surfaces of the pressure vessel where combustion gases transfer heat to the hydronic fluid.

D. Boiler

1. The boiler shall be a single-pass firetube design, such that all combustion chamber components are within water-backed areas. Watertube boilers will not be accepted.
2. Furnace to tube connections shall be constructed with low weld intensity, a tube to tube minimum spacing of 2 tube diameters center to center, minimum 1 tube diameter tube to tube ligament, and shall not contain any overlapping welds.
3. Heat transfer capability shall be maximized via the use of corrugated firetubes. The corrugation process shall not remove any material from the tubes. Finned, twisted tape, or coil type tube inserts negatively impact ease of maintenance and will not be accepted.
4. The boiler shall compensate for heat exchanger thermal expansion using a stress relief deflection element external to the pressure vessel shell. The deflection element shall act to protect the boiler tubes and tubesheets from exposure to longitudinal thermal expansion stresses. The deflection element shall not be in contact with flue gases.

a. Designs using the tubes, tubesheets, or furnace components to compensate for thermal expansion require cutting, welding, tube repair, or complete heat exchanger replacement in the event of deflection element failure and are not accepted.

b. Designs which do not compensate for thermal expansion stresses are not accepted.

5. Tubesheet to tube weld stresses while the boiler is in operation shall never exceed 1.0 ksi.
6. Material: The heat exchanger furnace, tubesheets, and firetubes shall be constructed of duplex alloy stainless steel. Austenitic stainless steels, such as 316L or 304, and ferritic stainless steels, such as 439, are not accepted.
7. For long term durability, heat exchanger material of construction must have a minimum Ultimate Tensile Strength of 94 ksi, and a minimum 0.2% Yield Strength of 65 ksi. Weaker materials of construction with reduced strength are not accepted. Boilers seeking an approval must provide documentation that supports this requirement or will be rejected.
8. Heat exchangers constructed of cast aluminum, mild steel, cast iron or copper finned tube materials are not accepted.
9. Exhaust manifold shall be minimum 0.5" thick stainless steel, ASME designation SA-351 CF3M, and shall be a water-backed design to enhance heat transfer. Dry-back style flue gas condensate collection pan exhaust manifolds are not accepted.
10. Pressure Vessel: Design and construction shall be in accordance with Section IV of the ASME Code for heating boilers.
11. The shell shall be minimum 0.375" thick steel, SA-53B ERW.
12. The top head shall be a minimum 0.50" thick steel, SA-790 or SA-516 Grade 70.
13. The pressure vessel shall be a counter-flow design with internal water-baffling plates.
14. The boiler return and supply water connections shall be 150# ANSI flanged. The water connections shall not be designed to support an external structural load from the piping system.
15. The water volume of the boiler shall not be less than 80 gallons.
16. The maximum water pressure drop across the boiler inlet and outlet connections shall not exceed 4.1 PSID at 472 GPM for 5,000 MBTU/hr boiler.
17. Fuel/Air Mixture Combustion System: Air and gas pre-mix on the suction side of the fan.
18. Closed-loop oxygen sensor feedback shall automatically adjust the fuel/air ratio. O2 monitoring-only systems that cannot adjust for operation variability shall not be accepted.

19. Combustion air flow shall be controlled by fan speed and a servo-motor actuated butterfly valve. Fuel flow shall be controlled by a servo-motor actuated butterfly valve. Zero governor or negative regulation systems offer less precision and are not capable of independent air and gas control, and are not accepted.

E. Burner:
1. Standard natural gas, forced draft, woven fiber mesh design.
2. Turndown: Shall be no less than EDR+6000: 15:1.
3. Excess Air: The burner shall operate at no greater than 8.0% excess O_2 over the entire modulation range to maximize seasonal combustion and thermal efficiencies.
4. NOx Emissions: When operating on natural gas, the burner shall maintain a level of <20 ppm over the complete combustion range at a 3% O_2 correction. The natural gas burner shall be configurable down to <9 ppm NOx when operating on 460/3/60 electrical service.

F. Blower:
1. Variable speed centrifugal fan to operate during each burner firing sequence and to pre-purge and post-purge the combustion chamber.
2. Motor: Totally enclosed fan-cooled premium efficiency AC motor, Class H insulation, variable speed capable with sealed bearings.
a. Variable speed drive: IP20 housing, 0-400Hz frequency output capability, overload capacity of 150% for 60 seconds and 200% for 3 seconds, shall fully modulate fan speed according to burner input requirements.
b. Motor Alternate: Closed-loop brushless DC variable speed motor with hall effect sensor feedback; internal electronic commutation controller with built in speed control and protection features; long life, sealed, ball bearing with high temperature grease.

G. Main Fuel Train:
1. A factory mounted fuel train shall be supplied. The fuel train shall be fully assembled and enclosed within the boiler cabinet, complete with factory mounted and wired high and low gas pressure switches in compliance with CSD-1.
2. Ignition: Direct spark ignition with transformer. A UV scanner shall be utilized to ensure precise communication of flame status back to the flame programmer. Flame rods are not accepted.

H. Boiler Enclosure:
1. Cabinet: Jacketed steel enclosure with left hinged full height front access door, fully removable latching access panels, mounted on a steel skid with steel plate decking.
2. Control Enclosure: NEMA 250, Type 1.
3. Finish: Cabinet shall be powder coated, pressure vessel assembly shall be painted.
4. Combustion Air: Factory mounted air filter directly coupled to the blower inlet.
5. Rigging and Placement: The boiler shall include lifting eyes and fork hole accessibility for rigging.
6. Characteristics and Capacities:
a. Standard capacities shall be based on 100% water.
b. Minimum Design Water Pressure Rating: 160 psig.
c. Minimum Return Water Temperature: No minimum temperature requirements.
d. Maximum Allowable Water Temperature (ASME): 210°F
e. Minimum Water Flow Rate: EDR+5000 75 gpm.

f. Maximum Delta-T: 100°F
g. Maximum Allowable Operating Setpoint: 200°F
h. Jacket Losses: External convection and radiation heat losses to the boiler room from the boiler shall comply with IAW ASHRAE 103-2007, and shall not exceed 0.2% of the rated boiler input at maximum capacity.

7. Flow switches, dedicated circulator pumps, or primary-secondary arrangements shall not be required to protect the boiler from thermal shock. Boilers requiring the use of flow switches or primary-secondary piping arrangements will not be accepted.
8. The dimensions of the boiler from where service clearances are measured shall not be more than (Height x Width x Depth) EDR+5000 79" x 34" x 117".
9. The equipment shall be in strict compliance with the requirements of this specification and shall be the manufacturer's standard commercial product unless specified otherwise. Additional equipment features, details, accessories, etc. which are not specifically identified but which are a part of the manufacturer's standard commercial product, shall be included in the equipment being furnished.

I. Trim
1. Safety Relief Valve: ASME rated .
2. Pressure and Temperature Gauge: Minimum 3-1/2" diameter, combination pressure and temperature gauge.
3. Flue Gas Condensate Drain Trap: A flue gas condensate drain trap shall be provided to prevent positive pressure exhaust gases from entering the boiler room.
4. Flue Gas Condensate Neutralization: pH neutralization shall be provided

J. Controls
1. The boiler electrical control panel shall include the following devices and features:
2. 7" color touch screen control display factory mounted on the front cabinet panel door.
a. The control display shall serve as a user interface for programming parameters, boiler control and monitoring; and shall feature a screen saver, boiler status, configuration, history and diagnostics.
3. Controls Transformers: 120VAC, 24 VDC, 12 VDC.
4. Flame safeguard control with 9 combustion fuel/air load profile points.
5. All standard controls shall be factory mounted and wired according to UL requirements.

K. Burner Operating Controls:
1. To maintain safe operating conditions, factory mounted and wired burner safety controls limit burner operation:
2. High Limit: A manual reset mechanical Aquastat device shall stop the burner if operating conditions rise above maximum boiler design temperature.
3. Low-Water Cut Off: Electronic probe type mounted in the pressure vessel shall prevent burner operation on low water alarm.
4. Air Safety Switch: Prevent operation unless sufficient combustion air is proven.
5. Blocked Exhaust: Prevent operation in the event of a blocked flue gas exhaust stack.

L. O2 Compensation:
1. To maximize efficiency throughout seasonality, factory mounted and wired.

2. A wide band Oxygen sensor shall be factory mounted and measure the Oxygen level present in combustion byproducts during run. The current Oxygen level shall be displayed to the user. The Oxygen sensor minimum requirements shall be:
a. Lambda range: $\lambda = 0.65$ to ∞
b. Lambda accuracy: ± 0.008 @ $\lambda=1.00$; ± 0.01 @ $\lambda=0.80$; ± 0.05 @ $\lambda=1.70$
3. The O2 Compensation system shall utilize a combination open-loop and closed-loop control system to tune the air/fuel ratio during operation, optimizing combustion reliability, flame stability, combustion efficiency, and the dewpoint temperature for formation of flue gas condensate.
4. Boilers listed as an alternate to the Basis of Design that do not include a closed-loop O2 Compensation control system in compliance with this specification shall be required to provide and commission a Siemens LMV52 Burner Management System with the QGO20 Oxygen Sensor, PLL52.110A100 O2 Trim Module, and associated installation parts.
5. Boiler Operating Controls and Features:
a. Inlet Water Temperature Monitoring.
b. Combustion Air Temperature Monitoring.
c. Flue Gas Exhaust Temperature Monitoring: Sensor probe shall be stainless steel.
d. Proportional Integral Derivative (PID) temperature load control capability for hydronic and domestic hot water in standalone or lead/lag operation.
e. Operating temperature sensor for automatic start and stop.
f. The temperature sensor shall have tolerance according to IEC 60751
g. Time of day display.
h. Customizable boiler name display.
i. Two customizable boiler interlock terminals displayed.
j. Alarm history for a minimum 100 most recent alarms including status at time of lockout.
k. Administrative password protection options.
l. Indirect domestic hot water priority.

M. Outdoor air setting:
1. The temperature sensor shall be field installed in an outdoor area not exposed to direct sunlight or the exhaust of other mechanical equipment, and wired the boiler controller.
a. The control shall be field programmed with the outdoor reset schedule.

N. Variable Speed System (Secondary) Pump Control:
1. When installed in a variable primary flow configuration, the boiler controller shall provide the capability to control two variable speed hydronic heating pumps. One pump shall be duty, and one standby.
2. The duty system pump shall be enabled upon the outdoor air temperature dropping below the warm weather shutdown temperature. Pumps shall be automatically rotated.
3. Variable speed signal shall be provided to modulate pump speed according to hydronic heating loop Delta-T. A user selectable parameter allows for Delta-P in place of Delta-T.

O. Motorized isolation valve control:
1. Upon heat demand for the boiler, the control shall provide an enable/open signal.
a. After the burner is disabled and upon the heat exchanger delta-T dropping to a user programmable delta-T, the signal will be disabled.
b. Boilers which utilize only a time delay close as the only means of valve actuation are unable to optimize for residual heat, and will not be accepted.

c. In variable primary arrangements, the control shall hold the lead boiler isolation valve open at all times.

P. Lead/Lag Control of Modular (Multiple) Boiler Plants:
1. Lead/Lag capabilities shall be integral to the boiler controller for all the boilers installed in the same hydronic loop and shall not require an external panel.
2. The boiler manufacturer shall provide a supply water header temperature sensor.
a. The temperature sensor shall have tolerance according to IEC 60751, field installed in the common supply water piping.
3. Lead/lag operation shall not require a master boiler or external control panel. Field wired sensors or communication may be connected to any boiler in the lead/lag sequence.
4. The boilers shall communicate with each other via a private Ethernet/IP addressed network.
a. Field wiring between boilers shall be shielded Cat5e or Cat6 Ethernet cable.
b. In the event a communication cable becomes damaged or interrupted, communication shall be lost with only one boiler and not the entire lead/lag operation. Daisy chain style wiring lacks this redundancy and shall not be accepted.

Q. Sequence of Operation:
1. Upon loop temperature dropping below start point, the lead boiler shall be enabled at low fire and shall modulate according to the heating demand.
a. As lag boiler stages are enabled according to heating demand, burners shall return to low fire. Boilers shall modulate in parallel as a cohesive unit according to heating demand.
b. When all boilers are active they shall be released to modulate in parallel up to full fire according to the heating demand. As heating demand decreases, the sequence shall operate in reverse. Rotation of the lead and subsequent lag boilers shall be automatic.
c. Building Automation System Interface: Hardware and software to enable building automation system (BAS) to monitor, control, and display boiler status and alarms.

R. Venting
1. The boiler shall be capable of operating with a stack effect not exceeding -0.10" W.C. and a combined air intake and exhaust venting pressure drop not exceeding EDR+5000: +1.0" W.C.
2. Combustion Air Intake: It shall be acceptable to either direct vent the boiler using sealed combustion by drawing combustion air in from the outdoors or by drawing air from the mechanical space itself.
3. Sealed Combustion: Schedule smooth-walled galvanized steel, vent termination with 1/2" x 1/2" mesh bird screen.
4. Flue Gas Exhaust: The flue gas exhaust stack shall be AL 29-4C or 316L stainless steel, listed and labeled to UL-1738 / C-UL S636 for use with Category II/IV appliances, guaranteed appropriate for the application by the manufacturer and supplier of the venting.
5. Condensate drain piping must be galvanized, stainless steel, or Schedule 40 CPVC.

2.3. ELECTRICAL POWER

A. Controllers, Electrical Devices, and Wiring: Electrical devices and connections are specified in electrical Sections.

B. Single-Point Field Power Connection: Factory-installed and -wired switches, motor controllers, transformers, and other electrical devices necessary shall provide a single-point field power connection to boiler.

a. House in NEMA 250, Type 1 enclosure.
b. Wiring shall be numbered and color coded to match wiring diagram.
c. Install factory wiring outside of an enclosure in a metal raceway.
d. Field power interface shall be to circuit breaker.
e. Provide branch power circuit to each motor and to controls with a disconnect switch or circuit breaker.
f. Provide each motor with overcurrent protection.

2.4. SOURCE QUALITY CONTROL

A. Burner and Hydrostatic Test: Factory adjust burner to eliminate excess oxygen, carbon dioxide, oxides of nitrogen emissions, and carbon monoxide in flue gas and to achieve combustion efficiency; perform hydrostatic test
B. Test and inspect factory-assembled boilers, before shipping, according to the latest edition of ASME Boiler and Pressure Vessel Code.
C. Assembled boiler must be factory tested for safety and functionality; boiler filled with water, fired throughout firing range, with all burner safety components proven. Results recorded for future reference.
D. Allow The City of New York access to source quality-control testing of boilers. Notify Commissioner 14 days in advance of testing.

PART 3 - EXECUTION

3.1. EXECUTION REQUIREMENTS

A. Refer to DDC General Conditions for execution requirements.

3.2. EXAMINATION

A. Examine roughing-in for concrete equipment bases, anchor-bolt sizes and locations, and piping and electrical connections to verify actual locations, sizes, and other conditions affecting performance of the Work.
B. Final boiler locations indicated on Drawings are approximate. Determine exact locations before roughing-in for piping and electrical connections.
C. Examine mechanical spaces for suitable conditions where boilers will be installed.
D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.3. BOILER INSTALLATION

A. Equipment Mounting:

B. Install boilers on cast-in-place concrete equipment base(s). Comply with requirements for equipment bases and foundations specified in Section 033000 "Cast-in-Place Concrete." Retain one of two subparagraphs below. Retain first for projects in seismic areas; retain second for projects not in seismic

areas. Indicate vibration isolation and seismic-restraint device type and minimum deflection in supported equipment schedule on Drawings.

Comply with requirements for vibration isolation and seismic-restraint devices specified in Section 230548 "Vibration and Seismic Controls for HVAC."

C. Comply with requirements for vibration isolation devices specified in Section 230548 "Vibration and Seismic Controls for HVAC Piping and Equipment."

D. Install gas-fired boilers according to NFPA 54.

E. Assemble and install any optional boiler trim.

F. Install electrical devices furnished with boiler but not specified to be factory mounted.

G. Install control wiring to field-mounted electrical devices.

3.4. CONNECTIONS

A. Coordinate piping installations and specialty arrangements with schematics on Drawings and with requirements specified in piping systems. If Drawings are explicit enough, these requirements may be reduced or omitted.

B. Piping installation requirements are specified in other Sections. Drawings indicate general arrangement of piping, fittings, and specialties.

C. Install piping adjacent to boiler to allow service and maintenance.

D. Install piping from equipment drain connection to nearest floor drain. Piping shall be at least full size of connection. Provide an isolation valve if required.

E. Connect piping to boilers, except safety relief valve connections, with flexible connectors of materials suitable for service. Flexible connectors and their installation are specified in Section 232116 "Hydronic Piping Specialties."

F. Connect gas piping to boiler gas-train inlet with union. Piping shall be at least full size of gas-train connection. Provide a reducer if required.

G. Connect hot-water piping to supply- and return-boiler tappings with shutoff valve and union or flange at each connection.

H. Connect steam and condensate piping to supply-, return-, and blowdown-boiler tappings with shutoff valve and union or flange at each connection.

I. Install piping from safety relief valves to nearest floor drain.

J. Install piping from safety valves to drip-pan elbow and to nearest floor drain.

K. Boiler Venting:

1. Install flue venting kit and combustion-air intake.
2. Connect full size to boiler connections. Comply with requirements in Section 235123 "Gas Vents."

L. Ground equipment according to Section 260526 "Grounding and Bonding for Electrical Systems."

M. Connect wiring according to Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

3.5. FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

B. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect components, assemblies, and equipment installations, including connections.

C. Perform the following tests and inspections with the assistance of a factory-authorized service representative:

1. Perform installation and startup checks according to manufacturer's written instructions.
2. Leak Test: Hydrostatic test. Repair leaks and retest until no leaks exist.
3. Operational Test: Start units to confirm proper motor rotation and unit operation. Adjust air-fuel ratio and combustion.
4. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
    a. Check and adjust initial operating set points and high- and low-limit safety set points of fuel supply, water level, and water temperature.
    b. Set field-adjustable switches and circuit-breaker trip ranges as indicated.
    c. Boiler will be considered defective if it does not pass tests and inspections.
    d. Prepare test and inspection reports
    e. Occupancy Adjustments: When requested within 12 months of date of Substantial Completion, provide on-site assistance in adjusting system to suit actual occupied conditions. Provide up to two visits to Project during other-than-normal occupancy hours for this purpose.
    f. Performance Tests
5. Engage a factory-authorized service representative to inspect component assemblies and equipment installations, including connections, and to conduct performance testing.
6. Boilers shall comply with performance requirements indicated, as determined by field performance tests. Adjust, modify, or replace equipment to comply.
7. Perform field performance tests to determine capacity and efficiency of boilers.
    a. Test for full capacity.
    b. Test for boiler efficiency at low fire 20, 40, 60, 80, 100, 80, 60, 40, and 20 percent of full capacity. Determine efficiency at each test point.
8. Repeat tests until results comply with requirements indicated.
9. Provide analysis equipment required to determine performance.
10. Provide temporary equipment and system modifications necessary to dissipate the heat produced during tests if building systems are inadequate.
11. Notify The City of New York 24 hours minimum in advance of test dates.
12. Document test results in a report and submit to Commissioner.

3.6. DEMONSTRATION

A. Engage a factory-authorized service representative to instruct maintenance personnel to adjust, operate, and maintain boilers.

END OF SECTION 235233

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SECTION 23 56 00
Solar Hot Water System

PART I - GENERAL

1.1 RELATED DOCUMENTS

A. The following documents apply to all required work for the Project: (1) the Contract Drawings, (2) the Specifications, (3) the General Conditions, (4) the Addendum and (5) the Contract (City of New York Standard Construction Contract).

1. LEED General Requirements

2. Refer to DDC General Conditions

   a. Section 01 33 00 "Submittal Procedures"
   b. Section 01 74 19 "Construction Waste Management and Disposal"
   c. Section 01 81 13.04 "Sustainable Design Requirements for LEED v4 Buildings"

1.2 SUMMARY

A. This specification addresses the installation of solar thermal hot water systems for use in domestic hot water heating.

B. All documentation and components furnished by contractor shall be developed, designed, and/or fabricated using high quality design, materials, and workmanship meeting the requirements of the City of New York and all applicable industry codes and standards. Reference is made in these specifications to various standards under which the Work is to be performed or tested. The installations shall comply with at least, but not limited to, the latest approved versions of the International Building Code (IBC) and National Electrical Code (NEC).

C. Contractor shall conform to all specification and guidelines from equipment manufacturers.

1.3 SCOPE OF WORK

A. Contractor shall provide all necessary labor, materials, equipment, and services required to install complete integrated turnkey solar thermal systems. Contractor shall supply all solar collectors, mounting equipment, piping, pumps, controls, metering, related wiring, monitoring equipment, and all ancillary equipment necessary to install the solar system and interconnect it to the hot water system. The solar system installations shall comply with all contract requirements, technical specifications, approved Contract Ddocuments, and applicable regulatory codes and requirements. Contractor shall submit As-Built Construction Drawings in hard copy with two (2) sets and an electronic copy in DWG format on compact disc to the Commissioner after completion of the proving period for each system at each site.

B. Contractor will be responsible for locating, identifying and protecting existing underground utilities conduits, piping, substructures, etc. and ensuring that no damage is inflicted upon existing infrastructure. In addition to USA Dig and utility line-locating, a private line-locator must be used for any project requiring underground work.

1.4 SUBMITTAL PROCEDURES

A. Refer to DDC General Conditions Section 01 33 00 "Submittal Procedures".

1.5 SUBMITTALS

A. Shop Drawings

1.6 QUALITY ASSURANCE

A. Refer to DDC General Conditions Section 01 40 00 "Quality Requirements".

B. Installer Qualifications:

1. The contractor or subcontractor performing the work of this section must, within the last five (5) consecutive years prior to the bid opening, have successfully completed in a timely fashion at least three (3) projects similar in scope, size and type to the required work.

C. Manufacturer Qualifications:

1. The manufacturer providing the material or equipment specified in this section must, for the past five (5) years, have been regularly engaged in the manufacture of material or equipment similar in type to that required for this Project. Such similar material or equipment provided by the manufacturer must have been in satisfactory service for not less than five (5) years.

D. Contractor shall implement a Quality Assurance / Quality Control (QA/QC) plan for construction activities at site. At least 30 days prior to the planned commencement of construction, Contractor shall submit a copy of the QA/QC Plan for review and approval by the Commissioner.

E. To ensure the highest quality of the installation, Contractor shall:

1. Implement policies and procedures to ensure proper oversight of construction work, verification of adherence to construction documents and contractual requirements, and rapid identification and mitigation of issues and risks.

2. Utilize best practice methods for communicating progress, performing work according to the approved Project schedule, and completing the Project on-time.

3. Keep the Site clean and orderly throughout the duration of construction. All trash and rubbish shall be disposed of off-site by licensed waste disposal companies and in accordance with applicable 2014 NYC Building Code.

4. Provide equipment marking, as well as labeling and signage for the Project that shall be removed after Project completion.

5. Fully comply with all applicable notification, safety and Work rules (including The City of New York safety standards) when working on or near the City of New York's facilities.

6. Route all electrical collection system wiring and conduits in a neat and orderly fashion and in accordance with all applicable code requirements. All cable terminations, excluding module-to-module and module-to-cable harness connections, shall be permanently labeled.

7. Torque all mechanical and electrical connections and terminations according to manufacturer specifications, with marking/sealing of all electrical terminations at appropriate torque point.

8. Provide all temporary road and warning signs, flagmen or equipment as required to safely execute the Work. Street sweeping services shall also be provided as required to keep any dirt, soil, mud, etc. off of roads. Comply with all state and local storm water pollution prevention (SWPP) ordinances.

1.7 REFERENCE STANDARDS AND REGULATIONS

A. The design, products, and installation shall comply with at least, but not limited to, the following industry standards:

1. Institute of Electrical and Electronics Engineers (IEEE) Standards
2. National Electrical Manufacturers Association (NEMA)
3. National Electric Code (NEC)
4. Solar Rating and Certification Corporation (SRCC)
5. Underwriters Laboratories, Inc. (UL)
6. National Fire Protection Association (NFPA)
7. American National Standards Institute (ANSI)
8. Occupational Health and Safety Administration (OSHA)
9. American Society for Testing and Materials (ASTM)
10. National Electrical Testing Association (NETA)
11. International Association of Plumbing and Mechanical Officials (IAPMO)
12. IAPMO Backflow Prevention Reference Manual Second Edition

B. In addition to the above, the solar collectors shall comply with at least, but not limited to, the following:

1. Solar Rating & Certification Corporation Standard 100 Minimum Standards for Solar Thermal Collectors (SRCC OG-100)
2. Solar Rating & Certification Corporation Standard 300 Minimum Standards for Solar Water Heating Systems (SRCC OG-300)
3. All equipment shall be new, undamaged, fully warranted without defect.
4. All equipment and installation shall qualify for available solar hot water incentives.
5. Acceptable mounting methods for panels shall be provided by the manufacturer. Bolted and similar connections shall be non-corrosive and include locking devices designed to prevent twisting.
6. If collectors using hazardous materials are to be provided, then the environmental impact of the hazardous material usage must be disclosed, including any special maintenance requirements and proper disposal/recycling of the collectors are the end of their useful life.

7. Glazed Closed Loop Flat Plate Collector: Provide minimum 65% optical efficiency, rugged high quality construction using impact-resistant, anti-reflective solar glass, copper meander/serpentine absorber tube, selective-surface absorber plate, non-degrading thermal insulation and optional rapid connections kits to interconnect collectors, ports for collector temperature sensors, air vents and electronic differential controls.

8. The collector shall have no less than 95% transmission, eta conversion factor of no less than 0.75 by gross area.

1.8 WARRANTY

A. Provide for the following warranties:

1. All solar collectors must have a minimum of a 10 year manufacturer's performance warranty to protect against defects and a 15% performance degradation. Additionally, the Contractor shall provide a 20-year warranty option if commercially available.

2. All systems must have a minimum 10 year performance warranty to protect the host against more than a 15% degradation of system performance over the 10 year period that may occur as a result of faulty installation.

3. All systems must have a minimum 1 year warranty on installation labor and workmanship not otherwise covered by the manufacturer's performance warranty.

4. The mounting system shall have a 20-year warranty covering at least structural integrity and corrosion.

5. Provide a comprehensive ten (10) year warranty on all system components against defects in materials and workmanship under normal application, installation, and use and service conditions.

6. All warranties must be documented in advance and be fully transferable to the City of New York.

PART II - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. SunMaxx Solar Hot Water Solutions

2. Sun Earth

3. Alternate Energy Technologies

4. Or approved equal

2.2 MATERIALS

A. Materials and equipment incorporated in the Work shall be new and suitable for the use intended. No material or equipment shall be used for any purpose other than that for which it is designed, specified or indicated.

B. Contractor shall use means necessary to protect the materials and equipment before, during and after installation. Contractor shall promptly replace lost or damaged materials and equipment with equal, or Commissioner-approved, replacements, or repair them, at no additional cost to the City of New York

2.3 SOLAR COLLECTOR ARRAY

A. Array Layout: Collector array shall be oriented so that all collectors face the same direction. Space collectors arranged in multiple rows so that no shading from other collectors is evident between 1000 hours and 1500 hours solar time on December 21. Indicate minimum spacing between rows. Collector array must have a minimum surface orientation factor (SOF) of 0.75.

B. Piping: Connect interconnecting array piping between solar collectors, in a reverse-return configuration with approximately equal pipe length for any possible flow path. Indicate flow rate through the collector array. Provide each collector bank isolated by valves, with a pressure relief valve and with the capability of being drained. Locate manually operated air vents at system high points, and pitch array piping a minimum of 0.25 inch per foot so that piping can be drained by gravity. Supply calibrated balancing valves at the outlet of each collector bank as indicated.

C. Supports for Solar Collector Array: Utilize the existing support structure and recertify that it will be covered under the Contractors warranty of 10 years with an optional 20 warranty. If a new support is proposed, the Contractor must provide a support structure for the collector array of aluminum, stainless steel, or other corrosion-resistant approved material. Furnish a support structure which secures the collector array at the proper tilt angle with respect to horizontal and orientation with respect to true south. Provide a support structure that will withstand the static weight of filled collectors and piping, wind, seismic, and other anticipated loads without damage. Provide a support structure which allows access to all equipment for maintenance, repair, and replacement. Neoprene or EPDM washers shall separate all dissimilar metals. Depending on system type, supports for solar array could terminate in ballast blocks to avoid roof penetrations.

2.4 TRANSPORT SUBSYSTEM

A. Heat Exchanger: For a heat exchanger, provide a minimum design pressure rating of 150 psi. Construct heat exchanger of 316 stainless steel, titanium, copper-nickel, or brass. Furnish heat exchanger with a capability of withstanding temperatures of at least 240 °F. Tube-in-tube copper side-arm heat exchangers are acceptable for appropriate system types.

B. Pumps: For active solar system designs requiring a pump, provide electrically- driven, single-stage, centrifugal type circulating pumps. Support pumps on a concrete foundation or mounting intended for the purpose, or by the piping on which installed if appropriate to the size. Construct the pump shaft of corrosion resistant alloy steel with a mechanical seal. Provide stainless steel impellers and casings of bronze. Pump motor start stop shall be controlled by the solar thermal temperature control system that is compatible with open communication protocol and meets CSI thermal incentive program requirements complete with manual override (Hand-Off-Automatic). Pumps shall be installed with isolation valves so the pump can be serviced without draining the system.

C. Heat Transfer Fluid Heat transfer fluid shall be compatible with all materials in the system. The nature and amount of heat transfer fluid will depend on the type of system proposed and the freeze conditions encountered at the site. Any anti-freeze, conditioners or corrosion inhibitors added to the heat transfer fluid must be non-toxic and intended for use in potable water systems when used with single wall heat exchangers.

2.5 PIPING SYSTEM

A. Provide a piping system complete with pipe, pipe fittings, valves, strainers, expansion loops, pipe hangers, inserts, supports, anchors, guides, sleeves, and accessories with this specification and the drawings. Pipe shall be designed to observe limits on flow velocity, pressure drop and gauge pressure associated with the pipe type and characteristics.

B. Provide piping flow rates below 5 feet per second. Piping shall be Type L or Type M copper tubing, ASTM B- 88, with 95-5 tin-antimony soldered joints. If cold water piping supplying the SWH system is of another type, such as PVC, it shall be replaced within 10 feet of the SWH system with copper to avoid bulging and rupture due to proximity to the higher temperatures of the solar system.

C. All work performed as described herein including but not limited to piping, fixtures, fitting, solder, flux and panels shall meet California Code requirements for Lead Free products and the installation of these products as set forth in California Health and Safety Code, Sections 116875-116880.

1. Provide outside array piping insulation with a capability of withstanding 250 °F, except that piping insulation within 1.5 feet of collector connections shall be capable of withstanding 400°F. Protect outside piping insulation from water damage and ultraviolet degradation with a suitable outer coating manufactured for this purpose (aluminum, sunlight resistant PVC or approved equal).

2. If systems are proposed with multiple collector banks, provide calibrated balancing valves suitable for 125 psig and 250 °F service. Furnish calibrated balancing valves with bronze body/brass ball construction with seat rings compatible with system fluid and differential readout ports across valve seat area. Provide readout ports fitted with internal insert of compatible material and check valve. Provide calibrated balancing valves with a memory stop feature to allow valve to be closed for service and reopened to set point without disturbing balance position, and with a calibrated nameplate to assure specific valve settings. Provide calibrated balancing valves and ball valves at the outlet of each collector bank. The balancing valves are specified to allow the array to be flow balanced. The ball valves are required to enable the array to be disconnected for maintenance or repair.

3. Provide pressure gauges with throttling type needle valve or a pulsation dampener and shutoff valve. Furnish a 3-1/2 inch minimum dial size.

4. Supply thermometers with wells and separable bronze sockets.

5. Support and hang piping so that the weight of the piping is not supported by drywall, siding, or other building members not designed to bear load. Support piping so that thermal expansion and contraction of pipe lengths is accommodated. Supports shall be replaced to ensure piping does not sag.

6. Provide valves compatible with the piping. Ball valves shall be used for shutoff, with full port, bronze body, bronze ball and Teflon seat. Bronze hose-end gate valves shall be used for draining low points of piping.

7. All exposed and accessible hot water piping must be insulated with material which has a minimum of R2.6 value.

2.6 ELECTRICAL COMPONENTS

A. Provide electrical equipment and wiring in accordance with NFPA 70, the NEC, and UL. Furnish motor starters complete with thermal overload protection and other appurtenances necessary for the motor control

specified. Provide each motor of sufficient size to drive the equipment at the specified capacity without exceeding the nameplate rating of the motor. Motors shall be high efficiency motors.

2.7 MOUNTING SYSTEM

A. The mounting systems shall be designed and installed such that the panels may be fixed with reliable components proven in similar projects, and shall be designed to resist dead load, live load, corrosion, UV degradation, wind loads, and seismic loads appropriate to the geographic area over the expected 25-year lifetime. The design shall sufficiently respond to the design requirements imposed by Federal, State, and local jurisdictions in effect. Conduct an analysis, and submit evidence thereof, including calculations, of each structure affected by the performance of the scope described herein. The analysis shall demonstrate that existing structures are not compromised or adversely impacted by the installation of panels, equipment, or other activity related to this scope. Mounting systems must also meet the following requirements at a minimum:

1. All structural components, including array structures, shall be designed in a manner commensurate with attaining a minimum 25-year design life. Particular attention shall be given to the prevention of corrosion at the connections between dissimilar metals.

2. Thermal loads caused by fluctuations of component and ambient temperatures shall be accounted for and selection of mounting systems such that neither the mounting system nor the surface on which it is mounted shall degrade or be damaged over time.

3. Each collector mounting system must be certified by the collector manufacturer as (1) an acceptable mounting system that shall not void the module warranty, and (2) that it conforms to the module manufacturer's mounting parameters.

4. Final coating and paint colors shall be reviewed and approved by the Commissioner.

5. Painting or other coatings must not interfere with the grounding and bonding of the array.

2.8 CORROSION CONTROL

A. In addition to the above, Corrosion Control must comply with at least, but not limited to the following requirements:

1. Fasteners and hardware throughout system shall be stainless steel or material of equivalent corrosion resistance

2. Racking components shall be anodized aluminum, hot-dipped galvanized steel, or material of equivalent corrosion resistance

3. Unprotected steel not to be used in any components

4. Each system and associated components must be designed and selected to withstand the environmental conditions of the site (e.g., temperatures, winds, rain, flooding, etc.) to which they will be exposed.

PART III - EXECUTION

3.1 EXECUTION REQUIREMENTS

A. Refer to DDC General Conditions for execution requirements.

3.2 ROOFING REQUIREMENTS

A. The installation of collectors and other equipment shall provide adequate room for access and maintenance of existing equipment on the building roofs. A minimum of three feet of clearance will be provided between equipment and existing mechanical equipment and other equipment mounted on the roof. A minimum of four feet of clearance shall be provided between equipment and the edge of the roof. Clearance guidelines shall be followed. The equipment shall not be installed in a way that obstructs air flow into or out of building systems or equipment.

B. Roof top mounted systems may be ballasted, standing seam attachment, or penetrating systems and must meet or exceed the following requirements:

1. Systems shall not exceed the ability of the existing structure to support the entire solar thermal system and withstand increased wind uplift and seismic loads. The capability of the existing structure to support proposed solar systems shall be verified by Contractor prior to design approval.

2. Roof penetrations, if part of the mounting solution, shall be kept to a minimum.

3. Contractor shall perform all work so that existing roof warranties shall not be voided, reduced, or otherwise negatively impacted.

4. No work shall compromise roof drainage, cause damming or standing water or cause excessive soil build-up.

5. All materials and/or sealants must be chemically compatible.

6. Thermal movement that causes scuffing to the roof must be mitigated as part of the mounting solution.

7. All penetrations shall be waterproofed.

8. Detail(s) for the sealing of any roof penetrations shall be approved in writing by the Commissioner, as well as the manufacturer of the existing roofing system, as part of system design review and approval – prior to Contractor proceeding with work.

9. Include signed certificates from the roofing manufacturer stating:

   a. The roofing contractor is certified installer of Complete Roofing System.
   b. The manufacturer's Technical Representative is qualified and authorized to approve the work.
   c. Project Plans and specs meet the requirements of the warranty of the Complete Roofing System for the specified period.
   d. Existing warranty incorporates the new roofing work and flashing work.
   e. Any damage to roofing material during installation of solar systems must be remedied by Contractor.
   f. The installation of panels and other equipment on building roofs will be designed to minimize visibility of the equipment from the ground.

3.3 MONITORING SYSTEMS

A. Contractor shall build, activate and ensure proper functioning of the necessary Data Acquisition Systems (DAS) that enable the City of New York to track the performance of the Solar Systems as well as environmental.

B. Metering and monitoring equipment installed shall include, but is not limited to a data acquisition system, a BTU meter, i.e. a flow meter, a temperature sensor pair, and a calculator. Btu meters must satisfy maximum permissible errors of OIML R75 Class 1 accuracy. Assembled Btu meters are allowable if Btu calculations are only performed when there is flow.

C. Data must be collected in 15-minute intervals that will be available on a daily basis. Data collected must include date, time, solar Btu delivered, cold water supply temperature, solar hot water delivery temperature, collector temperature, run time of pump(s) and log data which will include alarms, system messages, system events and trends.

D. The monitoring system must have remote communication capability whereby performance data can be collected, accessed remotely and uploaded for processing by a Performance Data Provider (PDP). The PDP provider must retain performance date for five years from the data collection end date.

E. A Monitoring Manual shall be provided to the City of New York in printed or on-line form that describes how to use the monitoring system, including the export of data and the creation of custom reports.

3.4 FREEZE AND STAGNATION PROTECTION

A. Contractor is responsible for installing a solar system that meets freeze protection requirements set forth by SRCC and IAMPO for the appropriate climate zone of the site.

B. Contractor is responsible for installing a solar system that meets stagnation and overheat protection requirements set forth by SRCC or IAPMO.

C. Closed loop drainback systems must have a controller which will shut down a pump when the storage tank temperature limit has been reached.

D. For closed loop systems, acceptable stagnation control measures include, but are not limited to advanced controller with thermal cycling function, heat dump radiator, steam back, pressure stagnation protection.

3.5 SHADING

A. Contractor shall adhere to the following requirements in order to avoid excessive shading on panels. For any object near an array that is higher than the lowest point of that array by height H, Contractor shall locate the array farther from the object than:

1. 2H to the North of the object
2. 2H to the East or West of the object
3. 2H to any non-cardinal direction of the object

B. Any trees that are in the footprint of systems to be installed by the Contractor shall be removed by the Contractor at their expense, subject to the approval of the City of New York. A tree shall be considered to be in the footprint of a system if its canopy would extend over any part of the system, including structural components or modules. The Contractor shall be responsible for any required tree remediation efforts resulting from tree removal that is deemed the Contractor's responsibility.

3.6 CLEANING

A. Clean and disinfect potable-water distribution piping as follows:

1. Purge new piping and parts of existing water piping that have been altered, extended, or repaired before using. Use purging and disinfecting procedure prescribed by a procedure described in either AWWA C651 or AWWA C652. Submit water samples in sterile bottles. Repeat procedure if biological examination shows contamination.

B. Clean the non-potable solar thermal side of the system including the solar thermal collectors and heat exchanger according to manufacturer's recommendations. Clean all piping by flushing the piping system with clean, potable water until dirty water does not appear at outlets.

3.7 TESTING AND COMMISSIONING

A. Following completion of construction, Contractor shall provide the following services related to startup and performance testing of the systems:

1. Acceptance Testing
2. System Startup
3. Proving Period

B. A detailed Testing Plan covering each of the phases above shall be submitted and approved by the City of New York prior to substantial completion of construction. A detailed description of each phase is provided below.

3.8 ACCEPTANCE TESTING

A. Contractor shall perform a complete acceptance test for each System. The acceptance test procedures include component tests as well as other standard tests, inspections, safety and quality checks. All testing and commissioning shall be conducted in accordance with the manufacturer's specifications.

B. The section of the Testing Plan that covers Acceptance Testing cover at least the following:

1. Detailed test methods, including sample calculations and reference to standards as required or applicable, and list of tested equipment.
2. Pre-test checklist to ensure readiness and any safety measures are in-place.
3. Detailed list of all items to be inspected and tests to be conducted.
4. Acceptance Criteria: For each test phase, specifically indicate what is considered an acceptable test result.

C. The Acceptance Testing section of the Testing Plan shall include (but not be limited to) the following tests:

1. Testing performance of the collectors relative to insolation, ambient temperature and inlet temperature
2. Testing of all sensors of the DAS
3. Temperature sensor diagnostics
4. Testing of the Data Presentation interface of the DAS
5. Piping hydraulic pressure test

6. Water potability test

D. After Contractor conducts all Acceptance Testing based on the Testing Plan approved by the Commissioner prior to substantial completion, Contractor shall submit a detailed Acceptance Test Report to the Commissioner for review.

E. The Acceptance Test Report shall document the results of the tests conducted following the Testing Plan, and include additional information such as the date and time each test was performed. It shall also make reference to any problem and deficiencies found during testing. If there was troubleshooting done, the Report shall describe the troubleshooting methods and strategy. Contractor shall be responsible for providing the labor and equipment necessary to troubleshoot the System.

3.9 SYSTEM STARTUP

A. Following The City of New York approval of the Acceptance Test Report, Contractor shall conduct tests over twenty-four (24) hours and at a time resolution of fifteen (15) minutes, recording the following data:

1. Thermal output (Btu)
2. In-plane irradiance
3. Ambient temperature
4. Collector inlet temperature
5. Thermal energy storage temperatures

B. These data points shall be presented in a manner that best depicts the actual performance of the system for The City of New York's review and approval and shall be submitted as part of the Startup Test Report.

3.10 PROVING PERIOD (30 DAYS)

A. Upon completion of Acceptance Testing and System Startup, and approval by the Commissioner, Contractor shall monitor the system during a thirty (30) day Proving Period and submit a report for Commissioner review and approval prior to final acceptance by the Commissioner. This includes monitoring system output and ensuring the correct functioning of system components over this time. The values for the following data shall be acquired every fifteen (15) minutes over thirty (30) days:

1. Date and Time of data points
2. Thermal output (Btu)
3. Total Btu's delivered (per tank if system has multiple tanks)
4. In-plane irradiance
5. Ambient temperature
6. Collector inlet temperature
7. Thermal energy storage temperatures
8. Quantity of back-up fuel consumption

9. System availability

B. Contractor shall utilize calibrated test instruments and DAS and monitoring system to collect the test data described above, which shall be made available to the Commissioner for access throughout the proving period. Contractor shall determine through analysis of data from the proving period whether the solar thermal system delivers the expected production as determined by Contract Documents. Actual production shall be compared against expected production using actual weather data and other system inputs for calculating expected production.

C. All data and reports required in system testing shall be fully functional and available to the City of New York at the commencement of the proving period. Data and reporting requirements are included in the testing scope of the proving period and deficiencies in these areas (including missing data, inaccurate reports, and other issues that make validation of system performance inconclusive) shall be grounds for denying approval of the proving period report.

D. If the solar thermal system does not perform to the specifications, diagnostic testing shall be performed by Contractor, deficiencies shall be identified with proposed corrective actions submitted to the Commissioner, and the Proving Period test repeated. Contractor shall be responsible for providing the labor and equipment necessary to troubleshoot the system. The Proving Period Report shall be submitted after the successful completion of this phase and submitted to the Commissioner for review and approval. The report shall contain, but not be limited to, the following information; calculations shall be provided in Excel format with formulas visible to allow for peer review:

1. System description
2. Test period
3. Test results
4. Anomalies identified during test
5. Corrective action performed
6. Actual measured performance
7. Calculations detailing expected performance under TMY conditions

3.11 CLOSE-OUT DOCUMENTATION REQUIREMENTS

A. Close-Out documents prepared by Contractor must include at minimum, but not limited to, the following items:

1. Final As-Built Drawing Set, provided in (2) hard copy sets and an electronic copy in DWG format (or as desired by The City of New York)
2. O&M Manuals – Contractor shall provide two (2) copies of O&M Manuals. Updated editions of O&M Manuals shall be sent electronically to the Commissioner as they become available.

3.12 PREVENTATIVE SERVICE

A. Preventive Service shall be performed once and include:

1. Test system performance vs. insolation and ambient temperature to verify continued performance at or near design levels

2. System level testing including tests of individual major components

3. System visual inspection to include but not be limited to the list below. All discovered issues shall be resolved as needed.

   a. Inspect for stolen, broken or damaged collectors, record damage and location. Report to the Commissioner and wait for the Commissioner to authorize a course of action.
   b. Check mechanical attachments of the collectors and racking system.
   c. Inspect all metallic parts for corrosion.
   d. Survey entire jobsite for debris or obstructions.
   e. Inspect fasteners for proper torque and corrosion.
   f. Check for proper operation and reporting of monitoring hardware.
   g. Inspect pipe connections for leaks
   h. Inspect piping and other hardware for signs of damage from vandalism or animal damage.
   i. Inspect storage tank(s) for signs of damage

4. System maintenance to include correction of loose water pipe connections, replacement if defective collectors found during testing, other minor maintenance repair work.

5. Collector cleaning, at a frequency to be determined by the ongoing monitoring of the system such that effect on production is no more than 5%, but not less often than twice a year.

6. DAS maintenance to include sensor calibration and data integrity check

3.13 MAJOR COMPONENT SERVICE

A. Pump repair and component replacement and refurbishment as required in the event of pump failure.

B. Pump inspection and regular servicing as required under pump manufacturer's warranty specifications. Those include but are not limited to the following annually by manufacturer:

   1. Check for corrosion on all fittings

   2. Check all connections.

   3. Perform a complete visual inspection of all connected systems including expansion tank and back-up water heater.

   4. Record all inspections completed.

   5. Inform pump manufacturer of all deficiencies identified.

   6. Oversee pump manufacturer performance of In-Warranty replacement of failed pump components.

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SECTION 235700
Heat Exchangers for HVAC

PART 1 - GENERAL

1.1. RELATED DOCUMENTS

A. The following documents apply to all required work for the Project: (1) the Contract Drawings, (2) the Specifications, (3) the General Conditions, (4) the Addendum and (5) the Contract (City of New York Standard Construction Contract).

1.2. SUMMARY

A. This Section includes plate heat exchangers.

1.3. SUBMITTALS

A. Refer to DDC General Conditions Section 01 33 00 "Submittal Procedures".
B. Product Data: Include rated capacities, operating characteristics, furnished specialties, and accessories.
C. Operation and Maintenance Data: For heat exchangers to include in emergency, operation, and maintenance manuals.

1.4. QUALITY ASSURANCE

A. Refer to DDC General Conditions Section 01 40 00 "Quality Requirements".
B. Product Options: Drawings indicate size, profiles, performance, and dimensional requirements of heat exchangers and are based on the specific equipment indicated. Refer to DDC General Conditions Section "Product Requirements."
C. ASME Compliance: Fabricate and label heat exchangers to comply with ASME Boiler and Pressure Vessel Code: Section VIII, "Pressure Vessels," Division 1.
D. ARI Standard 400

PART 2 - PRODUCTS

2.1. MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by the following:

1. Plate Concepts
2. API Heat Transfer Inc.
3. FlatPlate, Inc.
4. ITT Industries; Bell & Gossett.

5. Polaris Plate Heat Exchangers.
6. Or approved equal

B. Configuration: Brazed assembly consisting of two end plates, one with threaded nozzles and pattern-embossed plates, double wall construction.
C. End-Plate Material: Type 316 stainless steel.
D. Threaded Nozzles: Type 316 stainless steel.
E. Plate Material: Type 316 stainless steel.
F. Brazing Material: Copper.
G. Frame Material: Carbon Steel

PART 3 - EXECUTION

3.1. EXECUTION REQUIREMENTS

A. Refer to DDC General Conditions for execution requirements.

3.2. EXAMINATION

A. Examine areas for compliance with requirements for installation tolerances and for structural rigidity, strength, anchors, and other conditions affecting performance of heat exchangers.

1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.3. HEAT-EXCHANGER INSTALLATION

A. Ceiling Hung with vibration isolators.

3.4. CONNECTIONS

A. Piping installation requirements are specified in other Division 23 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.
B. Maintain manufacturer's recommended clearances for service and maintenance. Install piping connections to allow service and maintenance of heat exchangers.
C. Install shutoff valves at heat-exchanger inlet and outlet connections.
D. Install relief valves on heat-exchanger heated-fluid connection and install pipe relief valves, full size of valve connection, to floor drain.
E. Install hose end valve to drain shell.

3.5. FIELD QUALITY CONTROL

A. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

3.6. CLEANING

A. After completing system installation, including outlet fitting and devices, inspect exposed finish. Remove burrs, dirt, and construction debris and repair damaged finishes.

3.7. DEMONSTRATION

A. Instruct the City of New York's maintenance personnel to adjust, operate, and maintain heat exchangers. Refer to DDC General Conditions Section "Demonstration and Owner's Pre-Acceptance Orientation."

END OF SECTION 235700

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SECTION 237200
Heating and Ventilating / Rooftop Units with Energy Recovery Equipment

PART 1 - GENERAL

1.1. RELATED DOCUMENTS

A. The following documents apply to all required work for the Project: (1) the Contract Drawings, (2) the Specifications, (3) the General Conditions, (4) the Addendum and (5) the Contract (City of New York Standard Construction Contract).

B. LEED General Requirements:
   1. Refer to DDC General Conditions:
      a. Section 01 33 00 "Submittal Procedures."
      b. Section 01 81 13.04 "Sustainable Design Requirements for LEED v4 Buildings."
      c. Section 01 91 13 General Commissioning Requirements for MEP Systems.

1.2. SUMMARY

A. Section Includes:

   1. Heating and Ventilating and Rooftop units with energy recovery equipment.

1.3. QUALITY ASSURANCE

A. Refer to DDC General Conditions Section 01 40 00 "Quality Requirements".

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

C. AHRI Compliance: Capacity ratings for each energy recovery equipment shall comply with AHRI 1060, "Rating Air-to-Air Energy Recovery Equipment."

D. NRCA Compliance: Roof curbs for roof-mounted equipment shall be constructed according to recommendations of NRCA.

E. UL Compliance: Packaged heat recovery ventilators shall comply with requirements in UL 1812, "Ducted Heat Recovery Ventilators"; or UL 1815, "Nonducted Heat Recovery Ventilators."

F. Coordinate layout and installation of Heating and Ventilating and Rooftop units energy recovery equipment and suspension system with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, fire-suppression system, and partition assemblies.

G. Coordinate sizes and locations of roof curbs, equipment supports, and roof penetrations with actual equipment provided.

1.4. SUBMITTAL PROCEDURES

A. Refer to DDC General Conditions Section 01 33 00 "Submittal Procedures".

1.5. SUBMITTALS

A. Product Data: For each type of product indicated. Include rated capacities, furnished specialties, and accessories.

B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.

1. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
2. Wiring Diagrams: For power, signal, and control wiring.

C. Coordination Drawings: Plans, elevations, and other details, drawn to scale, on which the following items are shown and coordinated with each other, using input from Installers of the items involved:

1. Suspended ceiling components.
2. Structural members to which equipment or suspension systems will be attached.

D. Field quality-control reports.

E. Operation and Maintenance Data: Include manufacturer maintenance manuals for Heating and Ventilating and Rooftop units.

1.6. WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of the equipment that fails in materials or workmanship within specified warranty period.

PART 2 - PRODUCTS

2.1. OUTDOOR ENERGY RECOVERY UNIT

A. Construction of the Energy Recovery Equipment

1. The energy recovery component shall be of fixed-plate cross-flow construction, with no moving parts.
2. No condensate drain pans or drains shall be allowed and unit shall be capable of operating in both winter and summer conditions without generating condensate.
3. The unit case shall be constructed of G90 galvanized, 20-gauge steel, with lapped corners and zinc plated screw fasteners. The unit roof shall be once piece or have watertight standing seam joints and shall overlap wall panels and doors in order to positively shed water.
4. Access doors shall provide easy access to blowers, ERV cores, and filters. Doors shall have an airtight compression seal using closed cell foam gaskets rated for outdoor exposure. Pressure taps, with captive plugs, shall be provided allowing cross-core pressure measurement allowing for accurate airflow measurement.
5. Weatherhoods shall be screened to exclude birds and animals. Inlet weatherhoods shall be sized to maintain inlet velocities below 500 fpm, and equipped with rain excluder baffles.
6. Case walls and doors shall be insulated with 1inch, 4 pound density, foil/scrim faced,high-density fiberglass board insulation, providing a cleanable surface and eliminating the possibility of exposing the fresh air to glass fibers, and with minimum R-value of 4.3 (hr-ft2-F/BTU).

7. The energy recovery cores shall be protected by a MERV-13 rated, 2" nominal, pleated, disposable filter in both airstreams.
8. Unit shall have single-point power connection and a single-point 24 VAC contactor connection.
9. Blower motors shall be Premium Efficiency, EISA compliant for energy efficiency. The blower motors shall be totally enclosed (TEFC) and shall be supplied with factory installed motor starters. Direct drive models shall be EISA compliant for energy efficiency with open drip proof design and integral thermal protection.
10. Blowers shall be quiet running, forward curve type and be either direct drive or belt drive. Belt drive motors shall be provided with adjustable pulleys and motor mounts allowing for blower speed adjustment, proper motor shaft orientation and proper belt tensioning.
11. The unit electrical box shall include a factory installed, non-fused disconnect switch and a 24 VAC, Class II transformer/relay package.
12. The energy recovery equipment shall be provided "inverter-ready" allowing for applications of inverters supplied and installed by others.
13. Provide unit and duct connection orientation per project schedule.
14. Provide double wall construction with 24-guage galvanized steel liner.
15. Provide 14 inch high, non-pitched roof curbs as available from the factory. Pitched curbs, vibration curbs, seismic curbs and other custom curbs are available directly from curb manufacturer.

PART 3 - EXECUTION

3.1. EXAMINATION

A. Examine areas and conditions for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
B. Examine casing insulation materials and filter media before air-to-air energy recovery equipment installation. Reject insulation materials and filter media that are wet, moisture damaged, or mold damaged.
C. Examine roughing-in for electrical services to verify actual locations of connections before installation.
D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2. INSTALLATION

A. Install fixed-plate heat exchangers so supply and exhaust airstreams flow in opposite directions.

1. Install unit access doors in both supply and exhaust ducts, both upstream and downstream, for access to heat exchanger. Access doors and panels are specified in Division 23 Section 23 33 00 "Air Duct Accessories."

B. Roof Curb: Install on roof structure or concrete base, level and secure, according to NRCA's "Low-Slope Membrane Roofing Construction Details Manual," Illustration "Raised Curb Detail for Rooftop Air Handling Units and Ducts." Install air-to-air energy recovery equipment on curbs and coordinate roof penetrations and flashing with roof construction specified in Division 07 Section 07 71 00 "Roof Accessories and Specialties." Secure air-to-air energy recovery equipment to upper curb rail, and secure curb base to roof framing or concrete base with anchor bolts.
C. Suspended Units: Suspend units from structural-steel support frame using threaded steel rods and spring hangers. Comply with requirements for vibration isolation devices specified in Division 23 Section 23 05 48 "Vibration and Seismic Controls for HVAC Piping and Equipment."
D. Install units with clearances for service and maintenance.

E. Install new filters at completion of equipment installation and before testing, adjusting, and balancing.
F. Pipe drains from units and drains pans to nearest floor drain; use same size as condensate drain connection.
G. Unit Location and Placement

1. Locate and orient unit to provide the shortest and most straight duct connections. Provide service clearances as indicated on the plans. Locate units distant from sound critical occupancies.
2. Install a structurally sound, weathertight, level and properly insulated roof curb with nailers, curb gasket and tiedowns to meet local wind load requirements.
3. Insure roof decking penetrations inside curb are properly positioned and sixed for ducts. Seal all penetrations and gaps between ducts and decking with appropriate fire, weather and acoustic sealant system.
4. Install fiberglass batt insulation over the decking inside the curb. Insulation thickness to be determined by local thermal requirements.
5. Use proper rigging, including spreader bars, for safe lifting and placement.

H. Vibration Isolation

1. Provide spring type vibration rails or curb to match the specific unit corner weights.
2. Provide flexible duct connections at unit duct flanges.

I. Duct Design

1. All ductwork shall be designed, constructed, supported and sealed in accordance with SMACNA HVAC Duct Construction Standards and pressure classifications.
2. Ductwork shall be installed to the curb duct adaptors before unit is set in place.
3. Both the return and the supply ducts shall be thermally insulated at levels appropriate to the local climate from the unit through the curb and continuous until at least the first elbow or tee. A continuous vapor barrier shall also be provided on warm surface of the insulation.

3.3. CONNECTIONS

A. Comply with requirements for piping specified in Division 23 Section 23 21 13 "Hydronic Piping." Drawings indicate general arrangement of piping, fittings, and specialties.
B. Comply with requirements for ductwork specified in Division 23 Section 23 31 13 "Metal Ducts."
C. Install piping adjacent to machine to allow service and maintenance.

3.4. FIELD QUALITY CONTROL

A. Perform tests and inspections.
B. Tests and Inspections:

1. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
2. Adjust seals and purge.
3. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

4. Set initial temperature and humidity set points.
5. Set field-adjustable switches and circuit-breaker trip ranges as indicated.
6. Test and Balancing may not begin until 100% of the installation is complete and fully functional.
7. Follow National Environmental Balancing Bureau (NEBB) air test and balance procedures specific to Heat Recovery Ventilator Balancing Procedure including standard reports to the Commissioner.

C. Heating and Ventilating and Rooftop units' energy recovery equipment will be considered defective if it does not pass tests and inspections.

D. Prepare test and inspection reports.

3.5. DEMONSTRATION

A. Instruct the City of New York's maintenance personnel to adjust, operate, and maintain air-to-air energy recovery units.

END OF SECTION 237200

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SECTION 238126
Split-System Air-Conditioners

PART 1 - GENERAL

1.1. RELATED DOCUMENTS

A. The following documents apply to all required work for the Project: (1) the Contract Drawings, (2) the Specifications, (3) the General Conditions, (4) the Addendum and (5) the Contract (City of New York Standard Construction Contract).

1.2. SUMMARY

A. This Section includes split-system air-conditioning and heat pump units consisting of separate evaporator-fan and compressor-condenser components. Units are designed for exposed or concealed mounting, and may be connected to ducts.

1.3. SUBMITTALS

A. Refer to DDC General Conditions Section 01 33 00 "Submittal Procedures."

B. Product Data: Include rated capacities, furnished specialties, and accessories for each type of product indicated. Include performance data in terms of capacities, outlet velocities, static pressures, sound power characteristics, motor requirements, and electrical characteristics.

C. Shop Drawings: Diagram power, signal, and control wiring.

D. Samples for Initial Selection: For units with factory-applied color finishes.

E. Operation and Maintenance Data: For split-system air-conditioning units to include in emergency, operation, and maintenance manuals.

F. Warranty: Special warranty specified in this Section.

1.4. QUALITY ASSURANCE

A. Refer to DDC General Conditions Section 01 40 00 "Quality Requirements."

B. Product Options: Drawings indicate size, profiles, and dimensional requirements of split-system units and are based on the specific system indicated.

C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to NYC Department of Building, and marked for intended use.

D. ASHRAE/IESNA 90.1-2013 Compliance: Applicable requirements in ASHRAE/IESNA 90.1-2013, Section 6 - "Heating, Ventilating, and Air-Conditioning."

E. Energy Star Qualified.

F. In addition, the contractor or subcontractor must be licensed or approved by the manufacturer.

G. The contractor or subcontractor performing the work specified of this section must, within the last three (3) consecutive years prior to the bid opening, have successfully completed in a timely fashion at least three (3) projects similar in scope, size, and type to the required work, based on architectural style, construction method and materials and age of building for this particular project. One such prior project of the three must have involved a landmarked building, as officially designated by the City, State or Federal government.

H. The manufacturer providing the material or equipment specified in this section must, for the past three (3) years, have been regularly engaged in the manufacture of material or equipment similar in type to that required for this Project. Such similar material or equipment provided by the manufacturer must have been in satisfactory service for not less than three (3) years.

1.5. COORDINATION

A. Coordinate size and location of concrete bases for units. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork are specified in 033000 Section "Cast-in-Place Concrete."

B. Coordinate size, location, and connection details with roof curbs, equipment supports, and roof penetrations specified in 077100 Section "Roof Accessories."

1.6. WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to restore or replace components of split-system air-conditioning units that fails in materials or workmanship within specified warranty period.

1. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1. MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products as scheduled on drawings or by one of the following:

1. Daikin
2. Carrier Air Conditioning; Div. of Carrier Corporation.
3. Mitsubishi Electronics America, Inc.; HVAC Division.
4. Trane Company (The); Unitary Products Group.
5. York International Corp.

2.2. CONCEALED EVAPORATOR-FAN COMPONENTS

A. Cabinet: The cabinet shall be constructed of scratch resistant heavy duty G90 galvanized steel. The evaporator drain pan shall be constructed of stainless steel and shall be IAQ compliant. The complete unit shall be mounted on heavy-duty channels to accommodate hanging rods for ceiling/slab floor mounting.

B. Chassis: Galvanized steel with flanged edges, removable panels for servicing, and insulation on back of panel.

C. Insulation: Acoustical insulation shall be a minimum density of 2 lbs. and be installed on the interior top, side and bottom pans and panels.

D. Drain Pans: Galvanized steel, with connection for drain; insulated

E. Refrigerant Coil: The evaporator coil shall be of draw-thru airflow design. The coil shall be made with 3/8" O. D. heavy wall seamless copper tubes. Tubing shall be mechanically expanded to corrugated aluminum fins with drawn self-spacing collars. All evaporator coils / circuits shall be fed by an adjustable thermostatic expansion valve with external equalizer, complying with ARI 210/240, protective coating and with thermal-expansion valve.

F. Blower Assembly: The blower assembly shall be belt driven with the ability to deliver up to 1" ESP (motor and drive package may be non-standard). The blower housing shall be a galvanized heavy-duty gauge steel double inlet type. The blower wheel shall be mounted on a solid steel keyed shaft. The shaft shall be mounted on resiliently mounted permanently lubricated ball bearings. The blower pulley shall be of cast iron construction and keyed to the blower shaft.

G. Fan Motors: Comply with requirements in Section 230513 "Common Motor Requirements for HVAC Equipment." The motor shall have internal protection from over-heating. Motor shall have permanently lubricated ball bearings. The motor shall be mounted to an adjustable motor frame. Motor pulley shall be cast iron, keyed, and variable pitch design to allow for field adjustment of specific airflow and static requirements.

H. Disposable Filters: 1 inch thick, in fiberboard frames with ASHRAE 52.2 MERV rating of 8 or higher.

I. Electrical: The unit shall have dual electrical control panels, one in the evaporator section and the other in the condensing section. This shall enable the unit, if split in the field, to be power wired independently. All components (fan motors, compressors) shall have their own definite purpose contactor. Compressor(s) shall be protected by non-adjustable high and low-pressure controls with auto reset and a manual reset lock out relay in each refrigeration circuit. Unit(s) with electric heat or microprocessor control shall incorporate an air pressure differential switch. This shall enable the unit(s) to shut down in the event of an evaporator motor, blower or belt failure. A low voltage transformer with integral protection shall be provided to supply 24 VAC to the control circuit. Clearly labeled low voltage terminal strips will be provided for field wiring of thermostat.

J. Wiring Terminations: Connect motor to chassis wiring with plug connection.

2.3. AIR-COOLED DUCTED, COMPRESSOR-CONDENSER COMPONENTS

A. Casing: Steel, finished with baked enamel in color selected by Commissioner, with removable panels for access to controls, weep holes for water drainage, and mounting holes in base. Provide brass service valves, fittings, and gage ports on exterior of casing.

B. Compressor: The compressor(s) shall be a high efficiency heavy-duty heat pump, full hermetic scroll type. The compressor(s) shall be internally protected from over-heating. The compressor(s) shall have an integral crankcase heater if optional flooded condenser is included. Compressor(s) shall be vibration isolated with external mounting.

1. Compressor Type: Scroll.
2. High-pressure switch and automatic-reset low-pressure switch.
3. Refrigerant: R-410A.

C. Refrigerant Coil: The condenser coil shall be of draw-thru airflow design. The coil shall be made with 3/8" O. D. heavy wall seamless copper tubes. Tubing shall be mechanically expanded to louvered aluminum fins with drawn self-spacing collars. Comply with ARI 210/240.

D. Fan: Dynamically balanced.

E. Motor: Permanently lubricated, with integral thermal-overload protection.

F. Low Ambient Kit: Permits operation down to 35 deg F.

G. Refrigeration Circuit: The refrigeration circuit shall include high and low side access fittings, sight glass with integral moisture indicator, filter-drier, high and low pressure switches. The refrigeration circuit shall be field splittable with reusable quick-connects to prevent loss of factory charge when split in the field.

H. Service Access: The unit shall be accessible from the sides only. Access doors shall be held in place by screws. Access to the refrigeration circuit, including compressor and sight glass, shall be on the opposite side of the unit

I. Minimum Energy Efficiency: Comply with ASHRAE/IESNA 90.1-2007, "Energy Standard for Buildings except Low-Rise Residential Buildings" and New York State Energy Conservation Construction Code.

2.4. INDOOR CEILING-CONCEALED DUCTED INDOOR UNIT (VRF)

A. General: The unit shall be a ceiling concealed ducted indoor fan coil that mounts above the ceiling with a fixed rear return and a horizontal discharge supply, and shall have a modulating linear expansion device. The unit shall be used with the outdoor unit. The unit shall support individual control using M-NET Direct Digitals Controllers.

B. Indoor Unit: The indoor unit shall be factory assembled, wired and run tested. Contained within the unit shall be all factory wiring, piping, electronic modulating linear expansion device, control circuit board and fan motor. The unit shall have a self-diagnostic function, 3-minute time delay mechanism, and an auto re-

start function. Indoor unit and refrigerant pipes shall be charged with dehydrated air before shipment from the factory.

C. Unit Cabinet:

1. The cabinet shall be ceiling-concealed, ducted.
2. The cabinet panel shall have provisions for a field installed filtered outside air intake.

D. Fan:

1. The indoor unit fan shall be an assembly with one or two fan(s) direct driven by a single motor.
2. The indoor fan shall be statically and dynamically balanced to run on a motor with permanently lubricated bearings.
3. The indoor unit shall have a ducted air outlet system and ducted return air system.

E. Filter:

1. Return air shall be filtered by a field-supplied filter.
2. Optional rear return filter box with long-life filter shall available for all indoor units.

F. Coil:

1. The indoor coil shall be of nonferrous construction with smooth plate fins on copper tubing.
2. The tubing shall have inner grooves for high efficiency heat exchange.
3. All tube joints shall be brazed with phos-copper or silver alloy.
4. The coils shall be pressure tested at the factory.
5. A condensate pan and drain shall be provided under the coil.
6. The condensate shall be gravity drained from the fan coil.
7. Both refrigerant lines to the indoor units shall be insulated.

G. Electrical:

1. The unit electrical power shall be 208/230 volts, 1-phase, 60 hertz.
2. The system shall be capable of satisfactory operation within voltage limits of 187-228 volts (208V/60Hz) or 207-253 volts (230V/60Hz).

H. Controls:

1. This unit shall use controls provided by manufacturer to perform functions necessary to operate the system.
2. Indoor unit shall compensate for the higher temperature sensed by the return air sensor compared to the temperature at level of the occupant when in HEAT mode. Disabling of compensation shall be possible for individual units to accommodate instances when compensation is not required.
3. Control board shall include contacts for control of external heat source. External heat may be energized as second stage with 1.8°F – 9.0°F adjustable deadband from set point.
4. Indoor unit shall include no less than four (4) digital inputs capable of being used for customizable control strategies.

5. Indoor unit shall include no less than three (3) digital outputs capable of being used for customizable control strategies.

2.5. INDOOR UNIT – CEILING CASSETTE UNIT (VRF)

A. General: The model shall be a ceiling cassette fan coil unit, operable with R410A refrigerant, equipped with an electronic expansion valve, for installation into the ceiling cavity equipped with an air panel grille. It shall be a four-way air distribution type, ivory white, impact resistant, and washable decoration panel. The supply air is distributed via motorized louvers which can be horizontally and vertically adjusted from 0° to 90.

1. The indoor unit shall be completely factory assembled and tested. Included in the unit is factory wiring, piping, electronic proportional expansion valve, control circuit board, fan motor thermal protector, flare connections, condensate drain pan, condensate drain pump, self-diagnostics, auto-restart function, 3-minute fused time delay, and test run switch.
2. Indoor unit and refrigerant pipes will be charged with dehydrated air prior to shipment from the factory.
3. Both refrigerant lines shall be insulated from the outdoor unit.
4. The 4-way supply air flow can be field modified to 3-way and 2-way airflow to accommodate various installation configurations including corner installations.
5. Return air shall be through the panel, which includes a mold resistant filter.
6. The indoor units shall be equipped with a condensate pan and condensate pump. The condensate pump provides up to 21" of lift.
7. The indoor units shall be equipped with a return air thermistor.
8. The indoor unit will be separately powered with 208~230V/1-phase/60Hz.

B. Performance: Each unit's performance is based on nominal operating conditions and drawing schedules.

C. Cabinet: The cabinet shall be space saving and shall be located into the ceiling. Three auto-swing positions shall be available to choose, which include standard, draft prevention and ceiling stain prevention. The air-flow of the unit shall have the ability to shut down one or two sides allowing for simpler corner installation. The cabinet shall be constructed with sound absorbing foamed polystyrene and polyethylene insulation.

D. Fan: The fan shall be direct-drive turbo fan type with statically and dynamically balanced impeller with high and low fan speeds available. The fan motor shall operate on 208/230 volts, 1 phase, and 60 hertz. The air flow rate shall be available in high and low settings. The fan motor shall be thermally protected.

E. Filter: The return air shall be filtered by means of a washable long-life filter with mildew proof resin.

F. Coil: Coils shall be of the direct expansion type constructed from copper tubes expanded into aluminum fins to form a mechanical bond. The coil shall be of a waffle louver fin and high heat exchange, rifled bore tube design to ensure highly efficient performance. The coil shall be a cross fin copper evaporator coil, completely factory tested. The refrigerant connections shall be flare connections and the condensate will be 1 -1/4 inch outside diameter. A condensate pan shall be located under the coil. A condensate pump with a 21 inch lift shall be located below the coil in the condensate pan with a built in safety alarm. A thermistor will be located on the liquid and gas line.

G. Electrical: A separate power supply will be required of 208/230 volts, 1 phase, 60 hertz.

2.6. INDOOR UNIT – WALL MOUNTED UNIT (VRF)

A. General: Unit shall be an indoor wall mounted fan coil unit, operable with refrigerant R410A, equipped with an electronic expansion valve, for installation onto a wall within a conditioned space. The indoor unit shall be completely factory assembled and tested. Included in the unit is factory wiring, piping, electronic proportional expansion valve, control circuit board, fan motor thermal protector, flare connections, condensate drain pan, self-diagnostics, auto-restart function, 3-minute fused time delay, and test run switch. The unit shall have an auto-swing louver which ensures efficient air distribution, which closes automatically when the unit stops. The front grille shall be easily removed for washing. The discharge angle shall automatically set at the same angle as the previous operation upon restart. The drain pipe can be fitted to from either left or right sides.

1. Indoor unit and refrigerant pipes will be charged with dehydrated air prior to shipment from the factory.
2. Both refrigerant lines shall be insulated from the outdoor unit.
3. Return air shall be through a resin net mold resistant filter.
4. The indoor units shall be equipped with a condensate pan.
5. The indoor units shall be equipped with a return air thermistor.
6. The indoor unit will be separately powered with 208~230V/1-phase/60Hz.

B. Performance: Each unit's performance is based on nominal operating conditions and drawing schedules.

C. Cabinet: The cabinet shall be affixed to a factory supplied wall mounting template and located in the conditioned space. The cabinet shall be constructed with sound absorbing foamed polystyrene and polyethylene insulation.

D. Fan: The fan shall be a direct-drive cross-flow fan, statically and dynamically balanced impeller with high and low fan speeds available. The fan motor shall operate on 208/230 volts, 1 phase, 60 hertz. The air flow rate shall be available in high and low settings. The fan motor shall be thermally protected.

E. Coil: Coils shall be of the direct expansion type constructed from copper tubes expanded into aluminum fins to form a mechanical bond. The coil shall be of a waffle louver fin and high heat exchange, rifled bore tube design to ensure highly efficient performance. The coil shall be a cross fin copper evaporator coil completely factory tested. The refrigerant connections shall be flare connections and the condensate will be 1-1/4 inch outside diameter. A thermistor will be located on the liquid and gas line. A condensate pan shall be located in the unit.

F. Electrical: A separate power supply will be required of 208/230 volts, 1 phase, 60 hertz. The acceptable voltage range shall be 187 to 253 volts.

2.7. ACCESSORIES

A. Thermostat: Low voltage with sub base to control compressor and evaporator fan.

B. Automatic-reset timer to prevent rapid cycling of compressor.

C. Refrigerant Line Kits: Soft-annealed copper suction and liquid lines factory cleaned, dried, pressurized, and sealed; factory-insulated suction line with flared fittings at both ends.

1. Minimum Insulation Thickness: 1/2 -inch- thick.

D. Long Length Application Kit: Provide additional accessories and system modifications for reliable system operation for long length applications up to 250 feet.

PART 3 - EXECUTION

3.1. EXECUTION REQUIREMENTS

A. Refer to DDC General Conditions for execution requirements.

3.2. INSTALLATION

A. Install units level and plumb.

B. Install evaporator-fan components using manufacturer's standard mounting devices securely fastened to building structure.

C. Install ground-mounting, compressor-condenser components on 4-inch thick, reinforced concrete base; 6 inches larger on each side than unit. Concrete, reinforcement, and formwork are specified in 033000 Section "Cast-in-Place Concrete." Coordinate anchor installation with concrete base.

D. Install roof-mounting compressor-condenser components on equipment supports specified in 077100 Section "Roof Accessories." Anchor units to supports with removable, cadmium-plated fasteners.

E. Install and connect precharged refrigerant tubing to component's quick-connect fittings. Install tubing to allow access to unit.

3.3. CONNECTIONS

A. Piping installation requirements are specified in other specification sections. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Install piping adjacent to unit to allow service and maintenance.

C. Duct Connections: Duct installation requirements are specified in Section 233113 "Metal Ducts." Drawings indicate the general arrangement of ducts. Connect supply and return ducts to split-system air-conditioning units with flexible duct connectors. Flexible duct connectors are specified in 233300 Section "Air Duct Accessories."

D. Ground equipment according to 260526 Section "Grounding and Bonding for Electrical Systems."

E. Electrical Connections: Comply with requirements in electrical specification sections for power wiring, switches, and motor controls.

3.4. FIELD QUALITY CONTROL

A. Perform the following field tests and inspections and prepare test reports:

1. Leak Test: After installation, charge system and test for leaks. Restore leaks and retest until no leaks exist.
2. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
3. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
4. Progress Inspections as per New York City Energy Conservation Code.

B. Remove and replace malfunctioning units and retest as specified above.

3.5. STARTUP

A. System startup shall be performed by the equipment manufacturer.

3.6. DEMONSTRATION

A. Engage a factory-authorized service representative to instruct project's maintenance personnel to adjust, operate, and maintain units. Refer to DDC General Conditions.

END OF SECTION 238126

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SECTION 23 81 29
Variable Refrigerant Flow HVAC Systems

PART 1 - GENERAL

1.1. RELATED REQUIREMENTS

A. The following documents apply to all required work for the Project: (1) the Contract Drawings, (2) the Specifications, (3) the General Conditions, (4) the Addendum and (5) the Contract (City of New York Standard Construction Contract)

B. LEED General Requirements:

1. Refer to DDC General Conditions.

a. Section 01 33 00 "Submittal Procedures."

b. Section 01 81 13.04 "Sustainable Design Requirements for LEED v4 Buildings."

c. Section 01 91 13 General Commissioning Requirements for MEP Systems.

d. Section 01 81 19 "Indoor Air Quality Requirements for LEED Buildings."

1.2. QUALITY ASSURANCE

A. Refer to DDC General Conditions Section 01 40 00 "Quality Requirements".

B. The units shall be tested by a Nationally Recognized Testing Laboratory (NRTL) in accordance with AHRI 1230, and bear the Listed Mark. All wiring shall be in accordance with the National Electrical Code (NEC).The system shall be produced in an ISO 9001 and ISO 14001 facility. The system shall be factory tested for safety and function. The condensing unit will be factory charged with R-410A.

1.3. SUBMITTAL PROCEDURES

A. Refer to DDC General Conditions Section 01 33 00 "Submittal Procedures".

1.4. DELIVERY, STORAGE, AND HANDLING

A. All variable refrigerant system equipment shall be stored, handled and delivered according to the manufacturer's recommendations.

1.5. WARRANTY

A. Manufacturer's warranty shall be from the date of Substantial Completion. Contractor's guarantee shall be one (1) year only.

B. Condensing Unit

1. Parts: 5 Years
2. Labor: 1 Year
3. Compressor: 7 Years
4. Indoor units and accessories
5. Parts: 1 Year

C. Fan Coil Unit and Indoor Accessories

1. Parts: 1 Year

PART 2 - PRODUCTS

2.1. MANUFACTURERS

A. Basis of Design: Subject to compliance with requirements, provide Daikin HVAC equipment or comparable product by one of the following:

1. LG Electronics
2. Mitsubishi
3. Carrier
4. Or approved equal

2.2. HVAC SYSTEM DESIGN - SYSTEM DESCRIPTION:

A. The variable capacity heat recovery air conditioning system shall be a Variable Refrigerant Flow Series (heat and cool model) system as specified.

B. The system shall consist of multiple evaporators using PID control, Y style joints, a two-pipe refrigeration distribution system and VRF condenser unit.

C. The condenser shall be a direct expansion (DX) air-cooled heat pump, multi-zone air-conditioning system with variable speed natural gas engine with belt-driven compressors using R-410A refrigerant

D. The condensing unit may connect an indoor evaporator capacity up to 130% of the condensing unit capacity. All zones are capable of operating separately with individual temperature control.

E. The condensing unit shall be interconnected to indoor unit, and shall range in capacity from 7,500 Btu/h to 180,000 Btu/h in accordance with manufacturer data book detailing each available indoor unit.

F. The indoor units shall be connected to the condensing unit utilizing piping joints to ensure correct refrigerant flow and balancing. T-style joints are not acceptable for a variable refrigerant system.

G. Operation of the system shall permit either cooling or heating of all of the indoor units simultaneously. Each indoor unit or group of indoor units shall be able to provide set temperatures independently via a local remote controller, a centralized controller or a BMS interface.

2.3. VRF FEATURES

A. Voltage Platform –Variable Refrigerant Flow (VRF) condensing units shall be available for 460V/3PH/60Hz power supply.

B. Advanced Zoning – A single outdoor unit shall provide for up to twenty-nine (29) zones (see table from 2.02)

C. Independent Control – Each indoor unit shall use a dedicated electronic expansion valve with 2000 positions for independent control.

D. Variable Refrigerant Temperature – Each condensing unit shall use high efficiency, variable speed belt-driven compressor(s) coupled with variable speed fan motors to optimize part load performance. The system capacity and refrigerant temperatures shall be modulated automatically to set suction and condensing pressures while varying the refrigerant volume for the needs of the cooling or heating loads. The control will be automatic and customizable depending on load and weather conditions Heat Recovery – Engine exhaust heat recovery will be built in to increase heat output. Indoor units shall use PID to control superheat to deliver a comfortable room temperature conditions and optimize efficiency.

E. Flexible Design – Systems shall be capable of up to 557 ft. (656 ft. equivalent) of linear piping between the condensing unit and furthest located indoor unit. Systems shall be capable of up to 2100 ft. total "one-way" piping in the piping network. Systems shall have a vertical (height) separation of up to 164 ft. between the condensing unit and the indoor units Systems shall be capable of operating up to 295 ft. from the first Y branch point. The condensing unit shall have the ability to connect an indoor unit evaporator capacity of up to 130% of the condensing unit capacity. Systems shall be capable of 49 ft. of vertical separation between indoor units. VRF condensing units can be combined to a maximum of sixteen (16) outdoor units per one (1) Remote Monitoring System. Oil Return – Each system shall be furnished with a centrifugal oil separator and active oil recovery cycle. Simple Wiring – Systems shall use 16/18 AWG, 2 wire, multi-stranded, non-shielded and non-polarized daisy chain control wiring. Space Saving – Each system shall have a condensing unit module foot-print of 86 x 67 x 32 (H x W x D) inches or smaller. Advanced Diagnostics – Systems shall include a self-diagnostic auto-check function to detect malfunctions and display the type and location. Advanced Controls – Each system shall have at least one (1) remote controller capable of controlling up to sixteen (16) indoor units. Each system shall be capable of integrating with open protocol BACnet and LonWorks building management systems. Low Sound Levels – Each system shall have quiet operation mode of 55 dB(A) or lower measured at a distance of 3.3 ft. from condensing unit. System shall have remote monitoring capabilities.

2.4. PERFORMANCE

A. The VRF system rated performance shall be based on below conditions.

B. Performance Conditions:

1. Cooling:
   a. Indoor temperature of 80°F DB, 67°F WB
   b. Outdoor temperature of 95°F DB, 75°F WB
2. Heating:
   a. Indoor temperature of 70°F DB, 60°F WB
   b. Outdoor temperature of 47°F DB, 43°F WB
3. External piping:
   a. 100 ft. equivalent piping length and 0 ft. level difference.

C. Operating Range:

1. The operating range in cooling will be 32 to 115°F DB (14 to 115°F DB with optional air guard) intake air temperature for outdoor unit.
2. The indoor temperature and humidity range in cooling will be 61 to 88°F DB at 80% RH or less.
3. The operating range in heating will be -4 to 95°F DB intake air temperature for the outdoor unit.
4. The indoor temperature range in heating will be 61 to 88°F DB

2.5. REFRIGERANT PIPING

A. The system shall be capable of refrigerant piping up to 557 actual ft. or 656 equivalent ft. from the condensing unit to the furthest indoor unit, and a total combined liquid line length of 2100 ft. of piping between the condensing and indoor units with 164 ft. maximum vertical difference without any oil traps or additional components.

B. Refrigerant piping joints shall be used to ensure proper refrigerant balance and flow for optimum system capacity and performance. T style joints shall not be acceptable as this will negatively impact proper refrigerant balance and flow for optimum system capacity and performance.

2.6. CONDENSING UNIT

A. General:

1. The condensing unit is designed specifically for use with VRF series components. The condensing unit shall be factory assembled and pre-wired with all necessary electronic and refrigerant controls. The refrigeration circuit of the condensing unit shall consist of belt-driven scroll compressors, motors, fans, condenser coils, electronic expansion valves, solenoid valves, 4-way valves, distribution headers and capillaries, filters, shut off valves, oil coolers, service ports, refrigerant receivers and refrigerant accumulators. Liquid and suction lines must be individually insulated between the condensing and indoor units. The condensing unit can be wired and piped with access from the left, right, rear or bottom. The connection ratio of indoor units to condensing unit shall be permitted up to 130%.
2. Each condensing unit shall be able to support the connection of a maximum of twenty-nine (29) indoor units depending on the model of the condensing unit.
3. The sound pressure level standard shall be that value as listed in the equipment manual for the specified models at 3.3 ft. from the front of the unit. The condensing unit shall be capable of operating automatically at further reduced noise during night time or via an external input. The condensing unit shall be modular in design, and should allow for side-by-side installation with minimum spacing. The following safety devices shall be included on the condensing unit: high pressure sensor and switch, low pressure sensor, control circuit fuses, crankcase heaters and fan motors and over current protection. To ensure the liquid refrigerant does not flash when supplying to the various indoor units, the circuit shall be provided with a sub-cooling feature. The oil recovery cycle shall automatically occur one (1) hour after the start of operation. The condensing unit shall be capable of heating operation at -4°F DB ambient temperature without additional low ambient controls or air guard.

B. Unit Cabinet:

1. The condensing unit shall be completely weatherproof and corrosion resistant. The unit shall be constructed from rust-proofed mild steel panels coated with a baked enamel finish.

C. Fan:

1. Each condensing unit shall consist of two (2) propeller type, direct-drive fan motors that have multiple speed operation. The fan shall be a vertical discharge configuration with a nominal airflow up to 13,400 CFM depending on model specified. Nominal sound pressure levels shall be as shown in the table below or less, when measured at a distance of 3.3 ft. The fan motor shall have inherent protection and permanently lubricated bearings. The fan motor shall be provided with a fan guard to prevent contact with moving parts. Quiet control of the fan motor for low noise operation by way of automatically limiting the maximum speed shall be a standard feature. Operation sound level shall be selectable from two (2) steps.

D. Condenser Coil:

1. The condenser coil shall be manufactured from copper tubes expanded into aluminum fins to form a mechanical bond. The heat exchanger coil shall be of a waffle louver fin and rifled bore tube design to ensure high efficiency performance.
2. The heat exchanger on the condensing units shall be installed for engine heat recovery. The fins and side plates shall be covered with an anti-corrosion, anti-salt coating as standard with a salt spray test rating of 480 hours (JRA 9002).

E. Compressor:

1. The belt-driven scroll compressors shall be variable speed controlled and capable of changing the speed to follow the variations in total cooling and heating load as determined by the suction gas pressure as measured in the condensing unit. The target suction pressure should be capable of automatic reset based on outdoor temperatures and system load to improve efficiency. In addition, samplings of evaporator and condenser temperatures shall be made so that the high/low pressures always detect and calculate. With each reading, the compressor capacity shall be controlled by the gas engine to eliminate deviation from target value.
2. The compressors in the condensing unit shall be of highly efficient reluctance hermetically sealed scroll compressors. The capacity control range shall be as low as 10% to 100%. Each compressor shall be equipped with a crankcase heater, high pressure safety switch. The oil cooler shall be standard with the equipment together with an intelligent oil management system. The compressor shall be bracket mounted to avoid the transmission of vibration. Each condensing unit shall consist of two (2) belt-driven controlled compressors.

F. Electrical:

1. The power supply to the condensing unit shall be:

Power Supply Voltage	Voltage Range
208-240V/1ϕ/60Hz	187V-264V

2. The control voltage between the indoor and condensing units shall be 16VDC non-shielded, stranded 2 conductor cable. The control wiring shall be a two-wire multiplex transmission system, making it possible to connect multiple indoor units to one (1) condensing unit with one (1) 2-cable wire, thus simplifying the wiring installation
3. The control wiring shall be 16/18 AWG, two-wire, non-polarity, non-shielded, stranded and have maximum lengths as shown in the table below.

Max. Total Comm. Wiring	Max. Condenser to Indoor Units Wiring	Max. Indoor Unit to Remote Control
6,562 ft.	3,281 ft.	1,640 ft.

PART 3 - EXECUTION

3.1. EXECUTION REQUIREMENTS

A. Refer to DDC General Conditions for execution requirements.

END OF SECTION 238129

SECTION 238233
Radiators

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The following documents apply to all required work for the Project: (1) the Contract Drawings, (2) the Specifications, (3) the General Conditions, (4) the Addendum and (5) the Contract (City of New York Standard Construction Contract).

1.2 SUMMARY

A. This Section includes the following:

1. Hydronic panel radiators.

1.3 SUBMITTALS

A. Refer to DDC General Conditions Section 01 33 00 "Submittal Procedures."

B. Product Data: Include rated capacities, operating characteristics, furnished specialties, and accessories for each type of product indicated.

C. Shop Drawings: Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.

1. Plans, elevations, sections, and details.
2. Location and arrangement of piping valves and specialties.
3. Location and arrangement of integral controls.

D. Coordination Drawings: Floor plans and other details, drawn to scale, on which the following items are shown and coordinated with each other, based on input from installers of the items involved:

1. Structural members, including wall construction, to which convection units will be attached.

E. Color Samples for Initial Selection: For units with factory-applied color finishes.

F. Color Samples for Verification: For each type of exposed finish required.

G. Field quality-control test reports.

H. Operation and Maintenance Data: For convection heating units to include in emergency, operation, and maintenance manuals.

1.4 QUALITY ASSURANCE

A. Refer to DDC General Conditions Section 01 40 00 "Quality Requirements.

B. Devices and Accessories: Listed and labeled by an acceptable testing agency and marked for intended use.

PART 2 - PRODUCTS

2.1 PANEL RADIATORS

A. Manufacturers: Subject to compliance with requirements, provide

1. Embassy Industries, Inc.
2. Panel Radiator, Inc., a div. of Hydro-Air Components.
3. Runtal North America, Inc.
4. Or approved equal.

B. Heating Elements: Steel, welded and formed into flat, square, steel header with minimum thickness of 0.109 inches. Include threaded piping and air vent connections.

1. Working Pressure 56 psig: 0.048 inch

C. Mounting: Wall brackets/ Floor pedestal/Ceiling brackets on spacing as recommended by the manufacturer.

D. Finish: Baked-enamel finish in manufacturer's standard color as selected by Commissioner.

E. Accessories:

1. Steel piping covers finished to match radiator finish.

PART 3 - EXECUTION

3.1 EXECUTION REQUIREMENTS

A. Refer to DDC General Conditions for execution requirements.

3.2 EXAMINATION

A. Examine areas to receive heating units for compliance with requirements for installation tolerances and other conditions affecting performance.

B. Examine roughing-in for hydronic-piping connections to verify actual locations before convection heating unit installation.

3.3 RADIATOR INSTALLATION

A. Install units level and plumb.

B. Install panel radiators according to Guide 2000 - Residential Hydronic Heating.

C. Join sections with splice plates and filler pieces to provide continuous enclosure.

D. Install access doors for access to valves.

E. Terminate enclosures with manufacturer's end caps except where enclosures are indicated to extend to adjoining walls.

F. Install valves within reach of access door provided in enclosure.

G. Install piping within pedestals for freestanding units or ceiling hangers for ceiling installation.

H. Install piping covers.

3.4 CONNECTIONS

A. Piping installation requirements are specified in Division 23 Section 23 21 13 "Hydronic Piping". Drawings indicate general arrangement of piping, fittings, and specialties.

B. Connect hot-water units and components to piping according to Division 23 Section 23 21 13 "Hydronic Piping."

1. Install shutoff valves on inlet and outlet, and balancing valve on outlet.

C. Install control valves as required by Division 23 Section 23 09 00 "Instrumentation and Control for HVAC."

D. Install piping adjacent to heating units to allow service and maintenance.

3.5 FIELD QUALITY CONTROL

A. Perform the following field tests and inspections and prepare test reports:

1. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.
2. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

END OF SECTION 238233

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SECTION 238239
Unit Heaters

PART 1 - GENERAL

1.1. RELATED DOCUMENTS

A. The following documents apply to all required work for the Project: (1) the Contract Drawings, (2) the Specifications, (3) the General Conditions, (4) the Addendum and (5) the Contract (City of New York Standard Construction Contract).

1.2. SUMMARY

A. Work Included: The work includes, but is not necessarily limited to, the following:

1. Cabinets heaters as specified herein, as indicated on the drawings, as needed for a complete and proper installation.

B. Related Work: The following related items are specified in other sections of the specifications:

1.	Common Motor Requirements for HVAC Equipment	Section 230513
2.	Testing for HVAC	Section 230593

1.3. QUALITY ASSURANCE

A. Refer to DDC General Conditions Section 01 40 00 "Quality Requirements."

B. Manufacturer's Qualifications

1. Firms regularly engaged in manufacture of cabinet heaters, of types and sizes required, whose products have been in satisfactory use in similar service for not less than three (3) years.

C. Codes and Standards:

1. All electrical components and cabinet heaters shall be UL listed and labeled.
2. All fans shall be AMCA certified.
3. All electrical devices shall conform to NEMA standards.
4. All wiring shall conform to the NEC.

1.4. SUBMITTALS

A. Refer to DDC General Conditions Section 01 33 00 "Submittal Procedures."

B. Product Data: Catalog cuts, specifications, installation and instructions.

C. Shop Drawings: Submit assembly-type shop drawings showing unit dimensions, construction details, and field connection details.

D. Schedule: List manufacturer, unit type, model number, and performance data for each cabinet heater.

E. Wiring Diagram: Submit manufacturer's electrical requirements for power supply wiring to cabinet heaters. Submit manufacturer's wiring diagram for interlock and control wiring. Clearly differentiate between portions of wiring that are factory-installed and portions to be field-installed.

F. Samples: Submit samples of each type of cabinet finish furnished.

G. Maintenance Data: Submit maintenance instructions and spare parts lists. Include this data, products data, shop drawings and schedule in maintenance manuals.

1.5. DELIVERY, STORAGE AND HANDLING

A. Handle cabinet heaters carefully to prevent damage, breaking, denting and scoring. Do not install damaged units, cabinets or components; replace with new.

B. Store cabinet heaters in clean dry place. Protect from weather, dirt, fumes, water, construction debris and physical damage.

C. Comply with manufacturer's rigging and installation instructions for unloading cabinet heaters, and moving them to final location.

PART 2 - PRODUCTS

2.1. UNIT HEATERS, CABINET HEATERS:

A. Materials

1. General: Provide cabinet heaters of types, capacities, speeds, etc., as indicated on the drawings. Each cabinet heater shall be complete with centrifugal forward curved fan, motor, heating coil, casing, etc. Cabinet heaters shall each be securely supported by the Contractor.
2. Vertical Basic Unit: Basic units shall include a chassis, coil, fan wheel, fan housing and motor. The chassis shall be the structural frame, constructed of 18-gauge galvanized steel and continuous from the top of the unit to the floor. The unit shall be acoustically and thermally insulated with closed cell insulation.
3. Vertical Cabinet: Front panels shall be 16-gauge galvanized steel. All other panel parts shall be rigidized by channel forming. The end panel is removable. The discharge grille shall be recessed to resist condensate formations. The hinged access door shall be flush with the top. The front panel shall be removable without the use of tools.
4. Finish: All cabinet parts and exposed recessed panels shall be cleaned, bonderized, phosphatized and painted with any of six available decorator colors. Standard finish meets ASTM B117 specifications (salt spray test).
5. Fans: The aluminum fan wheels shall be centrifugal forward-curved and double-width. Fan wheels and housings shall be corrosion resistant. Fan housings shall be constructed of formed sheet metal.
6. Motors: All motors are permanent split capacitor motor run tested i assembled units. All motors shall have integral thermal overload protection and are permanently lubricated. Motors shall be capable of starting at 78 percent of rated voltage and operating at 90 percent of rated voltage on all speed settings. Motors shall be capable of being operated at 10 percent over voltage without undue magnetic noise and with a temperature rise by the winding resistance method not exceeding 50 C at full speed, and 55 C at reduced speeds.
7. Filters: Filters shall be concealed from sight and easily removable without displacing front panels and with no additional tools required. Filters shall be 1-inch throwaway.
8. Coils: Mechanically bonded copper/aluminum, pressure tested at 250 psi.
9. Power Supply: All units shall be single-point power. All fan motors shall be single phase.
10. Controls: All units shall be unit mounted thermostat.

B. Manufacturers:

1. Modine
2. Markel
3. Sterling
4. INDEECO
5. Or approved equal

PART 3 - EXECUTION

3.1. EXECUTION REQUIREMENTS

A. Refer to DDC General Conditions for execution requirements.

3.2. INSPECTION

A. Examine areas and conditions under which cabinet heaters are to be installed. Do not proceed with work until unsatisfactory conditions have been corrected.

3.3. INSTALLATION

A. Install the work of this section in accordance with the manufacturer's printed installation instructions, unless otherwise specified.

B. Install electrical devices furnished by the manufacturer but not specified to be factory-mounted. Verify that electrical wiring installation is in accordance with manufacturer's submittal and installation requirements of electrical specification sections. Do not proceed with equipment start-up until wiring installation is acceptable.

3.4. ADJUSTING AND CLEANING

A. General

1. After construction is completed, clean unit exposed surfaces, vacuum inside the unit heaters. Retouch any marred or scratched surfaces, using finish materials furnished by the manufacturer.

END OF SECTION 238239

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SECTION 260500
Common Work Results For Electrical

PART 1 - GENERAL

1.1. RELATED DOCUMENTS

A. The following documents apply to all required work for the Project: (1) the Contract Drawings, (2) the Specifications, (3) the General Conditions, (4) the Addendum and (5) the Contract (City of New York Standard Construction Contract).

B. LEED / Environmentally Preferable Purchase (EPP) General Requirements:

1. Refer to DDC General Conditions and the Addendum to the General Conditions.
2. LEED requirements apply to all Phase II work with the exception of the Existing Building scope. EPP requirements apply to the project's Existing Building scope only.

1.2. SUMMARY

A. Section Includes:

1. Electrical equipment coordination and installation.
2. Sleeves for raceways and cables.
3. Sleeve seals.
4. Grout.
5. Common electrical installation requirements.

B. Related Sections:

1. Section 078413 "Firestops and Smokeseals" for sleeve and firestopping selection/application and firestop material compliance
2. Section 079200 "Interior Joint Sealants" for joint sealant size, depth, and location.
3. Section 083113 "Access Doors" for access doors and panels.

1.3. DEFINITIONS

A. EPDM: Ethylene-propylene-diene terpolymer rubber.

B. NBR: Acrylonitrile-butadiene rubber.

1.4. SUBMITTALS

A. Refer to DDC General Conditions Section 01 33 00 "Submittal Procedures."

B. Product Data: For sleeve seals.

1.5. COORDINATION

A. Coordinate arrangement, mounting, and support of electrical equipment:

1. To allow maximum possible headroom unless specific mounting heights that reduce headroom are indicated.
2. To provide for ease of disconnecting the equipment with minimum interference to other installations.
3. To allow right of way for piping and conduit installed at required slope.
4. So connecting raceways, cables, wireways, cable trays, and busways will be clear of obstructions and of the working and access space of other equipment.

B. Coordinate installation of required supporting devices and set sleeves in cast-in-place concrete, masonry walls, and other structural components as they are constructed. Access door and panels are specified in Section 083113 "Access Doors."

C. Coordinate location of access panels and doors for electrical items that are behind finished surfaces or otherwise concealed

D. Coordinate sleeve selection and application with selection and application of firestopping specified in Section 078413 "Firestops and Smokeseals."

1.6. QUALITY ASSURANCE

A. Refer to DDC General Conditions Section 01 40 00 "Quality Requirements."

PART 2 - PRODUCTS

2.1. SLEEVES FOR RACEWAYS AND CABLES

A. Steel Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, galvanized steel, plain ends.

B. Cast-Iron Pipe Sleeves: Cast or fabricated "wall pipe," equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop, unless otherwise indicated.

C. Sleeves for Rectangular Openings: Galvanized sheet steel.

1. Minimum Metal Thickness:

a. For sleeve cross-section rectangle perimeter less than 50 inches (1270 mm) and no side more than 16 inches (400 mm), thickness shall be 0.052 inch (1.3 mm).
b. For sleeve cross-section rectangle perimeter equal to, or more than, 50 inches (1270 mm) and 1 or more sides equal to, or more than, 16 inches (400 mm), thickness shall be 0.138 inch (3.5 mm).

2.2. SLEEVE SEALS

A. Description: Modular sealing device, designed for field assembly, to fill annular space between sleeve and raceway or cable.

1. Manufacturers: Subject to compliance with all requirements:

   a. Advance Products & Systems, Inc.
   b. Calpico, Inc.
   c. Metraflex Co.
   d. Pipeline Seal and Insulator, Inc.
   e. Or approved equal.

2. Sealing Elements: EPDM NBR interlocking links shaped to fit surface of cable or conduit. Include type and number required for material and size of raceway or cable.
3. Pressure Plates: Plastic or Carbon steel. Include two for each sealing element.
4. Connecting Bolts and Nuts: Carbon steel with corrosion-resistant coating of length required to secure pressure plates to sealing elements. Include one for each sealing element.

2.3. GROUT

A. Nonmetallic, Shrinkage-Resistant Grout: ASTM C 1107, factory-packaged, nonmetallic aggregate grout, noncorrosive, nonstaining, mixed with water to consistency suitable for application and a 30-minute working time.

PART 3 - EXECUTION

3.1. EXECUTION REQUIREMENTS

A. Refer to DDC General Conditions for execution requirements.

3.2. COMMON REQUIREMENTS FOR ELECTRICAL INSTALLATION

A. Comply with NECA 1.

B. Measure indicated mounting heights to bottom of unit for suspended items and to center of unit for wall-mounting items.

C. Headroom Maintenance: If mounting heights or other location criteria are not indicated, arrange and install components and equipment to provide maximum possible headroom consistent with these requirements.

D. Equipment: Install to facilitate service, maintenance, and restoration or replacement of components of both electrical equipment and other nearby installations. Connect in such a way as to facilitate future disconnecting with minimum interference with other items in the vicinity.

E. Right of Way: Give to piping systems installed at a required slope.

3.3. SLEEVE INSTALLATION FOR ELECTRICAL PENETRATIONS

A. Electrical penetrations occur when raceways, cables, wireways, cable trays, or busways penetrate concrete slabs, concrete or masonry walls, or fire-rated floor and wall assemblies.

B. Concrete Slabs and Walls: Install sleeves for penetrations unless core-drilled holes or formed openings are used. Install sleeves during erection of slabs and walls.

C. Use pipe sleeves unless penetration arrangement requires rectangular sleeved opening.

D. Fire-Rated Assemblies: Install sleeves for penetrations of fire-rated floor and wall assemblies unless openings compatible with firestop system used are fabricated during construction of floor or wall.

E. Cut sleeves to length for mounting flush with both surfaces of walls.

F. Extend sleeves installed in floors 2 inches (50 mm) above finished floor level.

G. Size pipe sleeves to provide 1/4-inch (6.4-mm) annular clear space between sleeve and raceway or cable, unless indicated otherwise.

H. Seal space outside of sleeves with grout for penetrations of concrete and masonry

1. Promptly pack grout solidly between sleeve and wall so no voids remain. Tool exposed surfaces smooth; protect grout while curing.

I. Interior Penetrations of Non-Fire-Rated Walls and Floors: Seal annular space between sleeve and raceway or cable, using joint sealant appropriate for size, depth, and location of joint. Comply with requirements in Section 079200 "Interior Joint Sealants."

J. Fire-Rated-Assembly Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at raceway and cable penetrations. Install sleeves and seal raceway and cable penetration sleeves with firestop materials. Comply with requirements in Section 078413 "Firestops and Smokeseals."

K. Roof-Penetration Sleeves: Seal penetration of individual raceways and cables with flexible boot-type flashing units applied in coordination with roofing work.

L. Underground, Exterior-Wall Penetrations: Install cast-iron pipe sleeves. Size sleeves to allow for 1-inch (25-mm) annular clear space between raceway or cable and sleeve for installing mechanical sleeve seals.

3.4. FIRESTOPPING

A. Apply firestopping to penetrations of fire-rated floor and wall assemblies for electrical installations to restore original fire-resistance rating of assembly.

END OF SECTION 260500

SECTION 260519
Low-Voltage Electrical Power Conductors And Cables

PART 1 - GENERAL

1.1. RELATED DOCUMENTS

A. The following documents apply to all required work for the Project: (1) the Contract Drawings, (2) the Specifications, (3) the General Conditions, (4) the Addendum and (5) the Contract (City of New York Standard Construction Contract).

B. LEED / Environmentally Preferable Purchase (EPP) General Requirements:

1. Refer to DDC General Conditions and the Addendum to the General Conditions.
2. LEED requirements apply to all Phase II work with the exception of the Existing Building scope. EPP requirements apply to the project's Existing Building scope only.

1.2. SUMMARY

A. This Section includes the following:

1. Building wires and cables rated 600 V and less.
2. Connectors, splices, and terminations rated 600 V and less.
3. Sleeves and sleeve seals for cables.

B. Related Sections include the following:

1. 079200 Section "Joint Sealants" for joint sealant size, depth, and location.
2. 078413 Section "Firestops and Smokeseals" for sleeve and firestopping selection and application.
3. 260553 Section "Identification for Electrical Systems" for identifying and color-coding conductors and cables.
4. 271500 Section "Communications Horizontal Cabling" for cabling used for voice and data circuits.

1.3. DEFINITIONS

A. EPDM: Ethylene-propylene-diene terpolymer rubber.

B. NBR: Acrylonitrile-butadiene rubber.

1.4. SUBMITTALS

A. Refer to DDC General Conditions Section 01 33 00 "Submittal Procedures."

B. Product Data: For each type of product indicated.

C. Qualification Data: For testing agency.

D. Field quality-control test reports.

1.5. QUALITY ASSURANCE

A. Refer to DDC General Conditions Section 01 40 00 "Quality Requirements."

B. Testing Agency Qualifications: An independent agency, with the experience and capability to conduct the testing indicated, that is a member company of the InterNational Electrical Testing Association or is a nationally recognized testing laboratory (NRTL) as defined by OSHA in 29 CFR 1910.7, and that is acceptable to the Commissioner.

C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to the Commissioner, and marked for intended use.

D. Comply with NFPA 70.

1.6. COORDINATION

A. Set sleeves in cast-in-place concrete, masonry walls, and other structural components as they are constructed.

PART 2 - PRODUCTS

2.1. CONDUCTORS AND CABLES

A. Copper Conductors: Comply with NEMA WC 70.

B. Conductor Insulation: Comply with NEMA WC 70 for Types THW, THHN-THWN, XHHW, UF, USE and mineral-insulated (type MI).

C. Multiconductor Cable: Comply with NEMA WC 70 for armored cable, metal-clad cable, (Type MC).

2.2. CONNECTORS AND SPLICES

A. Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include the following:

1. AFC Cable Systems, Inc.
2. Hubbell Power Systems, Inc.
3. O-Z/Gedney; EGS Electrical Group LLC.
4. 3M; Electrical Products Division.
5. Or Approved Equal

B. Description: Factory-fabricated connectors and splices of size, ampacity rating, material, type, and class for application and service indicated.

PART 3 - EXECUTION

3.1. EXECUTION REQUIREMENTS

A. Refer to DDC General Conditions for execution requirements.

3.2. CONDUCTOR MATERIAL APPLICATIONS

A. Feeders: Copper for all feeders. Solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.

B. Branch Circuits: Copper. Solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.

3.3. CONDUCTOR INSULATION AND MULTICONDUCTOR CABLE APPLICATIONS AND WIRING METHODS

A. Service Entrance: Type USE-75, single conductors in raceway.

B. Exposed Feeders: Type THHN-THWN, single conductors in raceway.

C. Feeders Concealed in Ceilings, Walls, Partitions: Type THHN-THWN, single conductors in raceway.

D. Feeders Concealed in Concrete, below Slabs-on-Grade, and Underground: Type THHN-THWN, single conductors in raceway.

E. Exposed Branch Circuits: Type THHN-THWN, single conductors in raceway.

F. Branch Circuits Concealed in Ceilings, Walls: Type THHN-THWN, single conductors in raceway.

G. Cord Drops and Portable Appliance Connections: Type SO, hard service cord with stainless-steel, wire-mesh, strain relief device at terminations to suit application.

H. Class 1 Control Circuits: Type THHN-THWN, in raceway.

3.4. INSTALLATION OF CONDUCTORS AND CABLES

A. Conceal cables in finished walls, ceilings, and floors, unless otherwise indicated.

B. Use manufacturer-approved pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation. Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values.

C. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips that will not damage cables or raceway.

D. Identify and color-code conductors and cables according to 260553 Section "Identification for Electrical Systems."

3.5. CONNECTIONS

A. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

B. Make splices and taps that are compatible with conductor material and that possess equivalent or better mechanical strength and insulation ratings than unspliced conductors.

C. Wiring at Outlets: Install conductor at each outlet, with at least 12 inches (300 mm) of slack.

3.6. SLEEVE INSTALLATION FOR ELECTRICAL PENETRATIONS

A. Coordinate sleeve selection and application with selection and application of firestopping specified in Section 078413 "Firestops and Smokeseals."

B. Concrete Slabs and Walls: Install sleeves for penetrations unless core-drilled holes or formed openings are used. Install sleeves during erection of slabs and walls.

C. Use pipe sleeves unless penetration arrangement requires rectangular sleeved opening.

D. Rectangular Sleeve Minimum Metal Thickness:

1. For sleeve rectangle perimeter less than 50 inches (1270 mm) and no side greater than 16 inches (400 mm), thickness shall be 0.052 inch (1.3 mm).
2. For sleeve rectangle perimeter equal to, or greater than, 50 inches (1270 mm) and 1 or more sides equal to, or greater than, 16 inches (400 mm), thickness shall be 0.138 inch (3.5 mm).

E. Fire-Rated Assemblies: Install sleeves for penetrations of fire-rated floor and wall assemblies unless openings compatible with firestop system used are fabricated during construction of floor or wall.

F. Cut sleeves to length for mounting flush with both wall surfaces.

G. Extend sleeves installed in floors 2 inches (50 mm) above finished floor level.

H. Size pipe sleeves to provide 1/4-inch (6.4-mm) annular clear space between sleeve and cable unless sleeve seal is to be installed or unless seismic criteria require different clearance.

I. Seal space outside of sleeves with grout for penetrations of concrete and masonry.

J. Interior Penetrations of Non-Fire-Rated Walls and Floors: Seal annular space between sleeve and cable, using joint sealant appropriate for size, depth, and location of joint according to 079200 Section "Joint Sealants."

K. Fire-Rated-Assembly Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at cable penetrations.

L. Roof-Penetration Sleeves: Seal penetration of individual cables with flexible boot-type flashing units applied in coordination with roofing work.

M. Aboveground Exterior-Wall Penetrations: Seal penetrations using sleeves and mechanical sleeve seals. Size sleeves to allow for 1-inch (25-mm) annular clear space between pipe and sleeve for installing mechanical sleeve seals.

N. Underground Exterior-Wall Penetrations: Install cast-iron "wall pipes" for sleeves. Size sleeves to allow for 1-inch (25-mm) annular clear space between cable and sleeve for installing mechanical sleeve seals.

3.7. SLEEVE-SEAL INSTALLATION

A. Install to seal underground exterior-wall penetrations.

B. Use type and number of sealing elements recommended by manufacturer for cable material and size. Position cable in center of sleeve. Assemble mechanical sleeve seals and install in annular space between cable and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

3.8. FIRESTOPPING

A. Apply firestopping to electrical penetrations of fire-rated floor and wall assemblies to restore original fire-resistance rating of assembly according to 078413 Section "Firestops and Smokeseals"

3.9. FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections and prepare test reports.

B. Perform tests and inspections and prepare test reports.

C. Tests and Inspections:

1. After installing conductors and cables and before electrical circuitry has been energized, test service entrance and feeder conductors, and conductors feeding the following critical equipment and services for compliance with requirements.

2. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.

3. Infrared Scanning: After Substantial Completion, but not more than 60 days after Final Acceptance, perform an infrared scan of each splice in cables and conductors No. 3 AWG and larger. Remove box and equipment covers so splices are accessible to portable scanner.

D. Test Reports: Prepare a written report to record the following:

1. Test procedures used.
2. Test results that comply with requirements.
3. Test results that do not comply with requirements and corrective action taken to achieve compliance with requirements.

E. Remove and replace malfunctioning units and retest as specified above.

END OF SECTION 260519

SECTION 260526
Grounding And Bonding For Electrical Systems

PART 1 - GENERAL

1.1. RELATED DOCUMENTS

A. The following documents apply to all required work for the Project: (1) the Contract Drawings, (2) the Specifications, (3) the General Conditions, (4) the Addendum and (5) the Contract (City of New York Standard Construction Contract).

B. LEED / Environmentally Preferable Purchase (EPP) General Requirements:

1. Refer to DDC General Conditions and the Addendum to the General Conditions.
2. LEED requirements apply to all Phase II work with the exception of the Existing Building scope. EPP requirements apply to the project's Existing Building scope only.

1.2. SUMMARY

A. This Section includes methods and materials for grounding systems and equipment:

1. Overhead-lines grounding.
2. Underground distribution grounding.

1.3. SUBMITTALS

A. Refer to DDC General Conditions Section 01 33 00 "Submittal Procedures."

B. Product Data: For each type of product indicated.

C. Other Informational Submittals: Plans showing dimensioned as-built locations of grounding features specified in Part 3 "Field Quality Control" Article, including the following:

1. Test wells.
2. Ground rods.
3. Ground rings.
4. Grounding arrangements and connections for separately derived systems.

D. Qualification Data: For testing agency and testing agency's field supervisor.

E. Field quality-control test reports.

F. Operation and Maintenance Data: For grounding to include the following in emergency, operation, and maintenance manuals:

1. Instructions for periodic testing and inspection of grounding features at test wells ground rings grounding connections for separately derived systems based on NFPA 70B.
   a. Tests shall be to determine if ground resistance or impedance values remain within specified maximums, and instructions shall recommend corrective action if they do not.
   b. Include recommended testing intervals.

1.4. QUALITY ASSURANCE

A. Refer to DDC General Conditions Section 01 40 00 "Quality Requirements."

B. Testing Agency Qualifications: An independent agency, with the experience and capability to conduct the testing indicated, that is a member company of the InterNational Electrical Testing Association or is a nationally recognized testing laboratory (NRTL) as defined by OSHA in 29 CFR 1910.7, and that is acceptable to the Commissioner.

C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to the Commissioner, and marked for intended use.

D. Comply with UL 467 for grounding and bonding materials and equipment.

PART 2 - PRODUCTS

2.1. CONDUCTORS

A. Insulated Conductors: Copper wire or cable insulated for 600 V unless otherwise required by applicable Code or NYC Department of Buildings.

B. Bare Copper Conductors:

1. Solid Conductors: ASTM B 3.
2. Stranded Conductors: ASTM B 8.
3. Tinned Conductors: ASTM B 33.
4. Bonding Cable: 28 kcmil, 14 strands of No. 17 AWG conductor, 1/4 inch (6 mm) in diameter.
5. Bonding Conductor: No. 4 or No. 6 AWG, stranded conductor.
6. Bonding Jumper: Copper tape, braided conductors, terminated with copper ferrules; 1-5/8 inches (41 mm) wide and 1/16 inch (1.6 mm) thick.
7. Tinned Bonding Jumper: Tinned-copper tape, braided conductors, terminated with copper ferrules; 1-5/8 inches (41 mm) wide and 1/16 inch (1.6 mm) thick.

C. Grounding Bus: Rectangular bars of annealed copper, 1/4 by 2 inches (6 by 50 mm) in cross section, unless otherwise indicated; with insulators.

2.2. CONNECTORS

A. Listed and labeled by a nationally recognized testing laboratory acceptable to the Commissioner for applications in which used, and for specific types, sizes, and combinations of conductors and other items connected.

B. Bolted Connectors for Conductors and Pipes: Copper or copper alloy, bolted pressure-type, with at least two bolts.

1. Pipe Connectors: Clamp type, sized for pipe.

C. Welded Connectors: Exothermic-welding kits of types recommended by kit manufacturer for materials being joined and installation conditions.

2.3. GROUNDING ELECTRODES

A. Ground Rods: Copper-clad steel, 3/4 inch by10 feet (19 mm by 3 m) in diameter.

B. Chemical-Enhanced Grounding Electrodes: Copper tube, straight or L-shaped, charged with nonhazardous electrolytic chemical salts.

1. Termination: Factory-attached No. 4/0 AWG bare conductor at least 48 inches (1200 mm) long.
2. Backfill Material: Electrode manufacturer's recommended material.

PART 3 - EXECUTION

3.1. EXECUTION REQUIREMENTS

A. Refer to DDC General Conditions for execution requirements.

3.2. APPLICATIONS

A. Conductors: Install solid conductor for No. 8 AWG and smaller, and stranded conductors for No. 6 AWG and larger, unless otherwise indicated.

B. Underground Grounding Conductors: Install bare tinned-copper conductor, No. 2/0 AWG minimum.

1. Bury at least 24 inches (600 mm) below grade.
2. Duct-Bank Grounding Conductor: Bury 12 inches (300 mm) above duct bank when indicated as part of duct-bank installation.

C. Isolated Grounding Conductors: Green-colored insulation with continuous yellow stripe. On feeders with isolated ground, identify grounding conductor where visible to normal inspection, with alternating bands of green and yellow tape, with at least three bands of green and two bands of yellow.

D. Grounding Bus: Install in electrical and telephone equipment rooms, in rooms housing service equipment, and elsewhere as indicated.

1. Install bus on insulated spacers 1 inch (25 mm), minimum, from wall 6 inches (150 mm) above finished floor, unless otherwise indicated.
2. Where indicated on both sides of doorways, route bus up to top of door frame, across top of doorway, down to specified height above floor, and connect to horizontal bus.

E. Conductor Terminations and Connections:

1. Pipe and Equipment Grounding Conductor Terminations: Bolted connectors.
2. Underground Connections: Welded connectors, except at test wells and as otherwise indicated.
3. Connections to Ground Rods at Test Wells: Bolted connectors.
4. Connections to Structural Steel: Welded connectors.

3.3. GROUNDING UNDERGROUND DISTRIBUTION SYSTEM COMPONENTS

A. Comply with IEEE C2 grounding requirements.

B. Grounding: Install a driven ground rod close to wall, and set rod depth so 4 inches (100 mm) will extend above finished floor. If necessary, install ground rod before exterior well is placed and provide No. 1/0 AWG bare, tinned-copper conductor from ground rod into the earth.

3.4. EQUIPMENT GROUNDING

A. Install insulated equipment grounding conductors with all feeders and branch circuits.

B. Install insulated equipment grounding conductors with the following items, in addition to those required by NFPA 70:

1. Feeders and branch circuits.
2. Lighting circuits.
3. Receptacle circuits.
4. Single-phase motor and appliance branch circuits.
5. Three-phase motor and appliance branch circuits.
6. Flexible raceway runs.
7. Armored and metal-clad cable runs.
8. Busway Supply Circuits: Install insulated equipment grounding conductor from grounding bus in the switchgear, switchboard, or distribution panel to equipment grounding bar terminal on busway.
9. Computer and Rack-Mounted Electronic Equipment Circuits: Install insulated equipment grounding conductor in branch-circuit runs from equipment-area power panels and power-distribution units.

C. Air-Duct Equipment Circuits: Install insulated equipment grounding conductor to duct-mounted electrical devices operating at 120 V and more, including air cleaners, heaters, dampers, humidifiers, and other duct electrical equipment. Bond conductor to each unit and to air duct and connected metallic piping.

D. Water Heater, Heat-Tracing, and Antifrost Heating Cables: Install a separate insulated equipment grounding conductor to each electric water heater and heat-tracing cable. Bond conductor to heater units, piping, connected equipment, and components.

E. Signal and Communication Equipment: For telephone, alarm, voice and data, and other communication equipment, provide No. 4 AWG minimum insulated grounding conductor in raceway from grounding electrode system to each service location, terminal cabinet, wiring closet, and central equipment location.

1. Service and Central Equipment Locations and Wiring Closets: Terminate grounding conductor on a 1/4-by-2-by-12-inch (6-by-50-by-300-mm) grounding bus.
2. Terminal Cabinets: Terminate grounding conductor on cabinet grounding terminal.

3.5. INSTALLATION

A. Grounding Conductors: Route along shortest and straightest paths possible. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.

B. Common Ground Bonding with Lightning Protection System: Comply with NFPA 780 and UL 96 when interconnecting with lightning protection system. Bond electrical power system ground directly to lightning protection system grounding conductor at closest point to electrical service grounding electrode. Use bonding conductor sized same as system grounding electrode conductor, and install in conduit.

C. Ground Rods: Drive rods until tops are 2 inches (50 mm) below finished floor or final grade, unless otherwise indicated.

1. Interconnect ground rods with grounding electrode conductor below grade and as otherwise indicated. Make connections without exposing steel or damaging coating, if any.
2. For grounding electrode system, install at least three rods spaced at least one-rod length from each other and located at least the same distance from other grounding electrodes, and connect to the service grounding electrode conductor.

D. Bonding Straps and Jumpers: Install in locations accessible for inspection and maintenance, except where routed through short lengths of conduit.

1. Bonding to Structure: Bond straps directly to basic structure, taking care not to penetrate any adjacent parts.
2. Bonding to Equipment Mounted on Vibration Isolation Hangers and Supports: Install so vibration is not transmitted to rigidly mounted equipment.
3. Use exothermic-welded connectors for outdoor locations, but if a disconnect-type connection is required, use a bolted clamp.

E. Grounding and Bonding for Piping:

1. Metal Water Service Pipe: Install insulated copper grounding conductors, in conduit, from building's main service equipment, or grounding bus, to main metal water service entrances to building. Connect grounding conductors to main metal water service pipes, using a bolted clamp connector or by bolting a lug-type connector to a pipe flange, using one of the lug bolts of the flange. Where a dielectric main water fitting is installed, connect grounding conductor on street side of fitting. Bond metal grounding conductor conduit or sleeve to conductor at each end.
2. Water Meter Piping: Use braided-type bonding jumpers to electrically bypass water meters. Connect to pipe with a bolted connector.
3. Bond each aboveground portion of gas piping system downstream from equipment shutoff valve.

3.6. FIELD QUALITY CONTROL

A. Testing Agency will engage a qualified testing and inspecting agency to perform the following field tests and inspections and prepare test reports:

B. Perform the following tests and inspections and prepare test reports:

1. After installing grounding system but before permanent electrical circuits have been energized, test for compliance with requirements.
2. Test completed grounding system at each location where a maximum ground-resistance level is specified, at service disconnect enclosure grounding terminal. Make tests at ground rods before any conductors are connected.

a. Measure ground resistance not less than two full days after last trace of precipitation and without soil being moistened by any means other than natural drainage or seepage and without chemical treatment or other artificial means of reducing natural ground resistance.
b. Perform tests by fall-of-potential method according to IEEE 81.

3. Prepare dimensioned drawings locating each test well, ground rod and ground rod assembly, and other grounding electrodes. Identify each by letter in alphabetical order, and key to the record of tests and observations. Include the number of rods driven and their depth at each location, and include observations of weather and other phenomena that may affect test results. Describe measures taken to improve test results.

C. Report measured ground resistances that exceed the following values:

1. Power and Lighting Equipment or System with Capacity 500 kVA and Less: 10 ohms.
2. Power Distribution Units or Panelboards Serving Electronic Equipment: 1 ohm(s).

D. Excessive Ground Resistance: If resistance to ground exceeds specified values, notify Commissioner promptly and include recommendations to reduce ground resistance.

END OF SECTION 260526

SECTION 260529
Hangers and Supports For Electrical Systems

PART 1 - GENERAL

1.1. RELATED DOCUMENTS

A. The following documents apply to all required work for the Project: (1) the Contract Drawings, (2) the Specifications, (3) the General Conditions, (4) the Addendum and (5) the Contract (City of New York Standard Construction Contract).

B. LEED / Environmentally Preferable Purchase (EPP) General Requirements:

1. Refer to DDC General Conditions and the Addendum to the General Conditions.
2. LEED requirements apply to all Phase II work with the exception of the Existing Building scope. EPP requirements apply to the project's Existing Building scope only.

1.2. SUMMARY

A. This Section includes the following:

1. Hangers and supports for electrical equipment and systems.
2. Construction requirements for concrete bases.

B. Related Sections include the following:

1. 260548 Section "Vibration And Seismic Controls For Electrical Systems" for products and installation requirements necessary for compliance with seismic criteria.

1.3. DEFINITIONS

A. EMT: Electrical metallic tubing.

B. IMC: Intermediate metal conduit.

C. RMC: Rigid metal conduit.

1.4. PERFORMANCE REQUIREMENTS

A. Engineering Requirements: Engineer supports for multiple raceways, including comprehensive engineering analysis by a qualified professional engineer, licensed in the State of New York, using performance requirements and design criteria indicated.

B. Engineer supports for multiple raceways capable of supporting combined weight of supported systems and its contents.

C. Engineer equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.

D. Rated Strength: Adequate in tension, shear, and pullout force to resist maximum loads calculated or imposed for this Project, with a minimum structural safety factor of five times the applied force.

1.5. SUBMITTALS

A. Refer to DDC General Conditions Section 01 33 00 "Submittal Procedures."

B. Product Data: For the following:

1. Steel slotted support systems.
2. Nonmetallic slotted support systems.

C. Shop Drawings: Show fabrication and installation details and include calculations for the following:

1. Trapeze hangers. Include Product Data for components.
2. Steel slotted channel systems. Include Product Data for components.
3. Nonmetallic slotted channel systems. Include Product Data for components.
4. Equipment supports.

1.6. QUALITY ASSURANCE

A. Refer to DDC General Conditions Section 01 40 00 "Quality Requirements."

B. Welding: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

C. Comply with NFPA 70.

1.7. COORDINATION

A. Coordinate size and location of concrete bases. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified in concrete specification sections.

B. Coordinate installation of roof curbs, equipment supports, and roof penetrations. These items are specified in 077100 Section "Roof Specialties and Accessories."

PART 2 - PRODUCTS

2.1. SUPPORT, ANCHORAGE, AND ATTACHMENT COMPONENTS

A. Steel Slotted Support Systems: Comply with MFMA-4, factory-fabricated components for field assembly.

1. Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include the following:

   a. Allied Tube & Conduit.
   b. Cooper B-Line, Inc.; a division of Cooper Industries.
   c. GS Metals Corp.
   d. Thomas & Betts Corporation.
   e. Unistrut; Tyco International, Ltd.
   f. Or Approved Equal

2. Metallic Coatings: Hot-dip galvanized after fabrication and applied according to MFMA-4.
3. Nonmetallic Coatings: Manufacturer's standard PVC, polyurethane, or polyester coating applied according to MFMA-4.
4. Painted Coatings: Manufacturer's standard painted coating applied according to MFMA-4.
5. Channel Dimensions: Selected for applicable load criteria.

B. Raceway and Cable Supports: As described in NECA 1 and NECA 101.

C. Conduit and Cable Support Devices: Steel hangers, clamps, and associated fittings, designed for types and sizes of raceway or cable to be supported.

D. Support for Conductors in Vertical Conduit: Factory-fabricated assembly consisting of threaded body and insulating wedging plug or plugs for non-armored electrical conductors or cables in riser conduits. Plugs shall have number, size, and shape of conductor gripping pieces as required to suit individual conductors or cables supported. Body shall be malleable iron.

E. Structural Steel for Fabricated Supports and Restraints: ASTM A 36/A 36M, steel plates, shapes, and bars; black and galvanized.

F. Mounting, Anchoring, and Attachment Components: Items for fastening electrical items or their supports to building surfaces include the following:

1. Powder-Actuated Fasteners: Threaded-steel stud, for use in hardened portland cement concrete, steel, or wood, with tension, shear, and pullout capacities appropriate for supported loads and building materials where used.

   a. Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include the following:

      1) Hilti Inc.
      2) ITW Ramset/Red Head; a division of Illinois Tool Works, Inc.
      3) MKT Fastening, LLC.
      4) Or Approved Equal

2. Mechanical-Expansion Anchors: Insert-wedge-type, zinc-coated steel, for use in hardened portland cement concrete with tension, shear, and pullout capacities appropriate for supported loads and building materials in which used.

a. Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include the following:

1) Cooper B-Line, Inc.; a division of Cooper Industries.
2) Empire Tool and Manufacturing Co., Inc.
3) Hilti Inc.
4) Or Approved Equal

3. Concrete Inserts: Steel or malleable-iron, slotted support system units similar to MSS Type 18; complying with MFMA-4 or MSS SP-58.
4. Clamps for Attachment to Steel Structural Elements: MSS SP-58, type suitable for attached structural element.
5. Through Bolts: Structural type, hex head, and high strength. Comply with ASTM A 325.
6. Toggle Bolts: All-steel springhead type.
7. Hanger Rods: Threaded steel.

2.2. FABRICATED METAL EQUIPMENT SUPPORT ASSEMBLIES

A. Description: Welded or bolted, structural-steel shapes, shop or field fabricated to fit dimensions of supported equipment.

B. Materials: Comply with requirements in 055000 Section "Miscellaneous Metals" for steel shapes and plates.

PART 3 - EXECUTION

3.1. EXECUTION REQUIREMENTS

A. Refer to DDC General Conditions for execution requirements.

3.2. APPLICATION

A. Comply with NECA 1 and NECA 101 for application of hangers and supports for electrical equipment and systems except if requirements in this Section are stricter.

B. Maximum Support Spacing and Minimum Hanger Rod Size for Raceway: Space supports for EMT, IMC, and RMC as NFPA 70. Minimum rod size shall be 1/4 inch (6 mm) in diameter.

C. Multiple Raceways or Cables: Install trapeze-type supports fabricated with steel slotted support system, sized so capacity can be increased by at least 25 percent in future without exceeding specified design load limits.

1. Secure raceways and cables to these supports with single-bolt conduit clamps.

D. Spring-steel clamps designed for supporting single conduits without bolts may be used for 1-1/2-inch (38-mm) and smaller raceways serving branch circuits and communication systems above suspended ceilings and for fastening raceways to trapeze supports.

3.3. SUPPORT INSTALLATION

A. Comply with NECA 1 and NECA 101 for installation requirements except as specified in this Article.

B. Raceway Support Methods: In addition to methods described in NECA 1, EMT, IMC, and RMC may be supported by openings through structure members, as permitted in NFPA 70.

C. Strength of Support Assemblies: Where not indicated, select sizes of components so strength will be adequate to carry present and future static loads within specified loading limits. Minimum static design load used for strength determination shall be weight of supported components plus 200 lb (90 kg).

D. Mounting and Anchorage of Surface-Mounted Equipment and Components: Anchor and fasten electrical items and their supports to building structural elements by the following methods unless otherwise indicated by code:

1. To Wood: Fasten with lag screws or through bolts.
2. To New Concrete: Bolt to concrete inserts.
3. To Masonry: Approved toggle-type bolts on hollow masonry units and expansion anchor fasteners on solid masonry units.
4. Instead of expansion anchors, powder-actuated driven threaded studs provided with lock washers and nuts may be used in existing standard-weight concrete 4 inches (100 mm) thick or greater. Do not use for anchorage to lightweight-aggregate concrete or for slabs less than 4 inches (100 mm) thick.
5. To Steel: Beam clamps (MSS Type 19, 21, 23, 25, or 27) complying with MSS SP-69.
6. To Light Steel: Sheet metal screws.
7. Items Mounted on Hollow Walls and Nonstructural Building Surfaces: Mount cabinets, panelboards, disconnect switches, control enclosures, pull and junction boxes, transformers, and other devices on slotted-channel racks attached to substrate.

E. Drill holes for expansion anchors in concrete at locations and to depths that avoid reinforcing bars.

3.4. INSTALLATION OF FABRICATED METAL SUPPORTS

A. Comply with installation requirements in 055000 Section "Miscellaneous Metals" for site-fabricated metal supports.

B. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor electrical materials and equipment.

C. Field Welding: Comply with AWS D1.1/D1.1M.

3.5. CONCRETE BASES

A. Construct concrete bases of dimensions indicated but not less than 4 inches (100 mm) larger in both directions than supported unit, and so anchors will be a minimum of 10 bolt diameters from edge of the base.

B. Use 3000-psi (20.7-MPa), 28-day compressive-strength concrete. Concrete materials, reinforcement, and placement requirements are specified in 033000 Section "Cast-in-Place Concrete."

C. Anchor equipment to concrete base.

1. Place and secure anchorage devices. Use supported equipment manufacturer's setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
2. Install anchor bolts to elevations required for proper attachment to supported equipment.
3. Install anchor bolts according to anchor-bolt manufacturer's written instructions.

3.6. PAINTING

A. Touchup: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.

1. Apply paint by brush or spray to provide minimum dry film thickness of 2.0 mils (0.05 mm).

B. Touchup: Comply with requirements in Section 099000 Painting and Finishing for cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint on miscellaneous metal.

C. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-restore paint to comply with ASTM A 780.

END OF SECTION 260529

SECTION 260533
Raceway and Boxes For Electrical Systems

PART 1 - GENERAL

1.1. RELATED DOCUMENTS

A. The following documents apply to all required work for the Project: (1) the Contract Drawings, (2) the Specifications, (3) the General Conditions, (4) the Addendum and (5) the Contract (City of New York Standard Construction Contract).

B. LEED / Environmentally Preferable Purchase (EPP) General Requirements:

1. Refer to DDC General Conditions and the Addendum to the General Conditions.
2. LEED requirements apply to all Phase II work with the exception of the Existing Building scope. EPP requirements apply to the project's Existing Building scope only.

1.2. SUMMARY

A. This Section includes raceways, fittings, boxes, enclosures, and cabinets for electrical wiring.

B. Related Sections include the following:

1. Section 260543 "Underground Ducts and Raceways for Electrical Systems" for exterior ductbanks, manholes, and underground utility construction.

C. This Section describes steel, aluminum, and non-metallic raceways. Unless an exception is approved by the Commissioner, all raceways shall be steel (GRS, IMC, or EMT). Armored cables of MC cables are not permitted. Aluminum conduits are not permitted.

1.3. DEFINITIONS

A. EMT: Electrical metallic tubing.

B. EPDM: Ethylene-propylene-diene terpolymer rubber.

C. FMC: Flexible metal conduit.

D. IMC: Intermediate metal conduit.

E. LFMC: Liquidtight flexible metal conduit.

F. NBR: Acrylonitrile-butadiene rubber.

G. RNC: Rigid nonmetallic conduit.

1.4. SUBMITTALS

A. Refer to DDC General Conditions Section 01 33 00 "Submittal Procedures."

B. Product Data: For surface raceways, wireways and fittings, floor boxes, hinged-cover enclosures, and cabinets.

C. Shop Drawings: For the following raceway components. Include plans, elevations, sections, details, and attachments to other work.

1. Custom enclosures and cabinets.
2. For handholes and boxes for underground wiring, including the following:

    a. Duct entry provisions, including locations and duct sizes.
    b. Frame and cover design.
    c. Grounding details.
    d. Dimensioned locations of cable rack inserts, and pulling-in and lifting irons.
    e. Joint details.

D. Coordination Drawings: Conduit routing plans, drawn to scale, on which the following items are shown and coordinated with each other, based on input from installers of the items involved:

1. Structural members in the paths of conduit groups with common supports.
2. HVAC and plumbing items and architectural features in the paths of conduit groups with common supports.

E. Qualification Data: For professional engineer licensed in the State of New York and testing agency.

F. Source quality-control test reports.

1.5. QUALITY ASSURANCE

A. Refer to DDC General Conditions Section 01 40 00 "Quality Requirements."

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to the Commissioner and marked for intended use.

C. Comply with NFPA 70.

PART 2 - PRODUCTS

2.1. METAL CONDUIT AND TUBING

A. Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include the following:

1. Allied Tube & Conduit; a Tyco International Ltd. Co.
2. Anamet Electrical, Inc.; Anaconda Metal Hose.

3. Maverick Tube Corporation.
4. Wheatland Tube Company.
5. Or Approved Equal.

B. Rigid Steel Conduit: ANSI C80.1.

C. IMC: ANSI C80.6.

D. PVC-Coated Steel Conduit: PVC-coated rigid steel conduit, IMC.

1. Comply with NEMA RN 1.
2. Coating Thickness: 0.040 inch (1 mm), minimum.

E. EMT: ANSI C80.3.

F. FMC: Zinc-coated steel or aluminum.

G. LFMC: Flexible steel conduit with PVC jacket.

H. Fittings for Conduit, EMT, and Cable: NEMA FB 1; listed for type and size raceway with which used, and for application and environment in which installed.

1. Conduit Fittings for Hazardous (Classified) Locations: Comply with UL 886.
2. Fittings for EMT: Steel or die-cast, compression type.
3. Coating for Fittings for PVC-Coated Conduit: Minimum thickness, 0.040 inch (1 mm), with overlapping sleeves protecting threaded joints.

I. Joint Compound for Rigid Steel Conduit or IMC: Listed for use in cable connector assemblies, and compounded for use to lubricate and protect threaded raceway joints from corrosion and enhance their conductivity.

2.2. NONMETALLIC CONDUIT AND TUBING

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Arnco Corporation.
2. CANTEX Inc.
3. CertainTeed Corp.; Pipe & Plastics Group.
4. Condux International, Inc.
5. Electri-Flex Co.
6. RACO; a Hubbell Company.
7. Or Approved Equal.

B. ENT: NEMA TC 13.

C. RNC: NEMA TC 2, Type EPC-40-PVC, unless otherwise indicated.

D. LFNC: UL 1660.

E. Fittings for ENT and RNC: NEMA TC 3; match to conduit or tubing type and material.

F. Fittings for LFNC: UL 514B.

2.3. OPTICAL FIBER/COMMUNICATIONS CABLE RACEWAY AND FITTINGS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Arnco Corporation.
2. Endot Industries Inc.
3. IPEX Inc.
4. Lamson & Sessions; Carlon Electrical Products.
5. Or Approved Equal.

B. Description: Comply with UL 2024; flexible type, approved for general-use installation.

2.4. METAL WIREWAYS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Cooper B-Line, Inc.
2. Hoffman.
3. Square D; Schneider Electric.
4. Or Approved Equal.

B. Description: Sheet metal sized and shaped as indicated, NEMA 250, Type , unless otherwise indicated.

C. Fittings and Accessories: Include couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, and other fittings to match and mate with wireways as required for complete system.

D. Wireway Covers: Screw-cover type or Flanged-and-gasketed type.

E. Finish: Manufacturer's standard enamel finish.

2.5. SURFACE RACEWAYS

A. Surface Metal Raceways: Galvanized steel with snap-on covers. Manufacturer's standard enamel finish in color selected by Commissioner.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Thomas & Betts Corporation.
b. Walker Systems, Inc.; Wiremold Company (The).
c. Wiremold Company (The); Electrical Sales Division.
d. Or Approved Equal

B. Surface Nonmetallic Raceways: Two-piece construction, manufactured of rigid PVC with texture and color selected by Commissioner from colors.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. Butler Manufacturing Company; Walker Division.
   b. Enduro Systems, Inc.; Composite Products Division.
   c. Hubbell Incorporated; Wiring Device-Kellems Division.
   d. Lamson & Sessions; Carlon Electrical Products.
   e. Panduit Corp.
   f. Wiremold Company (The); Electrical Sales Division.
   g. Or Approved Equal

2.6. BOXES, ENCLOSURES, AND CABINETS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   1. Cooper Crouse-Hinds; Div. of Cooper Industries, Inc.
   2. EGS/Appleton Electric.
   3. Erickson Electrical Equipment Company.
   4. Hoffman.
   5. Hubbell Incorporated; Killark Electric Manufacturing Co. Division.
   6. O-Z/Gedney; a unit of General Signal.
   7. RACO; a Hubbell Company.
   8. Spring City Electrical Manufacturing Company.
   9. Thomas & Betts Corporation.
   10. Or Approved Equal

B. Sheet Metal Outlet and Device Boxes: NEMA OS 1.

C. Cast-Metal Outlet and Device Boxes: NEMA FB 1, ferrous alloy, Type FD, with gasketed cover.

D. Metal Floor Boxes: Cast or sheet metal, fully adjustable, rectangular.

E. Small Sheet Metal Pull and Junction Boxes: NEMA OS 1.

F. Cast-Metal Access, Pull, and Junction Boxes: NEMA FB 1, galvanized, cast iron with gasketed cover.

G. Hinged-Cover Enclosures: NEMA 250, Type 1, with continuous-hinge cover with flush latch, unless otherwise indicated.

   1. Metal Enclosures: Steel, finished inside and out with manufacturer's standard enamel.
   2. Nonmetallic Enclosures: Plastic.

H. Cabinets:

   1. NEMA 250, Type 1, galvanized-steel box with removable interior panel and removable front, finished inside and out with manufacturer's standard enamel.
   2. Hinged door in front cover with flush latch and concealed hinge.
   3. Key latch to match panelboards.

4. Metal barriers to separate wiring of different systems and voltage.
5. Accessory feet where required for freestanding equipment.

2.7. HANDHOLES AND BOXES FOR EXTERIOR UNDERGROUND WIRING

A. Description: Comply with SCTE 77.

1. Color of Frame and Cover: Gray.
2. Configuration: Units shall be designed for flush burial and have closed bottom, unless otherwise indicated.
3. Cover: Weatherproof, secured by tamper-resistant locking devices and having structural load rating consistent with enclosure.
4. Cover Finish: Nonskid finish shall have a minimum coefficient of friction of 0.50.
5. Cover Legend: Molded lettering, "ELECTRIC." "TELEPHONE." as indicated for each service.
6. Conduit Entrance Provisions: Conduit-terminating fittings shall mate with entering ducts for secure, fixed installation in enclosure wall.
7. Handholes 12 inches wide by 24 inches long (300 mm wide by 600 mm long) and larger shall have inserts for cable racks and pulling-in irons installed before concrete is poured.

B. Fiberglass Handholes and Boxes: Molded of fiberglass-reinforced polyester resin, with covers of hot-dip galvanized-steel diamond plate or fiberglass

1. Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include the following:

a. Carson Industries LLC.
b. Christy Concrete Products.
c. Nordic Fiberglass, Inc.
d. Or Approved Equal.

2.8. SLEEVES FOR RACEWAYS

A. Steel Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, galvanized steel, plain ends.

B. Cast-Iron Pipe Sleeves: Cast or fabricated "wall pipe," equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop, unless otherwise indicated.

C. Sleeves for Rectangular Openings: Galvanized sheet steel with minimum 0.052- or 0.138-inch (1.3- or 3.5-mm) thickness as indicated and of length to suit application.

D. Coordinate sleeve selection and application with selection and application of firestopping specified in 07 Section 078413 "Firestops and Smokeseals"

2.9. SLEEVE SEALS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Advance Products & Systems, Inc.
2. Calpico, Inc.
3. Metraflex Co.
4. Pipeline Seal and Insulator, Inc.
5. Or Approved Equal

B. Description: Modular sealing device, designed for field assembly, to fill annular space between sleeve and cable.

1. Sealing Elements: EPDM interlocking links shaped to fit surface of cable or conduit. Include type and number required for material and size of raceway or cable.
2. Pressure Plates: Plastic. Include two for each sealing element.
3. Connecting Bolts and Nuts: Carbon steel with corrosion-resistant coating of length required to secure pressure plates to sealing elements. Include one for each sealing element.

2.10. SOURCE QUALITY CONTROL FOR UNDERGROUND ENCLOSURES

A. Handhole and Pull-Box Prototype Test: Test prototypes of handholes and boxes for compliance with SCTE 77. Strength tests shall be for specified tier ratings of products supplied.

1. Tests of materials shall be performed by a independent testing agency.
2. Strength tests of complete boxes and covers shall be by either an independent testing agency or manufacturer. A professional engineer licensed in the State of New York shall certify tests by manufacturer.
3. Testing machine pressure gages shall have current calibration certification complying with ISO 9000 and ISO 10012, and traceable to NIST standards.

PART 3 - EXECUTION

3.1. EXECUTION REQUIREMENTS

A. Refer to DDC General Conditions for execution requirements.

3.2. RACEWAY APPLICATION

A. Outdoors: Apply raceway products as specified below, unless otherwise indicated:

1. Exposed Conduit: Rigid steel conduit, IMC, Type EPC-80-PVC.
2. Concealed Conduit, Aboveground: Rigid steel conduit, IMC, Type EPC-40-PVC.
3. Underground Conduit: Rigid steel conduit, Type EPC-40 –PVC.
4. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): LFMC.
5. Boxes and Enclosures, Aboveground: NEMA 250, Type 3R.
6. Application of Handholes and Boxes for Underground Wiring:

a. Handholes and Pull Boxes in Driveway, Parking Lot, and Off-Roadway Locations, Subject to Occasional, Nondeliberate Loading by Heavy Vehicles: Polymer concrete SCTE 77, Tier 15 structural load rating.
b. Handholes and Pull Boxes in Sidewalk and Similar Applications with a Safety Factor for Nondeliberate Loading by Vehicles: Polymer-concrete units, SCTE 77, Tier 8 structural load rating.
c. Handholes and Pull Boxes Subject to Light-Duty Pedestrian Traffic Only: Fiberglass-reinforced polyester resin, structurally tested according to SCTE 77 with 3000-lbf (13 345-N) vertical loading.

B. Comply with the following indoor applications, unless otherwise indicated:

1. Exposed, Not Subject to Physical Damage: Rigid steel.
2. Exposed, Not Subject to Severe Physical Damage: Rigid steel.
3. Exposed and Subject to Severe Physical Damage: Rigid steel conduit. Includes raceways in the following locations:

a. Loading dock.
b. Corridors used for traffic of mechanized carts, forklifts, and pallet-handling units.
c. Mechanical rooms.

4. Concealed in Ceilings and Interior Walls and Partitions: EMT.
5. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): FMC, except use LFMC in damp or wet locations.
6. Damp or Wet Locations: Rigid steel conduit IMC.
7. Raceways for Optical Fiber or Communications Cable Risers in Vertical Shafts: Riser-type, optical fiber/communications cable raceway EMT.
8. Raceways for Concealed General Purpose Distribution of Optical Fiber or Communications Cable: General-use, optical fiber/communications cable raceway or EMT.
9. Boxes and Enclosures: NEMA 250, Type 1, except use NEMA 250, Type 4, nonmetallic in damp or wet locations.

C. Minimum Raceway Size: 3/4-inch (21-mm) trade size.

D. Raceway Fittings: Compatible with raceways and suitable for use and location.

1. Rigid and Intermediate Steel Conduit: Use threaded rigid steel conduit fittings, unless otherwise indicated.
2. PVC Externally Coated, Rigid Steel Conduits: Use only fittings listed for use with that material. Patch and seal all joints, nicks, and scrapes in PVC coating after installing conduits and fittings. Use sealant recommended by fitting manufacturer.

3.3. INSTALLATION

A. Comply with NECA 1 for installation requirements applicable to products specified in Part 2 except where requirements on Drawings or in this Article are stricter.

B. Keep raceways at least 6 inches (150 mm) away from parallel runs of flues and steam or hot-water pipes. Install horizontal raceway runs above water and steam piping.

C. Complete raceway installation before starting conductor installation.

D. Support raceways as specified in Section 260529 "Hangers and Supports for Electrical Systems."

E. Arrange stub-ups so curved portions of bends are not visible above the finished slab.

F. Install no more than the equivalent of three 90-degree bends in any conduit run except for communications conduits, for which fewer bends are allowed.

G. Conceal conduit and EMT within finished walls, ceilings, and floors, unless otherwise indicated.

H. Raceways Embedded in Slabs:

1. Run conduit larger than 1-inch (27-mm) trade size, parallel or at right angles to main reinforcement. Where at right angles to reinforcement, place conduit close to slab support.
2. Arrange raceways to cross building expansion joints at right angles with expansion fittings.

I. Threaded Conduit Joints, Exposed to Wet, Damp, Corrosive, or Outdoor Conditions: Apply listed compound to threads of raceway and fittings before making up joints. Follow compound manufacturer's written instructions.

J. Raceway Terminations at Locations Subject to Moisture or Vibration: Use insulating bushings to protect conductors, including conductors smaller than No. 4 AWG.

K. Install pull wires in empty raceways. Use polypropylene or monofilament plastic line with not less than 200-lb (90-kg) tensile strength. Leave at least 12 inches (300 mm) of slack at each end of pull wire.

L. Raceways for Optical Fiber and Communications Cable: Install raceways, metallic and nonmetallic, rigid and flexible, as follows:

1. 3/4-Inch (19-mm) Trade Size and Smaller: Install raceways in maximum lengths of 50 feet (15 m).
2. 1-Inch (25-mm) Trade Size and Larger: Install raceways in maximum lengths of 75 feet (23 m).
3. Install with a maximum of two 90-degree bends or equivalent for each length of raceway unless Drawings show stricter requirements. Separate lengths with pull or junction boxes or terminations at distribution frames or cabinets where necessary to comply with these requirements.

M. Install raceway sealing fittings at suitable, approved, and accessible locations and fill them with listed sealing compound. For concealed raceways, install each fitting in a flush steel box with a blank cover plate having a finish similar to that of adjacent plates or surfaces. Install raceway sealing fittings at the following points:

1. Where conduits pass from warm to cold locations, such as boundaries of refrigerated spaces.
2. Where otherwise required by NFPA 70.

N. Flexible Conduit Connections: Use maximum of 72 inches (1830 mm) of flexible conduit for recessed and semirecessed lighting fixtures, equipment subject to vibration, noise transmission, or movement; and for transformers and motors.

1. Use LFMC in damp or wet locations.

O. Recessed Boxes in Masonry Walls: Saw-cut opening for box in center of cell of masonry block, and install box flush with surface of wall.

P. Set metal floor boxes level and flush with finished floor surface.

3.4. INSTALLATION OF UNDERGROUND CONDUIT

A. Direct-Buried Conduit:

1. Excavate trench bottom to provide firm and uniform support for conduit. Prepare trench bottom as specified in Section 310000 "Earthwork" for pipe less than 6 inches (150 mm) in nominal diameter.
2. Install backfill as specified in Section 310000 "Earthwork."
3. After installing conduit, backfill and compact. Start at tie-in point, and work toward end of conduit run, leaving conduit at end of run free to move with expansion and contraction as temperature changes during this process. Firmly hand tamp backfill around conduit to provide maximum supporting strength. After placing controlled backfill to within 12 inches (300 mm) of finished grade, make final conduit connection at end of run and complete backfilling with normal compaction as specified in Section 310000 "Earthwork."
4. Install manufactured duct elbows for stub-ups at poles and equipment and at building entrances through the floor, unless otherwise indicated. Encase elbows for stub-up ducts throughout the length of the elbow.
5. Install manufactured rigid steel conduit elbows for stub-ups at poles and equipment and at building entrances through the floor.

    a. Couple steel conduits to ducts with adapters designed for this purpose, and encase coupling with 3 inches (75 mm) of concrete.
    b. For stub-ups at equipment mounted on outdoor concrete bases, extend steel conduit horizontally a minimum of 60 inches (1500 mm) from edge of equipment pad or foundation. Install insulated grounding bushings on terminations at equipment.

6. Warning Planks: Bury warning planks approximately 12 inches (300 mm) above direct-buried conduits, placing them 24 inches (600 mm) o.c. Align planks along the width and along the centerline of conduit.

3.5. SLEEVE INSTALLATION FOR ELECTRICAL PENETRATIONS

A. Coordinate sleeve selection and application with selection and application of firestopping specified in Section 078413 "Firestops and Smokeseals."

B. Concrete Slabs and Walls: Install sleeves for penetrations unless core-drilled holes or formed openings are used. Install sleeves during erection of slabs and walls.

C. Use pipe sleeves unless penetration arrangement requires rectangular sleeved opening.

D. Rectangular Sleeve Minimum Metal Thickness:

1. For sleeve cross-section rectangle perimeter less than 50 inches (1270 mm) and no side greater than 16 inches (400 mm), thickness shall be 0.052 inch (1.3 mm).
2. For sleeve cross-section rectangle perimeter equal to, or greater than, 50 inches (1270 mm) and 1 or more sides equal to, or greater than, 16 inches (400 mm), thickness shall be 0.138 inch (3.5 mm).

E. Fire-Rated Assemblies: Install sleeves for penetrations of fire-rated floor and wall assemblies unless openings compatible with firestop system used are fabricated during construction of floor or wall.

F. Cut sleeves to length for mounting flush with both surfaces of walls.

G. Extend sleeves installed in floors 2 inches (50 mm) above finished floor level.

H. Size pipe sleeves to provide 1/4-inch (6.4-mm) annular clear space between sleeve and raceway unless sleeve seal is to be installed.

I. Seal space outside of sleeves with grout for penetrations of concrete and masonry.

J. Interior Penetrations of Non-Fire-Rated Walls and Floors: Seal annular space between sleeve and raceway, using joint sealant appropriate for size, depth, and location of joint.

K. Fire-Rated-Assembly Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at raceway penetrations. Install sleeves and seal with firestop materials. Comply with Section 078413 "Firestops and Smokeseals."

L. Roof-Penetration Sleeves: Seal penetration of individual raceways with flexible, boot-type flashing units applied in coordination with roofing work.

M. Aboveground, Exterior-Wall Penetrations: Seal penetrations using sleeves and mechanical sleeve seals. Select sleeve size to allow for 1-inch (25-mm) annular clear space between pipe and sleeve for installing mechanical sleeve seals.

N. Underground, Exterior-Wall Penetrations: Install cast-iron "wall pipes" for sleeves. Size sleeves to allow for 1-inch (25-mm) annular clear space between raceway and sleeve for installing mechanical sleeve seals.

3.6. SLEEVE-SEAL INSTALLATION

A. Install to seal underground, exterior wall penetrations.

B. Use type and number of sealing elements recommended by manufacturer for raceway material and size. Position raceway in center of sleeve. Assemble mechanical sleeve seals and install in annular space between raceway and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

3.7. FIRESTOPPING

A. Apply firestopping to electrical penetrations of fire-rated floor and wall assemblies to restore original fire-resistance rating of assembly. Firestopping materials and installation requirements are specified in Section 078413 "Firestops and Smokeseals."

3.8. PROTECTION

A. Provide final protection and maintain conditions that ensure coatings, finishes, and cabinets are without damage or deterioration at time of Substantial Completion.

1. Restore damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
2. Restore damage to PVC or paint finishes with matching touchup coating recommended by manufacturer.

END OF SECTION 260533

SECTION 260543
Underground Ducts And Raceways For Electrical Systems

PART 1 - GENERAL

1.1. RELATED DOCUMENTS

A. The following documents apply to all required work for the Project: (1) the Contract Drawings, (2) the Specifications, (3) the General Conditions, (4) the Addendum and (5) the Contract (City of New York Standard Construction Contract).

B. LEED / Environmentally Preferable Purchase (EPP) General Requirements.

1. Refer to DDC General Conditions and the Addendum to the General Conditions.
2. LEED requirements apply to all Phase II work with the exception of the Existing Building scope. EPP requirements apply to the project's Existing Building scope only.

1.2. SUMMARY

A. This Section includes the following:

1. Conduit, ducts, and duct accessories for direct-buried and concrete-encased duct banks, and in single duct runs.

1.3. DEFINITION

A. RNC: Rigid nonmetallic conduit.

1.4. SUBMITTALS

A. Refer to DDC General Conditions Section 01 33 00 "Submittal Procedures."

B. Product Data: For the following:

1. Duct-bank materials, including separators and miscellaneous components.
2. Ducts and conduits and their accessories, including elbows, end bells, bends, fittings, and solvent cement.
3. Accessories for manholes, handholes, boxes.
4. Warning tape.
5. Warning planks.

C. Shop Drawings for Precast or Factory-Fabricated Underground Utility Structures: Include plans, elevations, sections, details, attachments to other work, and accessories, including the following:

1. Duct entry provisions, including locations and duct sizes.
2. Reinforcement details.

3. Frame and cover design and manhole frame support rings.
4. Ladder/ Step details.
5. Grounding details.
6. Dimensioned locations of cable rack inserts, pulling-in and lifting irons, and sumps.
7. Joint details.

D. Shop Drawings for Factory-Fabricated Handholes and Boxes Other Than Precast Concrete: Include dimensioned plans, sections, and elevations, and fabrication and installation details, including the following:

1. Duct entry provisions, including locations and duct sizes.
2. Cover design.
3. Grounding details.
4. Dimensioned locations of cable rack inserts, and pulling-in and lifting irons.

E. Duct-Bank Coordination Drawings: Show duct profiles and coordination with other utilities and underground structures.

1. Include plans and sections, drawn to scale, and show bends and locations of expansion fittings.
2. Drawings shall be signed and sealed by a qualified professional engineer licensed in the State of New York.

F. Qualification Data: For professional engineer licensed in the state of New York and testing agency.

G. Source quality-control test reports.

H. Field quality-control test reports.

1.5. QUALITY ASSURANCE

A. Refer to DDC General Conditions Section 01 40 00 "Quality Requirements."

B. Testing Agency Qualifications: Qualified according to ASTM E 329 for testing indicated.

C. Comply with ANSI C2.

D. Comply with NFPA 70.

1.6. DELIVERY, STORAGE, AND HANDLING

A. Deliver ducts to Project site with ends capped. Store nonmetallic ducts with supports to prevent bending, warping, and deforming.

B. Store underground utility structures at Project site as recommended by manufacturer to prevent physical damage. Arrange so identification markings are visible.

C. Lift and support precast concrete units only at designated lifting or supporting points.

1.7. COORDINATION

A. Coordinate layout and installation of ducts and boxes with final arrangement of other utilities, site grading, and surface features as determined in the field.

B. Coordinate elevations of ducts and duct-bank entrances and boxes with final locations and profiles of ducts and duct banks as determined by coordination with other utilities, underground obstructions, and surface features. Revise locations and elevations from those indicated as required to suit field conditions and to ensure that duct runs drain to manholes and handholes, and as approved by Commissioner.

PART 2 - PRODUCTS

2.1. CONDUIT

A. Rigid Steel Conduit: Galvanized. Comply with ANSI C80.1.

B. RNC: NEMA TC 2, Type EPC-80-PVC, UL 651, with matching fittings by same manufacturer as the conduit, complying with NEMA TC 3 and UL 514B.

2.2. NONMETALLIC DUCTS AND DUCT ACCESSORIES

A. Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. ARNCO Corp.
2. Beck Manufacturing.
3. Cantex, Inc.
4. CertainTeed Corp.; Pipe & Plastics Group.
5. Condux International, Inc.
6. ElecSys, Inc.
7. Electri-Flex Company.
8. IPEX Inc.
9. Lamson & Sessions; Carlon Electrical Products.
10. Manhattan/CDT; a division of Cable Design Technologies.
11. Spiraduct/AFC Cable Systems, Inc.
12. Or Approved Equal

B. Underground Plastic Utilities Duct: NEMA TC 6 & 8, Type DB-120-PVC, ASTM F 512, with matching fittings by the same manufacturer as the duct, complying with NEMA TC 9.

C. Duct Accessories:

1. Duct Separators: Factory-fabricated rigid PVC interlocking spacers, sized for type and sizes of ducts with which used, and selected to provide minimum duct spacing indicated while supporting ducts during concreting or backfilling.
2. Warning Tape: Underground-line warning tape specified in Section 260553 "Identification for Electrical Systems."

3. Concrete Warning Planks: Nominal 12 by 24 by 3 inches (300 by 600 by 76 mm) in size, manufactured from 6000-psi (41-MPa) concrete.

   a. Color: Red dye added to concrete during batching.
   b. Mark each plank with "ELECTRIC" in 2-inch- (50-mm-) high, 3/8-inch- (10-mm-) deep letters.

2.3. SOURCE QUALITY CONTROL

A. Test and inspect precast concrete utility structures according to ASTM C 1037.

B. Pull-Box Prototype Test: Test prototypes of boxes for compliance with SCTE 77. Strength tests shall be for specified tier ratings of products supplied.

1. Tests of materials shall be performed by a independent testing agency.
2. Strength tests of complete boxes and covers shall be by either an independent testing agency or the manufacturer. A qualified registered professional engineer licensed in the State of New York shall certify tests by manufacturer.
3. Testing machine pressure gages shall have current calibration certification complying with ISO 9000 and ISO 10012, and traceable to NIST standards.

PART 3 - EXECUTION

3.1. EXECUTION REQUIREMENTS

A. Refer to DDC General Conditions for execution requirements.

3.2. UNDERGROUND DUCT APPLICATION

A. Ducts for Electrical Feeders 600 V and Less: RNC, NEMA Type EPC-80-PVC, in concrete-encased duct bank, unless otherwise indicated.

B. Underground Ducts Crossing Paved Paths, Walks and Driveways, Roadways: RNC, NEMA Type EPC-40-PVC, encased in reinforced concrete.

3.3. EARTHWORK

A. Excavation and Backfill: Comply with Section 310000 "Earthwork," but do not use heavy-duty, hydraulic-operated, compaction equipment.

B. Restore surface features at areas disturbed by excavation and reestablish original grades, unless otherwise indicated. Replace removed sod immediately after backfilling is completed.

C. Restore areas disturbed by trenching, storing of dirt, cable laying, and other work. Restore vegetation and include necessary topsoiling, fertilizing, liming, seeding, sodding, sprigging, and mulching.

D. Cut and patch existing pavement in the path of underground ducts and utility structures.

3.4. DUCT INSTALLATION

A. Slope: Pitch ducts a minimum slope of 1:300 down toward manholes and handholes and away from buildings and equipment. Slope ducts from a high point in runs between two manholes to drain in both directions.

B. Curves and Bends: Use 5-degree angle couplings for small changes in direction. Use manufactured long sweep bends with a minimum radius of 48 inches (1220 mm) 12.5 feet (4 m) 25 feet (7.5 m), both horizontally and vertically, at other locations, unless otherwise indicated.

C. Joints: Use solvent-cemented joints in ducts and fittings and make watertight according to manufacturer's written instructions. Stagger couplings so those of adjacent ducts do not lie in same plane.

D. Building Wall Penetrations: Make a transition from underground duct to rigid steel conduit at least 10 feet (3 m) outside the building wall without reducing duct line slope away from the building, and without forming a trap in the line. Use fittings manufactured for duct-to-conduit transition. Install conduit penetrations of building walls as specified in Section 260500 "Common Work Results for Electrical."

E. Sealing: Provide temporary closure at terminations of ducts that have cables pulled. Seal spare ducts at terminations. Use sealing compound and plugs to withstand at least 15-psig (1.03-MPa) hydrostatic pressure.

F. Pulling Cord: Install 100-lbf- (445-N-) test nylon cord in ducts, including spares.

G. Concrete-Encased Ducts: Support ducts on duct separators.

1. Separator Installation: Space separators close enough to prevent sagging and deforming of ducts, with not less than 5 spacers per 20 feet (6 m) of duct. Secure separators to earth and to ducts to prevent floating during concreting. Stagger separators approximately 6 inches (150 mm) between tiers. Tie entire assembly together using fabric straps; do not use tie wires or reinforcing steel that may form conductive or magnetic loops around ducts or duct groups.
2. Concreting Sequence: Pour each run of envelope between manholes or other terminations in one continuous operation.
    a. Start at one end and finish at the other, allowing for expansion and contraction of ducts as their temperature changes during and after the pour. Use expansion fittings installed according to manufacturer's written recommendations, or use other specific measures to prevent expansion-contraction damage.
    b. If more than one pour is necessary, terminate each pour in a vertical plane and install 3/4-inch (19-mm) reinforcing rod dowels extending 18 inches (450 mm) into concrete on both sides of joint near corners of envelope.
3. Pouring Concrete: Spade concrete carefully during pours to prevent voids under and between conduits and at exterior surface of envelope. Do not allow a heavy mass of concrete to fall directly onto ducts. Use a plank to direct concrete down sides of bank assembly to trench bottom. Allow concrete to flow to center of bank and rise up in middle, uniformly filling all open spaces. Do not use power-driven agitating equipment unless specifically designed for duct-bank application.

4. Reinforcement: Reinforce concrete-encased duct banks where they cross disturbed earth and where indicated. Arrange reinforcing rods and ties without forming conductive or magnetic loops around ducts or duct groups.
5. Forms: Use walls of trench to form side walls of duct bank where soil is self-supporting and concrete envelope can be poured without soil inclusions; otherwise, use forms.
6. Minimum Space between Ducts: 3 inches (75 mm) between ducts and exterior envelope wall, 2 inches (50 mm) between ducts for like services, and 4 inches (100 mm) between power and signal ducts.
7. Depth: Install top of duct bank at least 24 inches (600 mm) below finished grade in areas not subject to deliberate traffic, and at least 30 inches (750 mm) below finished grade in deliberate traffic paths for vehicles, unless otherwise indicated.
8. Stub-Ups: Use manufactured duct elbows for stub-ups at poles and equipment and at building entrances through the floor, unless otherwise indicated. Extend concrete encasement throughout the length of the elbow.
9. Warning Tape: Bury warning tape approximately 12 inches (300 mm) above all concrete-encased ducts and duct banks. Align tape parallel to and within 3 inches (75 mm) of the centerline of duct bank. Provide an additional warning tape for each 12-inch (300-mm) increment of duct-bank width over a nominal 18 inches (450 mm). Space additional tapes 12 inches (300 mm) apart, horizontally.

3.5. INSTALLATION OF BOXES OTHER THAN PRECAST CONCRETE

A. Install boxes level and plumb and with orientation and depth coordinated with connecting ducts to minimize bends and deflections required for proper entrances. Use box extension if required to match depths of ducts, and seal joint between box and extension as recommended by the manufacturer.

B. Unless otherwise indicated, support units on a level bed of crushed stone or gravel, graded from 1/2-inch (12.7-mm) sieve to No. 4 (4.75-mm) sieve and compacted to same density as adjacent undisturbed earth.

C. Elevation: In paved areas and trafficways, set so cover surface will be flush with finished grade. Set covers of other handholes 1 inch (25 mm) above finished grade.

D. Install handholes and boxes with bottom below the frost line at 30" below grade.

E. Install removable hardware, including pulling eyes, cable stanchions, cable arms, and insulators, as required for installation and support of cables and conductors and as indicated. Select arm lengths to be long enough to provide spare space for future cables, but short enough to preserve adequate working clearances in the enclosure.

F. Field-cut openings for ducts and conduits according to enclosure manufacturer's written instructions. Cut wall of enclosure with a tool designed for material to be cut. Size holes for terminating fittings to be used, and seal around penetrations after fittings are installed.

G. For enclosures installed in asphalt paving and subject to occasional, nondeliberate, heavy-vehicle loading, form and pour a concrete ring encircling, and in contact with, enclosure and with top surface screeded to top of box cover frame. Bottom of ring shall rest on compacted earth.

1. Concrete: 3000 psi (20 kPa), 28-day strength, complying with Section 033000 "Cast-in-Place Concrete," with a troweled finish.

2. Dimensions: 10 inches wide by 12 inches deep (250 mm wide by 300 mm deep).

3.6. GROUNDING

A. Ground underground ducts and utility structures according to Section 260526 "Grounding and Bonding for Electrical Systems."

3.7. FIELD QUALITY CONTROL

A. Perform the following tests and inspections and prepare test reports:

1. Demonstrate capability and compliance with requirements on completion of installation of underground ducts and utility structures.
2. Pull aluminum or wood test mandrel through duct to prove joint integrity and test for out-of-round duct. Provide mandrel equal to 80 percent fill of duct. If obstructions are indicated, remove obstructions and retest.
3. Test manhole and handhole grounding to ensure electrical continuity of grounding and bonding connections. Measure and report ground resistance as specified in Section 260526 "Grounding and Bonding for Electrical Systems."

B. Correct deficiencies and retest as specified above to demonstrate compliance.

3.8. CLEANING

A. Pull leather-washer-type duct cleaner, with graduated washer sizes, through full length of ducts. Follow with rubber duct swab for final cleaning and to assist in spreading lubricant throughout ducts.

B. Clean internal surfaces of manholes, including sump. Remove foreign material.

END OF SECTION 260543

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SECTION 260548
Vibration And Seismic Controls For Electrical Systems

PART 1 - GENERAL

1.1. RELATED DOCUMENT:

A. The following documents apply to all required work for the Project: (1) the Contract Drawings, (2) the Specifications, (3) the General Conditions, (4) the Addendum and (5) the Contract (City of New York Standard Construction Contract).

B. LEED / Environmentally Preferable Purchase (EPP) General Requirements:

1. Refer to DDC General Conditions and the Addendum to the General Conditions.
2. LEED requirements apply to all Phase II work with the exception of the Existing Building scope. EPP requirements apply to the project's Existing Building scope only.

1.2. SUBMITTAL DATA REQUIREMENTS

A. Refer to DDC General Conditions Section 01 33 00 "Submittal Procedures."

PART 2 - PRODUCT

2.1. SPECIFICATION

A. Electrical switchboards, generators, panelboards and UPS systems shall be vibration isolated with steel spring isolation mounting assemblies utilizing bare springs with the spring diameter not less than 0.8 of the loaded operating height of the spring. Each isolator shall be designed and installed so that the ends of the spring remain parallel. The spring specified minimum deflection from loaded operating height shall be 50% of the rated deflection.

B. Neoprene-in-shear isolation mounting assemblies shall utilize bare neoprene elements with unit type design molded in oil resistant neoprene. The neoprene shall be compounded to meet the following:

1. Not greater than 70 durometer.
2. Minimum tensile strength of 2000 PSI.
3. Minimum elongation of 300%.
4. Maximum compression at 25% of original deflection.

C. Vibration isolation equipment submittal drawings shall include the following information:

1. Isolation mounting deflections.
2. Spring diameters, compressed spring heights at rated load; solid spring heights, where steel spring isolation mountings are used.
3. Equipment operating frequencies.
4. Calculations showing that the spring surge frequency is not coincided with any forcing frequencies/harmonics of the equipment to be mounted.

D. Mounting Transformers Less than 150Kva

1. Each transformer shall be either floor mounted or hung from structural members on an integral one-piece base or frame, reinforced as necessary, to prevent flexure.
2. The structural base/frame shall be supported by neoprene mountings with a minimum static deflection of 3/8 inch. Isolator types shall be one of the following:

   a. Floor mounts:
      1) Type ND – Mason Industries
      2) Type 368SD – Vibration Eliminator Company
      3) Type RD – Vibration Mountings and Controls
      4) Or Approved Equal
   b. Hung Mounts:
      1) Type HD – Mason Industries
      2) Type CD – Vibration Eliminator Company
      3) Type RHD – Vibration Mountings and Controls
      4) Or Approved Equal

E. Floor Mounting of Electrical switchboards, generators and panel boards.

1. Each switchboard, generator and panelboard shall be mounted on an integral one-piece structural base that is reinforced as necessary to prevent flexure of the base. The structural frame shall be drilled and tapped as necessary, to receive equipment so that the frame shall act as a template.
2. The structural steel integral base shall be supported on steel spring mountings with a minimum static deflection of 1.5" (+/- 10%). These mountings shall be positioned in accordance with the weight distribution to ensure adequate deflection and vibration isolation. Housing or snubbing devices shall not be used to contain the isolator springs. Isolator types shall be one of the following, or as approved:
   a. Type SLF – Mason Industries Inc.
   b. Type OST – Vibration Eliminator Company.
   c. Type AN – Vibration Mountings and Controls, Inc.
   d. Or Approved Equal
3. A minimum 0.75" thick neoprene-in-shear pad at a maximum loading og 50 psi shall be provided between the spring isolator and the floor.

PART 3 - EXECUTION

3.1. EXECUTION REQUIREMENTS

A. Refer to DDC General Conditions for execution requirements.

3.2. GENERAL

A. All vibration isolators and seismic restraint systems must be installed in strict accordance with the manufacturers written instructions and all certified submittal data.

B. Installation of vibration isolators and seismic restraints must not cause any change of position of equipment resulting in stresses of misalignment.

C. No rigid connections between equipment and the building structure shall be made that degrades the noise and vibration control system herein specified.

D. The contractor shall not install any equipment or conduit which makes rigid connections with the building unless isolation is not specified. "Building" includes, but is not limited to, slabs, beams, columns, studs and walls.

E. Coordinate work with other trades to avoid rigid contact with the building.

F. Any conflicts with other trades which will result in rigid contact with equipment or piping due to inadequate space or other unforeseen conditions should be brought to the Commissioner's attention prior to installation.

G. Bring to the commissioner's attention any discrepancies between the specifications and the field conditions or changes required due to specific equipment selection, prior to installation.

H. Overstressing of the building structure must not occur because of overhead support of equipment. Contractor must submit loads to the structural engineer of record for approval. Generally bracing may occur from:

   a. Flanges of structural beams.

   b. Upper truss cords in bar joist construction.

   c. Cast in place inserts or wedge type drill-in concrete anchors.

I. Specification 12 cable restraints shall be installed slightly slack to avoid short circuiting the isolated suspended equipment, piping or conduit.

J. Specification 12 cable assemblies are installed taut on non-isolated systems. Specification 13 seismic solid braces may be used in place of cables on rigidly attached systems only.

K. At locations where specification 12 or 13 restraints are located, the support rods must be braced when necessary to accept compressive loads with specification 14 braces.

L. At all locations where specification 12 or 13 restraints are attached to pipe clevis's, the clevis cross bolt must be reinforced with specification type 15 braces.

M. Drill-in concrete anchors for ceiling and wall installation shall be specification type 18, and specification type 19 female wedge type for floor mounted equipment.

N. Vibration isolation manufacturer shall furnish integral structural steel bases as required. Independent steel rails are not permitted on this project.

O. Hand built elastomeric expansion joints may be used when pipe sizes exceed 24" or specified movements exceed specification 23 capabilities.

P. Where piping passes through walls, floors or ceilings the vibration isolation manufacturer shall provide specification 27 wall seals.

Q. Air handling equipment and centrifugal fans shall be protected against excessive displacement which results from high air thrust in relation to the equipment weight. Horizontal thrust restraint shall be specification type 28.

R. Locate isolation hangers as near to the overhead support structure as possible.

END OF SECTION 260548

SECTION 260553
Identification For Electrical Systems

PART 1 - GENERAL

1.1. RELATED DOCUMENTS

A. The following documents apply to all required work for the Project: (1) the Contract Drawings, (2) the Specifications, (3) the General Conditions, (4) the Addendum and (5) the Contract (City of New York Standard Construction Contract).

B. LEED / Environmentally Preferable Purchase (EPP) General Requirements:

1. Refer to DDC General Conditions and the Addendum to the General Conditions.
2. LEED requirements apply to all Phase II work with the exception of the Existing Building scope. EPP requirements apply to the project's Existing Building scope only.

1.2. SUMMARY

A. Section Includes:

1. Identification for conductors.
2. Underground-line warning tape.
3. Warning labels and signs.
4. Instruction signs.
5. Equipment identification labels.
6. Miscellaneous identification products.

1.3. SUBMITTALS

A. Refer to DDC General Conditions Section 01 33 00 "Submittal Procedures."

B. Product Data: For each electrical identification product indicated.

C. Samples: For each type of label and sign to illustrate size, colors, lettering style, mounting provisions, and graphic features of identification products.

D. Identification Schedule: An index of nomenclature of electrical equipment and system components used in identification signs and labels.

1.4. QUALITY ASSURANCE

A. Refer to DDC General Conditions Section 01 40 00 "Quality Requirements."

B. Comply with ANSI A13.1 and IEEE C2.

C. Comply with NFPA 70.

D. Comply with 29 CFR 1910.144 and 29 CFR 1910.145.

E. Comply with ANSI Z535.4 for safety signs and labels.

F. Adhesive-attached labeling materials, including label stocks, laminating adhesives, and inks used by label printers, shall comply with UL 969.

1.5. COORDINATION

A. Coordinate identification names, abbreviations, colors, and other features with requirements in other Sections requiring identification applications, Drawings, Shop Drawings, manufacturer's wiring diagrams, and the Operation and Maintenance Manual; and with those required by 29 CFR 1910.145. Use consistent designations throughout Project.

B. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.

C. Coordinate installation of identifying devices with location of access panels and doors.

D. Install identifying devices before installing acoustical ceilings and similar concealment.

PART 2 - PRODUCTS

2.1. CONDUCTOR IDENTIFICATION MATERIALS

A. Color-Coding Conductor Tape: Colored, self-adhesive vinyl tape not less than 3 mils (0.08 mm) thick by 1 to 2 inches (25 to 50 mm) wide.

B. Self-Adhesive Vinyl Labels: Preprinted, flexible label laminated with a clear, weather- and chemical-resistant coating and matching wraparound adhesive tape for securing ends of legend label.

C. Snap-Around Labels: Slit, pretensioned, flexible, preprinted, color-coded acrylic sleeve, with diameter sized to suit diameter of raceway or cable it identifies and to stay in place by gripping action.

D. Snap-Around, Color-Coding Bands: Slit, pretensioned, flexible, solid-colored acrylic sleeve, 2 inches (50 mm) long, with diameter sized to suit diameter of raceway or cable it identifies and to stay in place by gripping action.

E. Marker Tapes: Vinyl or vinyl-cloth, self-adhesive wraparound type, with circuit identification legend machine printed by thermal transfer or equivalent process.

F. Write-On Tags: Polyester tag, 0.010 inch (0.25 mm) 0.015 inch (0.38 mm) thick, with corrosion-resistant grommet and cable tie for attachment to conductor or cable.

1. Marker for Tags: Permanent, waterproof, black ink marker recommended by tag manufacturer.

2.2. FLOOR MARKING TAPE

A. 2-inch- (50-mm-) wide, 5-mil (0.125-mm) pressure-sensitive vinyl tape, with black and white stripes and clear vinyl overlay.

2.3. UNDERGROUND-LINE WARNING TAPE

A. Tape:

1. Recommended by manufacturer for the method of installation and suitable to identify and locate underground electrical and communications utility lines.
2. Printing on tape shall be permanent and shall not be damaged by burial operations.
3. Tape material and ink shall be chemically inert, and not subject to degrading when exposed to acids, alkalis, and other destructive substances commonly found in soils.

B. Color and Printing:

1. Comply with ANSI Z535.1 through ANSI Z535.5.
2. Inscriptions for Red-Colored Tapes: ELECTRIC LINE, HIGH VOLTAGE.
3. Inscriptions for Orange-Colored Tapes: TELEPHONE CABLE, CATV CABLE, COMMUNICATIONS CABLE, OPTICAL FIBER CABLE.

C. Tag: Type II:

1. Multilayer laminate consisting of high-density polyethylene scrim coated with pigmented polyolefin, bright-colored, compounded for direct-burial service.
2. Thickness: 12 mils (0.3 mm).
3. Weight: 36.1 lb/1000 sq. ft. (17.6 kg/100 sq. m).
4. 3-Inch (75-mm) Tensile According to ASTM D 882: 400 lbf (1780 N), and 11,500 psi (79.2 MPa).

2.4. WARNING LABELS AND SIGNS

A. Comply with NFPA 70 and 29 CFR 1910.145.

B. Self-Adhesive Warning Labels: Factory-printed, multicolor, pressure-sensitive adhesive labels, configured for display on front cover, door, or other access to equipment unless otherwise indicated.

C. Baked-Enamel Warning Signs:

1. Preprinted aluminum signs, punched or drilled for fasteners, with colors, legend, and size required for application.
2. 1/4-inch (6.4-mm) grommets in corners for mounting.
3. Nominal size, 7 by 10 inches (180 by 250 mm).

D. Metal-Backed, Butyrate Warning Signs:

1. Weather-resistant, nonfading, preprinted, cellulose-acetate butyrate signs with 0.0396-inch (1-mm) galvanized-steel backing; and with colors, legend, and size required for application.
2. 1/4-inch (6.4-mm) grommets in corners for mounting.
3. Nominal size, 10 by 14 inches (250 by 360 mm).

E. Warning label and sign shall include, but are not limited to, the following legends:

1. Multiple Power Source Warning: "DANGER - ELECTRICAL SHOCK HAZARD - EQUIPMENT HAS MULTIPLE POWER SOURCES."
2. Workspace Clearance Warning: "WARNING - OSHA REGULATION - AREA IN FRONT OF ELECTRICAL EQUIPMENT MUST BE KEPT CLEAR FOR 36 INCHES (915 MM)."

2.5. INSTRUCTION SIGNS

A. Engraved, laminated acrylic or melamine plastic, minimum 1/16 inch (1.6 mm) thick for signs up to 20 sq. inches (129 sq. cm) and 1/8 inch (3.2 mm) thick for larger sizes.

1. Engraved legend with black letters on white face .
2. Punched or drilled for mechanical fasteners.
3. Framed with mitered acrylic molding and arranged for attachment at applicable equipment.

B. Adhesive Film Label: Machine printed, in black, by thermal transfer or equivalent process. Minimum letter height shall be 3/8 inch (10 mm).

C. Adhesive Film Label with Clear Protective Overlay: Machine printed, in black, by thermal transfer or equivalent process. Minimum letter height shall be 3/8 inch (10 mm). Overlay shall provide a weatherproof and UV-resistant seal for label.

2.6. EQUIPMENT IDENTIFICATION LABELS

A. Adhesive Film Label: Machine printed, in black, by thermal transfer or equivalent process. Minimum letter height shall be 3/8 inch (10 mm).

B. Adhesive Film Label with Clear Protective Overlay: Machine printed, in black, by thermal transfer or equivalent process. Minimum letter height shall be 3/8 inch (10 mm). Overlay shall provide a weatherproof and UV-resistant seal for label.

C. Self-Adhesive, Engraved, Laminated Acrylic or Melamine Label: Adhesive backed, with white letters on a dark-gray background. Minimum letter height shall be 3/8 inch (10 mm).

D. Engraved, Laminated Acrylic or Melamine Label: Punched or drilled for screw mounting. White letters on a dark-gray background. Minimum letter height shall be 3/8 inch (10 mm).

E. Stenciled Legend: In nonfading, waterproof, black ink or paint. Minimum letter height shall be 1 inch (25 mm).

2.7. CABLE TIES

A. General-Purpose Cable Ties: Fungus inert, self extinguishing, one piece, self locking, Type 6/6 nylon.

1. Minimum Width: 3/16 inch (5 mm).
2. Tensile Strength at 73 deg F (23 deg C), According to ASTM D 638: 12,000 psi (82.7 MPa).
3. Temperature Range: Minus 40 to plus 185 deg F (Minus 40 to plus 85 deg C).
4. Color: Black except where used for color-coding.

PART 3 - EXECUTION

3.1. EXECUTION REQUIREMENTS

A. Refer to DDC General Conditions for execution requirements.

3.2. INSTALLATION

A. Verify identity of each item before installing identification products.

B. Location: Install identification materials and devices at locations for most convenient viewing without interference with operation and maintenance of equipment.

C. Apply identification devices to surfaces that require finish after completing finish work.

D. Self-Adhesive Identification Products: Clean surfaces before application, using materials and methods recommended by manufacturer of identification device.

E. Attach signs and plastic labels that are not self-adhesive type with mechanical fasteners appropriate to the location and substrate.

F. System Identification Color-Coding Bands for Raceways and Cables: Each color-coding band shall completely encircle cable or conduit. Place adjacent bands of two-color markings in contact, side by side. Locate bands at changes in direction, at penetrations of walls and floors, at 50-foot (15-m) maximum intervals in straight runs, and at 25-foot (7.6-m) maximum intervals in congested areas.

G. Aluminum Wraparound Marker Labels and Metal Tags: Secure tight to surface of conductor or cable at a location with high visibility and accessibility.

H. Cable Ties: For attaching tags. Use general-purpose type, except as listed below:

1. Outdoors: UV-stabilized nylon.
2. In Spaces Handling Environmental Air: Plenum rated.

I. Underground-Line Warning Tape: During backfilling of trenches install continuous underground-line warning tape directly above line at 6 to 8 inches (150 to 200 mm) below finished grade. Use multiple tapes where width of multiple lines installed in a common trench or concrete envelope exceeds 16 inches (400 mm) overall.

J. Painted Identification: Comply with requirements in Section 099000 "Painting and Finishing," for surface preparation and paint application.

3.3. IDENTIFICATION SCHEDULE

A. Concealed Raceways, Duct Banks, More Than 600 V, within Buildings: Tape and stencil 4-inch- (100-mm-) wide black stripes on 10-inch (250-mm) centers over orange background that extends full length of raceway or duct and is 12 inches (300 mm) wide. Stencil legend "DANGER CONCEALED HIGH VOLTAGE WIRING" with 3-inch- (75-mm-) high black letters on 20-inch (500-mm) centers. Stop stripes at legends. Apply to the following finished surfaces:

1. Floor surface directly above conduits running beneath and within 12 inches (300 mm) of a floor that is in contact with earth or is framed above unexcavated space.
2. Wall surfaces directly external to raceways concealed within wall.
3. Accessible surfaces of concrete envelope around raceways in vertical shafts, exposed in the building, or concealed above suspended ceilings.

B. Accessible Raceways, 600 V or Less, for Service, Feeder, and Branch Circuits More Than 30 A, and 120 V to ground: Identify with self-adhesive vinyl label. Install labels at 30-foot (10-m) maximum intervals.

C. Accessible Raceways and Cables within Buildings: Identify the covers of each junction and pull box of the following systems with self-adhesive vinyl labels with the wiring system legend and system voltage. System legends shall be as follows:

1. Emergency Power.
2. Power.

D. Power-Circuit Conductor Identification, 600 V or Less: For conductors in vaults, pull and junction boxes, manholes, and handholes, use color-coding conductor tape to identify the phase.

1. Color-Coding for Phase Identification, 600 V or Less: Use colors listed below for ungrounded service feeder and branch-circuit conductors.

   a. Color shall be factory applied or field applied for sizes larger than No. 8 AWG.
   b. Colors for 208/120-V Circuits:

      1) Phase A: Black.
      2) Phase B: Red.
      3) Phase C: Blue.

   c. Field-Applied, Color-Coding Conductor Tape: Apply in half-lapped turns for a minimum distance of 6 inches (150 mm) from terminal points and in boxes where splices or taps are made. Apply last two turns of tape with no tension to prevent possible unwinding. Locate bands to avoid obscuring factory cable markings.

E. Install instructional sign including the color-code for grounded and ungrounded conductors using adhesive-film-type labels.

F. Conductors to Be Extended in the Future: Attach write-on tags/ marker tape to conductors and list source.

G. Auxiliary Electrical Systems Conductor Identification: Identify field-installed alarm, control, and signal connections.

1. Identify conductors, cables, and terminals in enclosures and at junctions, terminals, and pull points. Identify by system and circuit designation.
2. Use system of marker tape designations that is uniform and consistent with system used by manufacturer for factory-installed connections.
3. Coordinate identification with Project Drawings, manufacturer's wiring diagrams, and the Operation and Maintenance Manual.

H. Locations of Underground Lines: Identify with underground-line warning tape for power, lighting, communication, and control wiring and optical fiber cable.

1. Limit use of underground-line warning tape to direct-buried cables.
2. Install underground-line warning tape for both direct-buried cables and cables in raceway.

I. Workspace Indication: Install floor marking tape to show working clearances in the direction of access to live parts. Workspace shall be as required by NFPA 70 and 29 CFR 1926.403 unless otherwise indicated. Do not install at flush-mounted panelboards and similar equipment in finished spaces.

J. Warning Labels for Indoor Cabinets, Boxes, and Enclosures for Power and Lighting: Self-adhesive warning labels.

1. Comply with 29 CFR 1910.145.
2. Identify system voltage with black letters on an orange background.
3. Apply to exterior of door, cover, or other access.
4. For equipment with multiple power or control sources, apply to door or cover of equipment including, but not limited to, the following:

   a. Power transfer switches.
   b. Controls with external control power connections.

K. Operating Instruction Signs: Install instruction signs to facilitate proper operation and maintenance of electrical systems and items to which they connect. Install instruction signs with approved legend where instructions are needed for system or equipment operation.

L. Emergency Operating Instruction Signs: Install instruction signs with white legend on a red background with minimum 3/8-inch- (10-mm-) high letters for emergency instructions at equipment used for power transfer.

M. Equipment Identification Labels: On each unit of equipment, install unique designation label that is consistent with wiring diagrams, schedules, and the Operation and Maintenance Manual. Apply labels to disconnect switches and protection equipment, central or master units, control panels, control stations, terminal cabinets, and racks of each system. Systems include power, lighting, control, communication, signal, monitoring, and alarm systems unless equipment is provided with its own identification.

1. Labeling Instructions:

   a. Indoor Equipment: Self-adhesive, engraved, laminated acrylic or melamine label. Unless otherwise indicated, provide a single line of text with 1/2-inch- (13-mm-) high letters on 1-1/2-inch- (38-mm-) high label; where two lines of text are required, use labels 2 inches (50 mm) high.
   b. Outdoor Equipment: Engraved, laminated acrylic or melamine label - Stenciled legend 4 inches (100 mm) high.
   c. Elevated Components: Increase sizes of labels and letters to those appropriate for viewing from the floor.
   d. Unless provided with self-adhesive means of attachment, fasten labels with appropriate mechanical fasteners that do not change the NEMA or NRTL rating of the enclosure.

2. Equipment to Be Labeled:

   a. Panelboards: Typewritten directory of circuits in the location provided by panelboard manufacturer. Panelboard identification shall be self-adhesive, engraved, laminated acrylic or melamine label.
   b. Enclosures and electrical cabinets.
   c. Access doors and panels for concealed electrical items.
   d. Switchgear.
   e. Switchboards.
   f. Emergency system boxes and enclosures.
   g. Enclosed switches.
   h. Enclosed circuit breakers.
   i. Enclosed controllers.
   j. Push-button stations.
   k. Power transfer equipment.
   l. Contactors.
   m. Remote-controlled switches, dimmer modules, and control devices.
   n. Power-generating units.
   o. Monitoring and control equipment.

END OF SECTION 260553

SECTION 260573
Overcurrent Protective Device Coordination Study

PART 1 - GENERAL

1.1. RELATED DOCUMENT

A. The following documents apply to all required work for the Project: (1) the Contract Drawings, (2) the Specifications, (3) the General Conditions, (4) the Addendum and (5) the Contract (City of New York Standard Construction Contract).

B. LEED General Requirements:

1. Refer to DDC General Conditions.

a. Section 01 33 00 "Submittal Procedures."
b. Section 01 81 13.04 "Sustainable Design Requirements for LEED v4 Buildings."

1.2. SUMMARY

A. Provide a Short-Circuit and Protective Device Evaluation Study, a Protective Device Coordination Study, and an Arc-Flash Hazard Study, as specified herein.

B. Obtain the short circuit current value at the main service switchboard for the specific project location from the utility. Bear all costs associated with obtaining the available short circuit current value.

C. Adjust all required protective device settings based on the results of the Protective Device Coordination Study and Arc-Flash Hazard Study.

D. Install Arc-Flash and Shock Hazard labels on all electrical equipment, as specified herein.

1.3. DESCRIPTION OF THE WORK

A. Short-Circuit and Protective Device Evaluation Study

1. Contractor shall provide a Short-Circuit and Protective Device Evaluation Study to verify the proposed equipment ratings and protective device ratings.

2. Unless specified otherwise, the scope of the study shall include all proposed distribution equipment supplied under this Contract, as well as all directly affected existing distribution equipment at the facility. The study shall include all portions of the existing and proposed electrical distribution system from the electric utility power source(s) and emergency power source(s) down to and including each switchboard, distribution panel, transfer switch (automatic or manual), motor control center, variable frequency drive, distribution panelboard, branch circuit panelboard, busway, enclosed circuit breaker and fused disconnect switch.

B. Protective Device Coordination Study

1. Contractor shall provide a Protective Device Coordination Study to determine and coordinate the selective tripping of protective devices for the proposed equipment.

2. Unless specified otherwise, the scope of the study shall include all proposed distribution equipment supplied under this Contract, as well as all directly affected existing distribution equipment at the facility. The study shall include all portions of the existing and proposed electrical distribution system from the electric utility power source(s) and emergency power source(s) down to and including the smallest adjustable trip circuit breaker and fused disconnect switch in the system.

C. Arc-Flash Hazard Study

1. Contractor shall provide an Arc-Flash Hazard Study to determine potential arc-flash incident energies, arc-flash boundaries, shock hazard boundaries; required personal protective equipment (PPE) for all energized electrical equipment; and arc-flash and shock hazard warning labels.

2. Unless specified otherwise, the study shall include all electrical circuits from the electric utility power source(s) and emergency power source(s) to and including all electrical equipment and panelboards rated 208 V and greater.

3. Wherever possible, the proposed electrical equipment shall be designed, manufactured, and supplied to limit the potential arc-flash incident energy to 8 cal/sq cm or less (PPE Category 2). The firm performing the studies shall coordinate with Contractor and the electrical equipment manufacturers to assist in achieving this requirement.

D. Field Verification

1. Contractor shall provide the services of an independent testing firm performing the studies to field verify that all protective devices are set in accordance with the accepted short-circuit/coordination study requirements and recommendations. In addition, the firm shall verify that all arc- flash and stock hazard labels have been installed.

1.4. REFERENCE STANDARDS AND CODES

A. Unless specified otherwise, all calculations, analyses, and studies, including application of same to equipment and settings shall meet or exceed the applicable requirements of the following standards and codes:

B. Institute of Electrical and Electronics Engineers, Inc. (IEEE):

1. IEEE 141 — Recommended Practice for Electric Power Distribution for Industrial Plants

2. IEEE 142 — Recommended Practice for Grounding of Industrial and Commercial Power Systems

3. IEEE 241 — Recommended Practice for Electric Power Systems in Commercial Buildings

4. IEEE 242 — Recommended Practice for Protection and Coordination of Industrial and Commercial Power Systems

5. IEEE 399 — Recommended Practice for Industrial and Commercial Power System Analysis

6. IEEE 551 — Recommended Practice for Calculating Short-Circuit Currents in Industrial and Commercial Power Systems

7. IEEE 1015 — Recommended Practice for Applying Low-Voltage Circuit Breakers Used in Industrial and Commercial Power Systems

8. IEEE 1584 - Guide for Performing Arc-Flash Hazard Calculations.

C. American National Standards Institute (ANSI):

1. ANSI C37.010 — Standard Application Guide for AC High-Voltage Circuit Breakers Rated on a Symmetrical Current Basis

2. ANSI C37.13 — Standard for Low-Voltage AC Power Circuit Breakers Used in Enclosures

3. ANSI C37.41 — Standard Design Tests for High-Voltage Fuses, Fuse and Disconnecting Cutouts, Distribution Enclosed Single-Pole Air Switches, Fuse Disconnecting Switches, and Fuse Links and Accessories Used with These Devices.

4. ANSI C57.12.00 — Standard General Requirements for Liquid-Immersed Distribution, Power, and Regulating Transformers

D. Code of Federal Regulations:

1. CFR 29, Subpart R, Part 1910.269, Occupational Safety and Health Standards - Electric Power Generation, Transmission, and Distribution.

2. CFR 29, Subpart S, Part 1910.301 through 1910.399, Occupational Safety and Health Standards - Electrical.

E. The National Fire Protection Association (NFPA):

1. NFPA 70 - National Electrical Code, 2008 edition and NYC amendments (2011)

2. NFPA 70E — Standard for Electrical Safety in the Workplace

1.5. SUBMITTALS

A. Refer to DDC General Conditions Section 01 33 00 "Submittal Procedures."

B. Computer Software Information

1. Submit product literature/brochure for computer software to be utilized for the studies. Submit computer software statement of compliance with IEEE, ANSI, and NFPA 70E standards and requirements.

C. Qualification Information

1. Submit qualification information specified in Part 1.6 herein.

D. Utility Information

1. Submit letter from utility with available short circuit current value at the main service switchboard. As a minimum, the utility letter shall include the following: project address, service voltage and configuration, main service switchboard amperage, short circuit current (3-phase and phase-ground), 3-phase and phase- ground X/R ratios, service transformer kVA and impedance, and service conductor size, number, and length.

E. Study Results and Report

1. The results of the Short-Circuit and Protective Device Evaluation Study, Protective Device Coordination Study, and Arc-Flash Hazard Study shall be summarized in a well-organized, comprehensive report. The report shall address all study requirements specified in Part 2 herein. A sample outline for the report is provided below:

   a. Section 1 - Executive Summary

   b. Section 2 - Short-Circuit and Protective Device Evaluation Study

      i. Short-Circuit Analysis Objectives
      ii. System Modeling
      iii. Short-Circuit Results
      iv. Equipment, Material, and Protective Device Evaluation

   c. Section 3 - Protective Device Coordination Study

      i. General Description and Protection Philosophy
      ii. Codes and Standards
      iii. Coordination Objectives
      iv. Coordination Results
      v. Coordination Recommendations
      vi. Time-Current Characteristic Plots

   d. Section 4 - Recommended Protective Device Settings

   e. Section 5 - Short-Circuit Analysis Computer Reports

      i. Report Interpretation
      ii. Short-Circuit Input Data Report

iii. Short-Circuit Analysis Results Report - Utility Source
iv. Short-Circuit Analysis Results Report - Generator Source
v. Short-Circuit Analysis Results Report - Single-Phase

f. Section 6 - Arc-Flash Hazard Study

i. General Description
ii. Analysis Procedure
iii. Arc-Flash Analysis Results
iv. Arc-Flash Analysis Recommendations
v. Arc-Flash Labels and Location Drawings

g. Section 7 - Single Line Diagrams

i. Power System Study Diagram
ii. Reference Drawing Single Line Diagrams

2. Unless specified otherwise, Contractor shall provide all computer software project study files to the City of New York in electronic format. In addition, a copy of the computer analysis software viewer program shall be provided with the electronic project files, to allow the Commissioner to review all aspects of the project and print single line diagrams, arc-flash labels, etc.

E. Coordination of Studies and Equipment Submittals

1. The Short-Circuit and Protective Device Coordination Studies shall be submitted to the Commissioner prior to receiving final acceptance of the related equipment shop drawings and prior to equipment fabrication. If formal completion of the studies may cause delay in equipment fabrication and delivery, approval from the Commissioner may be obtained for preliminary submittal of sufficient study data to ensure that the proposed equipment ratings and protective device selection/characteristics will be satisfactory.

1.6. QUALIFICATIONS

A. The firm performing the specified studies shall be experienced in the application of computer software used for power system studies, and shall have performed studies of similar magnitude on electrical systems using similar equipment and devices.

B. The short-circuit, protective device coordination, and arc-flash hazard studies shall be conducted under the direct supervision and control of a Professional Electrical Engineer licensed in the State of New York skilled in performing and interpreting the power system studies. Each study report shall be signed and stamped by that Professional Electrical Engineer.

PART 2 - PRODUCTS

2.1. GENERAL REQUIREMENTS

A. Short-Circuit and Protective Device Evaluation Study, Protective Device Coordination Study, and Arc-Flash Hazard Study shall be performed by the same entity.

B. The studies shall be submitted prior to fabrication of any electrical distribution equipment. Written approval will be required prior to equipment fabrication.

C. The studies shall include all portions of the electrical system including the electric utility power source and emergency power sources, and contributions from inductive loads on low voltage (208V) distribution system.

D. All induction motors greater than 50 HP shall be included individually with associated starters and feeder impedance. Unless specified otherwise, all induction motors 50 HP or less and fed from the same bus may be grouped together.

E. Normal system connections and those which result in maximum fault conditions shall be adequately evaluated in the studies.

F. The studies shall be performed using analysis software. Software shall comply with all applicable IEEE, ANSI, and NFPA 70E standards and requirements.

2.2. DATA COLLECTION

A. Contractor shall be responsible to collect all data as required for the power system studies.

B. The firm performing the system studies shall furnish the Contractor with a listing of the required data and the Contractor shall expedite collection of the data to assure completion of the studies prior to final approval of the distribution equipment shop drawings and/or release of the equipment for manufacture.

C. As a minimum, the following input data shall be collected and tabulated:

1. Product data for overcurrent protective devices involved in overcurrent protective device coordination studies. Use equipment names/tags that are consistent with electrical distribution system diagrams, overcurrent protective device submittals, input and output data, and recommended device settings.

2. Minimum and maximum fault contribution, impedance, and X/R ratio of the electric power utility service transformer. Rating, type, and settings of the primary overcurrent protective device that protects the service transformer. Conductor data from the protective device to the service transformer. Contractor shall obtain the required electrical service information directly from the electric power utility. Contractor shall be responsible for all coordination and costs associated with obtaining the utility information.

3. Ampacity and interrupting rating in amperes RMS symmetrical for all switchboards, motor control centers, and panelboards.

4. Circuit breaker and fuse current ratings and types within each switchboard, motor control center, panelboard, variable frequency drive, and equipment control panel.

5. Manufacturer, frame size, interrupting rating in amperes RMS symmetrical, ampere or current sensor rating, long-time adjustment range, short-time adjustment range, and instantaneous adjustment range for circuit breakers.

6. Manufacturer and type, ampere-tap adjustment range, time-delay adjustment range, instantaneous attachment adjustment range, and current transformer ratio for overcurrent relays.

7. Time-current-characteristic curves of protective devices indicated to be coordinated.

8. Distribution system transformer characteristics, including primary protective device, magnetic inrush current, and overload capability.

9. Standby generator kVA, size, voltage, source impedance, and thermal- damage curve.

10. Conductors: conduit material, sizes of conductors, number of conductors per phase, conductor material, insulation, and length.

11. Motor horsepower and code letter designation according to NEMA MG 1. Motor full-load current, locked rotor current, service factor, starting time, type of start, and thermal-damage curve.

D. Contractor shall obtain required existing equipment data as necessary to satisfy the study requirements.

2.3. SINGLE LINE DIAGRAM

A. A single line diagram of the electrical distribution system shall be prepared in hard-copy and electronic-copy formats.

B. As a minimum, the single line diagram shall show the following:

1. All individual switchboard, motor control center, and panelboard equipment buses with voltage, bus ampere ratings, and short-circuit current ratings.

2. Circuit breaker and fuses with current ratings, amperes interrupting ratings, and types.

3. Motors labeled with horsepower and code letter designation according to NEMA MG 1.

4. Conductor and bus connections between the equipment.

5. Conductor sizes, number of conductors per phase, conductor material and insulation, conductor length, and conduit material.

6. Transformers labeled with size (kVA), voltage, configuration, impedance, and X/R ratio.

7. Generators labeled with size (kVA), voltage, and source impedance.

8. Transfer switches labeled with ampere rating and short-circuit current rating.

2.4. SHORT-CIRCUIT AND PROTECTIVE DEVICE EVALUATION STUDY

A. Use actual conductor impedances if known. If unknown, use typical conductor impedances based on IEEE Standard 141.

B. Transformer design impedances shall be used when test impedances are not available.

C. As a minimum, provide the following:

1. Calculation methods and assumptions
2. Selected base per unit quantities
3. Source impedance data, including electric power utility system and motor fault contribution characteristics
4. Single line diagram of the system being evaluated with available fault at each bus, and interrupting rating of devices noted
5. Results, conclusions, and recommendations.

D. Calculate short-circuit momentary and interrupting duties for a three-phase bolted fault at each:

1. Electric power utility's supply termination point
2. Incoming switchgear
3. Unit substation primary and secondary terminals
4. Low voltage switchgear and/or switchboard
5. Motor control center
6. Distribution panelboard
7. Branch circuit panelboard
8. Variable frequency drive
9. Standby generator and automatic transfer switch
10. Equipment control panels
11. Other significant locations throughout the system.

E. For grounded systems, provide a bolted line-to-ground fault current study for areas as defined for the three-phase bolted fault short-circuit study.

F. Equipment, Material, and Protective Device Evaluations:

1. Evaluate equipment and protective devices and compare to proposed short-circuit ratings.
2. Evaluate adequacy of switchgear, switchboard, motor control center, and panelboard bus bars/bracing to withstand short-circuit stresses.
3. Evaluate adequacy of transformer windings to withstand short-circuit stresses.
4. Evaluate conductors and busways for ability to withstand short-circuit heating.
5. Identify any existing circuit protective devices improperly rated for the calculated available fault current.
6. Tabulate all evaluation results.

2.5. PROTECTIVE DEVICE COORDINATION STUDY

A. Perform the protective device study using the approved computer software program. Utilize the results of the short-circuit analysis. Coordination study shall be performed in compliance with IEEE 399.

1. Model 1/2 cycle network (sub-transient network), 1.5 to 4 cycle network (transient), and 30 cycle network (steady-state network). Calculate 1/2 cycle, 1.5 to 4 cycle, and 30 cycle balanced and unbalanced faults for 3- phase, L-G, L-L, and L-L-G.
2. Calculate the maximum and minimum 1/2 cycle short-circuit currents.
3. Calculate the maximum and minimum interrupting duty (5 cycles to 2 seconds) short-circuit currents.
4. Calculate the maximum and minimum ground-fault currents.

B. Fault currents and time intervals shall comply with IEEE 241 recommendations.

C. Protect conductors against damage from fault currents according to Insulated Cable Engineers Association (ICEA) Publication P-32-382, ICEA P-45-482, and conductor melting curves in IEEE 242. Demonstrate that equipment withstands the maximum short-circuit current for a time equivalent to the tripping time of the primary relay protection or total clearing time of the fuse. To determine temperatures that damage insulation, use curves from cable manufacturers or from listed standards indicating conductor size and short-circuit current.

D. Protect transformers against damage from through-fault currents according to ANSI C57.109, IEEE C57.12.00, and IEEE 242.

E. Provide computer software generated time-current characteristic (TCC) plots of all overcurrent protective devices on log-log sheets graphically indicating the coordination for all of the key systems.

F. Perform a sequence of operation that evaluates, verifies, and confirms the operation and selectivity of the protective devices for various types of faults via normalized TCC plots and the single-line diagram. Provide adequate time margins between device characteristics such that selective operation is provided, while providing proper protection.

G. Establish settings and/or ratings of overcurrent protective devices to achieve selective coordination between devices. Graphically illustrate that adequate time separation exists between devices installed in series, including electric power utility's upstream devices. Prepare separate sets of plots for the switching schemes and for emergency periods where the power source is via the emergency standby generator(s).

H. On each TCC plot, include reference voltage, a complete title, and single line diagram with legend identifying the specific portion of the system covered.

I. Identify the device associated with each curve by device designation/tag, manufacturer, type, and function. Terminate the protective device characteristic curves at a point reflecting maximum symmetrical or asymmetrical fault current to which the device will be exposed.

J. The electric power utility's relay, fuse, or protective device shall be plotted with all load protective devices at the same voltage.

K. Transformer primary protective device, transformer magnetic inrush, transformer ANSI withstand points, secondary voltage fuse or circuit breaker and largest feeder fuse or circuit breaker shall be plotted at the secondary voltage.

L. Fuse curves shall include no damage, melting, and clearing curves as applicable.

M. Circuit breaker curves shall include complete operating bands, terminating with the appropriate available short-circuit current.

N. When the main circuit breaker is provided with an arc-flash reduction maintenance system to reduce the arc fault level, both settings shall be included in the study.

O. Low voltage circuit breakers with adjustable overcurrent protection shall have instantaneous, short delay, and long-time pick-up identified on the plot. Low voltage circuit breakers with ground fault protection shall have ground fault trip settings, ground fault ampere, and time delay settings identified on the plot. Sensor or monitor rating shall be stated for each circuit breaker. All regions of the circuit breaker curve shall be identified.

P. Feeder circuit breakers shall have the time-damage curve of the feeder conductors plotted to indicate protection of the conductor insulation at the total clearing time of the circuit breaker or fuse. This time-damage point shall be calculated for the specific parameters of conductor insulation used, with average 3 phase RMS asymmetrical amperes at 1/2 cycle calculated using actual resistance and reactance values of the source plus all motor contributions which exist at the load end of the feeder conductors. Conductor initial temperature and conductor maximum transient temperature for short-circuits, as recommended by ICEA, shall be indicated.

Q. The coordination plots shall include significant motor starting characteristics and large motor protective devices.

R. As a minimum, TCC coordination plots shall be provided for the following:

1. Electric power utility's overcurrent protective device
2. Medium voltage equipment overcurrent relays
3. Medium and low voltage fuses including manufacturer's minimum melt, total clearing, tolerance, and damage bands
4. Low voltage circuit breakers and fuses, including manufacturer's tolerance bands
5. Transformer full-load and 150, 400, or 600 percent currents, magnetizing inrush current, and ANSI through-fault protection curves
6. Conductor damage curves
7. Ground fault protective devices, as applicable
8. Pertinent motor starting characteristics and motor damage points. For motor control circuits, show motor control center full-load current plus symmetrical and asymmetrical of the largest motor starting current and time to ensure protective devices will not trip during major or group start operation.
9. Pertinent generator short-circuit decrement curve and generator damage point, where applicable. Provide phase and ground coordination of the generator protective devices. Obtain the required input information from the generator manufacturer and include the generator actual impedance value, time constants, and current boost data in the study. Do not use typical values for the generator.
10. Other system load protective devices, including branch circuits and feeder circuit breakers in each motor control center, and main circuit breaker in each branch panelboard.

S. A summary tabulation shall be provided listing the designation/tag, manufacturer, and type for all overcurrent and ground fault protective devices, and all recommended settings of each adjustable band included for each device.

T. Provide an evaluation of the degree of system protection and service continuity possible with the overcurrent devices supplied.

2.6. ARC-FLASH HAZARD STUDY

A. The arc-flash hazard study shall be performed according to the IEEE 1584 guidelines and equations presented in NFPA 70E-2015, Annex D. The analysis shall be performed in conjunction with the Short-Circuit and Protective Device Evaluation Study, and the Protective Device Coordination Study.

B. The flash-protection boundary and the incident energy shall be calculated at all equipment locations in the electrical distribution system where work could be performed on energized parts, including, but not limited to, the following: switchboards, motor control centers, panelboards, busway and splitters, and equipment control panels.

C. The Arc-Flash Hazard Study shall include all 208V locations. In addition, the Arc-Flash Hazard Study shall include all DC locations of 5OV or greater.

D. Safe working distances shall be based upon the calculated arc-flash boundary considering an incident energy of 1.2 cal/sq cm.

E. When appropriate, the short-circuit calculations and the clearing times of the overcurrent protective devices shall be retrieved from the short-circuit and protective device coordination study model. Ground overcurrent relays should not be taken into consideration when determining the clearing time when performing incident energy calculations.

F. The short-circuit calculations and the corresponding incident energy calculations for multiple system scenarios shall be compared, and the greatest incident energy shall be uniquely reported for each equipment location. Calculations shall be performed to represent the maximum and minimum contributions of fault current magnitude for all normal and emergency operating conditions. The minimum calculation shall assume that the electric power utility contribution is at a minimum and shall assume a minimum motor contribution (all motors off). Conversely, the maximum calculation shall assume a maximum contribution from the electric power utility and shall assume the maximum amount of motors to be operating under full-load conditions. Calculations shall take into consideration the parallel operation of synchronous generators with the electric power utility, where applicable.

G. The incident energy calculations shall consider the accumulation of energy over time when performing arc-flash calculations on buses with multiple sources. Iterative calculations shall take into account the changing current contributions, as the sources are interrupted or decremented with time. Fault contribution from motors and generators shall be decremented as follows:

1. Fault contribution from induction motors should not be considered beyond 3-5 cycles.

2. Fault contribution from synchronous motors and generators should be decayed to match the actual decrement of each as closely as possible (e.g. contributions from permanent magnet generators will typically decay from 10 per unit to 3 per unit after 10 cycles).

H. For each equipment location with a separately enclosed main device (where there is adequate separation between the line side terminals of the main protective device and the work location), calculations for incident energy and flash-protection boundary shall include both the line and load side of the main breaker.

I. When performing incident energy calculations on the line side of a main breaker (as required per above), the line side and load side contributions shall be included in the fault calculation.

J. Mis-coordination shall be checked amongst all devices within the branch containing the immediate protective device upstream of the calculation location and the calculation shall utilize the fastest device to compute the incident energy for the corresponding location.

K. Arc-flash calculations shall be based on actual overcurrent protective device clearing time. Maximum clearing time will be capped at 2 seconds based on IEEE 1584, Section B.1.2. Where it is not physically possible to move outside of the flash-protection boundary in less than 2 seconds during an arc-flash event, a maximum clearing time based on the specific location shall be utilized.

L. Determine incident energy and arc-flash PPE requirements for each equipment location. For main circuit breakers with arc-flash reduction maintenance systems, determine two (2) incident energies (one for normal duty and one for maintenance duty).

M. Calculate shock hazard approach boundaries (limited approach boundary and restricted approach boundary) for each equipment location.

N. Provide recommendations to reduce arc-flash hazard energy and exposure.

O. Coordinate with manufacturers/suppliers of the electrical equipment.

2.7. STUDY DATA

A. The results of all study calculations, analyses, evaluations, and determinations specified in Part 2 herein shall be presented in a detailed, comprehensive report. In addition, data from the computer software analyses shall be included in the study report along with data evaluation and recommendations. Computer analysis data, data evaluation, and recommendations shall include, but not be limited to, the following:

B. Study Input Data

1. Feeder input data including feeder type (cable or bus), size, length, number per phase, conduit type (magnetic or non-magnetic) and conductor material (copper or aluminum).

2. Transformer input data, including winding connections, secondary neutral-ground connection, primary and secondary voltage ratings, kVA rating, impedance, percent taps and phase shift.

3. Reactor data, including voltage rating, and impedance.

4. Generation contribution data, (synchronous generators and electric power utility), including short-circuit reactance (X"d), rated MVA, rated voltage, three-phase and single-line to ground contribution (for electric power utility sources) and X/R ratio.

5. Motor contribution data (induction motors and synchronous motors), including short-circuit reactance, rated horsepower or kVA, rated voltage, and X/R ratio.

C. Short-Circuit Study

1. Low Voltage Fault Report shall include a section for three-phase and unbalanced fault calculations and shall show the following information for each applicable location:
   a. Voltage (600V and less)
   b. Calculated fault current magnitude and angle
   c. Fault point X/R ratio

d. Equivalent impedance

D. Protective Device Coordinating Study:

1. Recommendations for Phase and Ground Relays:

a. Current transformer ratio
b. Current setting
c. Time setting
d. Instantaneous setting
e. Recommendations on improved relaying systems, if applicable.

2. Recommendations for Circuit Breakers:

a. Adjustable pickups and time delays (long time, short time, ground)
b. Adjustable time-current characteristic
c. Adjustable instantaneous pickup
d. Recommendations on improved trip systems, if applicable.

E. Arc-Flash Hazard Study:

1. Incident Energy Calculations:

a. Arcing fault magnitude
b. Protective device clearing time
c. Duration of arc
d. Incident energy

2. Arc-Flash Protection Boundary Calculations and Recommendations:

a. Arc-flash boundary
b. Shock hazard approach boundaries
c. Personal protective equipment
d. Recommendations for arc-flash energy reduction.

2.8. IMPLEMENTATION OF STUDY RESULTS

A. Prior to fabrication, Contractor shall coordinate the study results with the manufacturers and suppliers of electrical equipment to incorporate the recommendations and modifications therein.

2.9. ARC-FLASH AND SHOCK HAZARD LABELS

A. General

1. Labels shall be 4" x 6" thermal transfer type labels of UV resistant high adhesion polyester. Labels shall be machine printed, with no field markings.

2. Labels shall comply with the requirements of the NEC, NPFA 70E, and ANSI Z535.4.

3. All labels shall be based on recommended overcurrent protective device settings and shall be provided after the results of the analyses have been accepted by the Commissioner and after any system changes, upgrades or modifications have been incorporated into the system.

4. In general, the arc-flash labels shall be based on the maximum calculated incident energies for the worst case operating scenario. However, where arc-flash reduction maintenance systems are specified, provide two (2) sets of arc-flash labels (one for normal duty and one for maintenance duty).

5. The firm performing the Study shall provide all labels. Equipment elevations drawings showing the location of each label shall be prepared by the firm performing the Study.

6. For outdoor electrical panels with interior enclosures and outer NEMA 3R wrappers, labels shall be provided on both outer and inner doors, as follows:

   a. For incident energy levels less than 40 cal/sq cm, each outer door section shall be provided with a warning label stating "WARNING, ARC-FLASH AND SHOCK HAZARD, APPROPRIATE PPE REQUIRED". The label color scheme shall match the inner arc-flash warning label.

   b. For incident energy levels greater than 40 cal/sq cm, each outer door section shall be provided with a danger label stating "DANGER, ARC-FLASH AND SHOCK HAZARD, NO SAFE PPE EXISTS, ENERGIZED WORK PROHIBITED". The label color scheme shall match the inner arc-flash danger label.

   c. Inner doors shall be provided with arc-flash labels as specified in Parts B and C below.

7. Labels shall be provided for each switchboard, distribution panel, transfer switch (automatic or manual), motor control center, variable frequency drive, distribution panelboard, branch circuit panelboard, busway, enclosed circuit breaker and disconnect switch in a readily visible location in accordance with NEC and OSHA requirements.

8. Where incident energy levels vary across a panel line-up, such as a motor control center, a separate label shall be provided for each section or compartment with a different incident energy level. As a minimum, labels shall be installed every four feet.

B. Warning Labels

1. Warning labels shall be white with an orange stripe and black letters.

2. Warning labels shall include the following information:

   a. "WARNING, ARC-FLASH AND SHOCK HAZARDS, APPROPRIATE PPE REQUIRED".
   b. Arc-flash hazard boundary.
   c. Available incident energy (cal/sq cm) and working distance.
   d. Recommended (minimum) PPE from NFPA Table 70E H.3(b)
   e. Maximum available fault current (Isc).
   f. Shock hazard when cover is removed.
   g. Glove class.
   h. Limited approach distance.
   i. Restricted approach distance.
   j. Equipment description and location.

k. Protective device description.
l. Operating scenario
m. Firm identification (prepared by).
n. Label preparation date

C. Danger Labels

1. Danger labels shall be white with a red warning stripe and black letters. A sample danger label is presented at the end of this Section.

2. Danger labels shall include the following information:

a. "DANGER, ARC-FLASH AND SHOCK HAZARDS, ENERGIZED WORK PROHIBITED".
b. Arc-flash hazard boundary.
c. Available incident energy (cal/sq cm) and working distance.
d. No safe PPE exists — Do not work on equipment while energized.
e. Available fault current (Isc).
f. Shock hazard when cover is removed.
g. Glove class.
h. Limited approach distance.
i. Restricted approach distance.
j. Equipment description and location.
k. Protective device description.
l. Operating Scenario.
m. Firm identification (prepared by).
n. Label preparation date.

PART 3 - EXECUTION

3.1. EXECUTION REQUIREMENTS

A. Refer to DDC General Conditions for execution requirements.

3.2. PROTECTIVE DEVICE SELECTION AND SETTING

A. Field setting of the protective devices shall be performed as required to place the equipment in final operating condition. The settings shall be in accordance with the approved short-circuit study, protective device evaluation study, and protective device coordination study. Confirmation of protective device selection and performance of device field setting shall be witnessed and verified by the testing consultant performing electrical system testing or by the firm performing the studies.

B. Contractor shall set all relays, overcurrent devices and ground fault protection devices, and confirm selection of fuse overcurrent devices as follows:

1. Relays: Reset all adjustable relay settings from factory defaults settings to the settings recommended in the studies specified herein.

2. Circuit Breakers: Reset all adjustable trip settings from factory default settings to the settings recommended in the studies specified herein.

3. Ground Fault Protection Devices: Reset all adjustable device settings from the factory defaults settings to the settings recommended in the studies specified herein.

4. Fuses: Confirm that fuse types installed on the project are as recommended in the studies specified herein.

C. Necessary field adjustments of devices and minor modifications to equipment to accomplish conformance with the approved studies shall be performed at no additional cost to the City of New York.

D. Contractor shall verify the proper short-circuit duty and amperage rating of all protective devices and bussing. Equipment short-circuit duty and amperage ratings shall be in accordance with the Drawings and equipment specifications, and shall meet or exceed the ratings recommended in the studies specified herein.

3.3. ARC-FLASH AND SOCK HAZARD LABEL INSTALLATION

A. Affix arc-flash and shock hazard labels to all electrical equipment as required by NFPA 70 and NFPA 70E.

B. Install labels in accordance with the approved label location drawings and as specified herein.

3.4. FIELD REPORT

A. The firm witnessing the confirmation of protective device selection and performance of device field setting shall provide a detailed report showing that selections and settings of protective devices are in compliance with the studies and requirements specified herein. In addition, the report shall include a photographic record of all installed arc- flash labels, including locations. The report shall be submitted for acceptance as a submittal document.

END OF SECTION 260573

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PART I - GENERAL

1.1 RELATED DOCUMENTS

A. The following documents apply to all required work for the project: (1) the contract drawings, (2) the Specifications, (3) the General Conditions, (4) the Addendum and (5) the Contract (City of New York Standard Construction Contract).

1.2 SUMMARY

A. This section includes commissioning process requirements for Electrical systems, assemblies, and equipment.

B. Related Sections:

1. Refer to DDC General Conditions for commissioning process requirements.

1.3 DESCRIPTION

A. Commissioning: Commissioning is a systematic process of ensuring that all building systems, including the mechanical and electrical systems, have been installed in the prescribed manner, are functionally checked and capable of being operated and maintained to perform with the design intent and have documentation to support proper installation and operation. The Commissioning Agent (CxA) shall provide the City of New York with an unbiased, objective view of the system's installation, operation and performance. This process does not eliminate or reduce the responsibility of the Contractor to provide a complete design or installing Sub-Contractors to provide a finished product. Commissioning is intended to enhance the quality of each system installation, startup and transfer to beneficial use by the City of New York.

B. Commissioning during the construction phase is intended to achieve the following specific objectives, according to the Contract Documents:

1. Verify that applicable equipment and systems are installed according to the manufacturer's recommendations and to industry accepted minimum standards and that they receive adequate operational checkout by installing Sub-Contractors.
2. Verify and document proper performance of equipment and systems.
3. Verify that Operation & Maintenance documentation is complete and transferred to City of New York.
4. Verify that proper orientation program has been implemented for the City of New York service personnel.
5. Ensure that provisions are in place for a post occupancy review with O&M staff within 10 months after Substantial Completion.

C. The Commissioning process shall be a team effort and encompass, as well as coordinate, the traditionally separate functions of system documentation, system installation, equipment startup, control system calibration, testing, balancing and verification and performance checkouts.

D. The CxA will work closely with the construction team, cooperating on and coordinating all Cx activities with the City of New York, Contractor, Sub-Contractors, manufacturers and equipment suppliers.

E. The Cx process shall not reduce the responsibility of the Contractor to comply with the Contract Documents.

1.4 DEFINITIONS

A. Refer to DDC General Conditions for definitions.

1.5 SUBMITTALS

A. Refer to DDC General Conditions for CxA's role.

B. Refer to DDC General Conditions for specific submittal requirements. In addition, provide the following:

1. Certificates of readiness
2. Certificates of completion of installation, prestart, and startup activities.
3. O&M manuals
4. Field / factory Test reports

1.6 QUALITY ASSURANCE

A. Test Equipment Calibration Requirements: The Contractor will comply with test equipment manufacturer's calibration procedures and intervals. Recalibrate test instruments immediately after instruments have been repaired resulting from being dropped or damaged. Affix calibration tags to test instruments. Furnish calibration records to CxA upon request.

1.7 COORDINATION

A. Refer to DDC General Conditions for requirements pertaining to coordination during the commissioning process.

PART II - PRODUCTS

2.1 TEST EQUIPMENT

A. The Contractor shall ensure that the equipment and system perform startup, initial checkout and functional performance testing as outlined in the DDC General Conditions. For example, the Contractor shall ultimately be responsible for all standard testing equipment for the electrical systems and control systems in Division 26. A sufficient quantity of two-way radios shall be provided by the Contractor.

B. Special equipment, tools and instruments (specific to a piece of equipment and only available from vendor) required for testing shall be included in the price to the City of New York and left on site, except for stand-alone data logging equipment that may be used by the CxA.

C. Test equipment and software required by any equipment manufacturer for programming and/or start-up, whether specified or not, shall be provided by the manufacturer of the equipment. The Contractor shall ensure that the manufacturer provide the test equipment, demonstrate its use, and assist in the commissioning process as needed. Test equipment (and software) shall become the property of the City of New York upon completion of the commissioning process.

D. If required and necessary, data logging equipment and software required for testing will be provided by the CxA, but shall not become the property of the City of New York.

E. All testing equipment shall be of sufficient quality and accuracy to test and/or measure system performance with the tolerances specified in the Specifications.

PART III - EXECUTION

3.1 GENERAL DOCUMENTATION REQUIREMENTS

A. The Contractor shall cause the Sub-Contractor(s) to provide instruction responsibility to the CxA in preparing Installation Check Sheets for all commissioned components, equipment, and systems.

B. Red-lined Drawings:

1. The Contractor shall cause the Sub-Contractor(s) to verify all equipment, systems, instrumentation, wiring and components are shown correctly on red-lined drawings.
2. Preliminary red-lined drawings must be made available to the Commissioning Team for use prior to the start of Functional Performance Testing.
3. Changes, as a result of Functional Testing, must be incorporated into the final as-built drawings, which will be created from the red-lined drawings.
4. The Contractor will create the as-built drawings.

C. Operation and Maintenance Data:

1. The Contractor shall cause the Sub-Contractor to provide a copy of O&M literature within 45 days of each submittal acceptance for use during the commissioning process for all commissioned equipment and systems.
2. The CxA will review the O&M literature once for conformance to project requirements.
3. The CxA will receive a copy of the final approved O&M literature once corrections have been made by the Contractor.

D. Demonstration and Instruction:

1. The Contractor shall cause the Sub-Contractor to provide demonstration and operator's instruction as required by the contract documents.
2. A complete instruction plan and schedule must be submitted by the Contractor to the CxA four weeks (4) prior to any such event.
3. Agenda for each instruction session shall be submitted to the CxA at least one (1) week prior to the session.

4. The CxA shall be notified at least seventy-two (72) hours in advance of scheduled tests so that testing may be observed by the CxA. A copy of the test record shall be provided to the CxA and Commissioner.
5. Engage a Factory-authorized service representative to demonstrate City of New York service personnel to adjust, operate, and maintain specific equipment.
6. Instruct City of New York service personnel on procedures and schedules for starting and stopping, trouble shooting, servicing, and maintaining equipment.
7. Review and update data in O&M Manuals.

3.2 CONTRACTOR RESPONSIBILITIES FOR SUB-CONTRACTOR PERFORMANCE

A. The Contractor shall cause the specified Sub-Contractor to have the following instruction responsibilities in performing electrical System work: The commissioning responsibilities are as follows (all references apply to commissioned system and equipment only):

1. Perform commissioning tests as per the written procedures and at the direction of the CxA
2. Attend construction phase controls coordination meetings.
3. Participate in Electrical systems, assemblies, equipment, and component maintenance orientation and inspection as directed by the CxA.
4. Provide information requested by the CxA for final commissioning documentation.
5. Include requirements for submittal data, operation and maintenance data, and instruction in each purchase order or sub-contract written.
6. Prepare preliminary schedule for Electrical system orientations and inspections, operation and maintenance manual submissions, instruction sessions, equipment start-up and task completion for the Commissioner. Distribute preliminary schedule to commissioning team members.
7. Update schedule as required throughout the construction period.
8. During the startup and initial checkout process, execute the related portions of the prefunctional checklists for all commissioned equipment.
9. Perform all verification and functional performance tests in the presence of the CxA as required.
10. Provide measuring instruments and logging devices to record test data, and provide data acquisition equipment to record data for the complete range of testing for the required test period.
11. Gather operation and maintenance literature on all equipment, and assemble in binders as required by the specifications. Submit to CxA forty five (45) days after submittal acceptance.
12. Coordinate with the CxA to provide seventy-two (72) hour advance notice so that the witnessing of equipment and system start-up and testing can begin.
13. Notify the CxA a minimum of (2) weeks in advance for start of the testing work.
14. Participate in, and schedule vendors and respective Sub-Contractors to participate in the operator's orientation sessions.

15. Provide written notification to the CxA that the following work has been completed in accordance with the contract documents, and that the equipment, systems, and sub-system are operating as required.
    a. Electrical equipment including switchgear, panel boards, motor control centers, lighting, receptacles, and all other equipment furnished under this Division.
    b. Fire alarm system
    c. Lighting System
16. The Contractor shall ensure that the equipment suppliers documents the performance of their equipment.
17. The Contractor shall ensure equipment Suppliers perform the following tasks:
    a. Provide all requested submittal data, including detailed start-up procedures and specific responsibilities of the City of New York, to keep warranties in force.
    b. Assist in equipment testing per agreements.
    c. Provide information requested by CxA regarding equipment sequence of operation and testing procedures.
18. The Contractor shall attend the 10-month warranty walkthrough with the facility representative and the CxA.
19. Provide instruction of the City of New York service personnel using qualified personnel, as specified.
20. Refer to DDC General Conditions for additional responsibilities.

3.3 CxA's RESPONSIBILITIES

A. Refer to DDC General Conditions for CxA's Responsibilities.

3.4 TESTING PREPARATION

A. Certify in writing to the CxA that Electrical systems, subsystems, and equipment have been installed, meggered, calibrated, and started and are operating according to the Contract Documents.

B. Certify in writing to the CxA that Electrical instrumentation and control systems have been completed and calibrated, that they are operating according to the Contract Documents, and that pretest set points have been recorded.

C. Certify in writing that testing procedures have been completed and that testing reports have been submitted, discrepancies corrected, and corrective work approved.

D. Set systems, subsystems, and equipment into operating mode to be tested (e.g., normal shutdown, normal auto position, normal manual position, unoccupied cycle, emergency power, and alarm conditions).

E. Inspect and verify the position of each device and interlock identified on checklists.

F. Check safety cutouts, alarms, and interlocks with smoke control and life-safety systems during each mode of operation.

G. Testing Instrumentation: Install measuring instruments and logging devices to record test data as directed by the CxA.

3.5 GENERAL TESTING REQUIREMENTS

A. Provide technicians, instrumentation, and tools to perform commissioning test at the direction of the CxA.

B. Scope of Electrical testing shall include the entire Electrical installation, from the incoming power equipment throughout the distribution system. Testing shall include measuring, but not limited to resistance, voltage, and amperage of system(s) and devices.

C. Test all operating modes, interlocks, control responses, and responses to abnormal or emergency conditions, and verify proper response of building automation system controllers and sensors.

D. The Contractor and other Sub-Contractors, including trade performing fire alarm work shall prepare detailed testing plans, procedures, and checklists for Electrical systems, subsystems, and equipment with guidance from CxA.

E. Tests will be performed using design conditions whenever possible.

F. Simulated conditions may need to be imposed using an artificial load when it is not practical to test under design conditions. Before simulating conditions, calibrate testing instruments. Provide equipment to simulate loads. Set simulated conditions and document simulated conditions and methods of simulation. After tests, return settings to normal operating conditions.

G. The CxA may direct that set points be altered when simulating conditions is not practical.

H. If tests cannot be completed because of a deficiency outside the scope of the Electrical system, document the deficiency and report it to the Commissioner. After deficiencies are resolved, reschedule tests.

I. If the testing plan indicates specific seasonal testing, complete appropriate initial performance tests and documentation and schedule seasonal tests.

3.6 GENERAL REQUIREMENT FOR PV SYSTEM

A. PV System is defined as all components required for a complete installation per project specifications, (Photovoltaic Panels, Panel Mounting Racks, Inverters, Inverter Interfaces, Disconnects, Isolation Transformers, Safeties, Meters, Alarms, Displays, Wiring, Conduit, etc.)

B. Verify that PV System was constructed, shipped and installed with all options specified.

C. Provide a complete list of nameplate data and serial number(s) for all PV System components.

D. Document dates, times, operating conditions and names of parties involved with any tests performed.

E. Each test form shall be reviewed and signed by the Contractor. The Contractor has the responsibility to inform the City of New York and CxA if the test is identified to be witnessed.

F. The Contractor shall document procedures, forms and submissions required to initiate & maintain manufacturer's warranty.

G. The Contractor shall provide copies of all applicable Operation & Maintenance instructions.

H. List all rejected items, failed tests, abnormalities observed or remedial action required by the Commissioner that were not completely rectified during construction punchlist process. After deficiencies are resolved, reschedule tests.

I. Refer to DDC General Conditions for additional contract and responsibilities.

3.7 ELECTRICAL SYSTEMS, SUBSYSTEMS, AND EQUIPMENT TESTING PROCEDURES

A. Equipment Testing and Acceptance Procedures: Testing requirements are specified in Division 26. Provide submittals, test data, inspector record, infrared camera and certifications to the CxA.

B. Electrical Instrumentation and Control System Testing: Field testing plans and testing requirements are specified in Division 26. Assist the CxA with preparation of testing plans.

C. Fire Detection and Alarm System Testing: The Contractor shall provide technicians, instrumentation, tools and equipment to test performance of designated systems and devices at the direction of the CxA. The CxA shall determine the sequence of testing and testing procedures for each equipment item and pipe section to be tested.

D. Electrical Distribution System Testing: The Contractor shall provide technicians, load banks, infrared cameras, instrumentation, tools and equipment to test performance of designated systems and devices at the direction of the CxA. The CxA shall determine the sequence of testing and testing procedures for each equipment item and pipe section to be tested

E. Variable Frequency Drive System Testing: The Contractor to prepare a variable frequency drive system testing plan to include tuning to minimize vibration. The Contractor to coordinate witnessing of testing with CxA.

F. Vibration and Sound Tests: The Contractor shall provide technicians, instrumentation, tools, and equipment to test performance of vibration isolation and seismic controls.

G. The work included in the commissioning process involves a complete and thorough evaluation of the operation and performance of all components, systems and sub-systems. The scope of commissioning work shall include but not limited to the following equipment and systems:

1. Electrical Main Switchboards and Transformers
2. Electrical Distribution system and panels.
3. Lighting and Lighting Controls
4. Fire Alarm Systems
5. Generators
6. ATS
7. PV Systems
8. Solar Hot Water Heaters
9. Pull the Plug Testing

3.8 PV SYSTEM AND EQUIPMENT FOR TESTING PROCEDURES

A. The Contractor shall ensure PV Sub-Contractor perform the following tasks:

1. Confirm wiring has been completed and protection devices, (fuses, heaters, breakers, etc.), have been installed to meet applicable specifications for all PV System components installed.
2. Verify all disconnect and/or H-O-A switches have been installed and tested.
3. Ensure all pilot lights, control switches, touchpads and operating displays are fully functional.
4. Document that unit has been programmed for the specific type of installation outlined in specifications.
5. Verify PV System failure modes, (Power failure, Over current, Under voltage, etc.), have been reviewed with the Commissioner to ensure they meet facility Standard Operating Procedures.
6. Check and document that all PV System start-up, transfer to grid, transfer from grid, shutdown and failure modes have been tested.
7. If applicable, document that all remote monitoring or EMCS network interfaces with PV System operating parameters, faults or alarms have been tested and calibrated.
8. If applicable, enable password protection of PV System programming and confirm password matrix of access levels and privileges has been approved and implemented per the City of New York's requirement.
9. Provide list of all PV System programming parameters and settings.
10. Any non-permanent or disposable batteries have been installed and tested and all battery locations, types, and recommended replacement intervals have been documented.
11. Document that all factory recommended start-up and check-out procedures have been completed.
12. Measure and document both DC open circuit voltage (Voc), short circuit current (Isc), and peak power (Pp), and AC voltage, frequency, amperage, and power factor at multiple sunlight and temperature conditions to establish an operating baseline and ensure they are within manufacturer's specifications. Ensure that factory performance test results of all modules have been received and properly recorded.
13. If applicable, document monitoring of PV System through dial-up or Internet connection has been completed and tested with lists of all phone numbers, modem settings, IP addresses, passwords, etc.
14. Confirm layout, orientation and slope/tilt of PV Panel Modules & Grid System match specifications.
15. Ensure all PV System component locations are not subject to temperatures beyond manufacturer's published operating limits.
16. Check that adequate clearances exist for cooling air and routine service of all PV System components.
17. Verify locations of electronic enclosures are not subject to excessive moisture, spray, or dirt.

18. Make sure all exterior enclosure penetrations are watertight and/or do not void weather ratings.
19. Confirm equipment, component, and device labels, tags or signs have been installed per specifications.
20. Ensure that mounting hardware does not subject modules to physical stress, i.e. check that structural elements are straight and not twisted.
21. Perform visual inspection of all modules to check for cracked cells.
22. Check the location and orientation of all sensors, (anemometers, air temperature, PV cell temp, pyranometer, etc.) to ensure they are installed per manufacturer's instructions and will not experience interference from adjacent surfaces or structures.
23. Document calibration of all sensors through full range of operating conditions

3.9 SEASONAL TESTING

A. Refer to DDC General Conditions for requirements pertaining to seasonal testing.

3.10 OPERATION AND MAINTENANCE MANUALS

A. The Operation and Maintenance Manuals shall conform to Contract Documents requirements.

B. Refer the DDC General Conditions for the requirements for the Contractor and CxA roles in the Operation and Maintenance Manual contribution, review, and approval process.

3.11 INSTRUCTION OF FACILTY PERSONNEL

A. Refer to DDC General Conditions for requirements pertaining to instruction.

B. The Contractor shall have the following instruction responsibilities:

1. Provide the CxA with an instruction plan four weeks before the planned instruction.
2. Provide the City of New York service personnel with comprehensive instruction in the understanding of the systems and the operation and maintenance of each major piece of commissioned electrical equipment or system.
3. Instruction shall be recorded by the CxA and start with classroom sessions, if necessary, followed by hands on instruction on each piece of equipment, which shall illustrate the various modes of operation, including startup, shutdown, fire/smoke alarm, power failure, etc.
4. During any demonstration, should the system fail to perform in accordance with the requirements of the O&M manual or sequence of operations, the system will be repaired or adjusted as necessary and the demonstration repeated.
5. The appropriate trade or manufacturer's representative shall provide the instructions on each major piece of equipment. This person may be the start-up technician for the piece of equipment, the installing Sub-Contractor or manufacturer's representative. Practical building operating expertise as well as in-depth knowledge of all modes of operation of the specific piece of equipment is required. More than one party may be required to execute the instruction.

6. The instruction sessions shall follow the outline in the Table of Contents of the operation and maintenance manual and illustrate whenever possible the use of the O&M manuals for reference. Instruction shall include but not limited to:
   a. Use the printed installation, operation and maintenance instruction material included in the O&M manuals.
   b. Include a review of the written O&M instructions emphasizing safe and proper operating requirements, preventative maintenance, special tools needed and spare parts inventory suggestions. The instruction shall include start-up, operation in all modes possible, shut-down, seasonal changeover and any emergency procedures.
   c. Discuss relevant health and safety issues and concerns.
   d. Discuss warranties and guarantees.
   e. Cover common troubleshooting problems and solutions.
   f. Explain information included in the O&M manuals and the location of all plans and manuals in the facility.
   g. Discuss any peculiarities of equipment installation or operation.
7. Hands-on instruction shall include start-up, operation in all modes possible, including manual, shut-down and any emergency procedures and preventative maintenance of all pieces of equipment.
8. The Contractor shall fully explain and demonstrate the operation, function and overrides of any local packaged controls, not controlled by the central control system.
9. Instruction shall occur after functional testing is complete, unless approved otherwise by the Commissioner.

END OF SECTION 26 08 00

SECTION 260923
Lighting Control Devices

PART 1 - GENERAL

1.1. RELATED DOCUMENTS

A. The following documents apply to all required work for the Project: (1) the Contract Drawings, (2) the Specifications, (3) the General Conditions, (4) the Addendum and (5) the Contract (City of New York Standard Construction Contract).

B. LEED / Environmentally Preferable Purchase (EPP) General Requirements:

1. Refer to DDC General Conditions and the Addendum to the General Conditions.
2. LEED requirements apply to all Phase II work with the exception of the Existing Building scope. EPP requirements apply to the project's Existing Building scope only

1.2. SUMMARY

A. This Section includes the following lighting control devices:

1. Time switches.
2. Outdoor and indoor photoelectric switches.
3. Indoor occupancy sensors.
4. Outdoor motion sensors.
5. Lighting contactors.
6. Emergency shunt relays.

B. Related Sections include the following:

1. Section 262726 "Wiring Devices" for wall-box dimmers, wall-switch occupancy sensors, and manual light switches.

1.3. DEFINITIONS

A. LED: Light-emitting diode.

B. PIR: Passive infrared.

1.4. SUBMITTALS

A. Refer to DDC General Conditions Section 01 33 00 "Submittal Procedures."

B. Product Data: For each type of product indicated.

C. Shop Drawings: Show installation details for occupancy and light-level sensors.

1. Interconnection diagrams showing field-installed wiring.

D. Field quality-control test reports.

E. Operation and Maintenance Data: For each type of product to include in emergency, operation, and maintenance manuals.

1.5. QUALITY ASSURANCE

A. Refer to DDC General Conditions Section 01 40 00 "Quality Requirements."

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to NYC Department of Buildings, and marked for intended use.

1.6. COORDINATION

A. Coordinate layout and installation of ceiling-mounted devices with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, smoke detectors, fire-suppression system, and partition assemblies.

PART 2 - PRODUCTS

2.1. TIME SWITCHES

A. Manufacturers: Subject to compliance with requirements, provide:

1. Wattstopper,Inc
2. Area Lighting Research, Inc.; Tyco Electronics.
3. Leviton Mfg. Company Inc.
4. Lightolier Controls; a Genlyte Company.
5. Lithonia Lighting; Acuity Lighting Group, Inc.
6. Square D; Schneider Electric.
7. TORK.
8. Philips Lighting Controls.
9. Or Approved Equal

B. Electronic Time Switches: Electronic, solid-state programmable units with alphanumeric display; complying with UL 917.

1. Contact Configuration: DPST.
2. Contact Rating: 20-A ballast load, 120/240-V ac.
3. Programs: 20 channels; each channel shall be individually programmable with 8 on-off set points on a 24-hour schedule.
4. Circuitry: Allow connection of a photoelectric relay as substitute for on-off function of a program on selected channels.
5. Astronomic Time: Selected channels.
6. Battery Backup: For schedules and time clock.

2.2. OUTDOOR PHOTOELECTRIC SWITCHES

A. Manufactures: Subject to compliance with requirements, provide:

1. Wattstopper, Inc.
2. Lithonia Lighting; Acuity Lighting Group, Inc.
3. Square D; Schneider Electric.
4. TORK.
5. Touch-Plate, Inc.
6. Or Approved Equal

B. Description: Solid state, with SPST, DPST dry contacts rated for 1800-VA tungsten or 1000-VA inductive, to operate connected relay, contactor coils, or microprocessor input; complying with UL 773A.

1. Light-Level Monitoring Range: 1.5 to 10 fc (16.14 to 108 lx), with an adjustment for turn-on and turn-off levels within that range, and a directional lens in front of photocell to prevent fixed light sources from causing turn-off.
2. Time Delay: 15-second minimum, to prevent false operation.
3. Surge Protection: Metal-oxide varistor, complying with IEEE C62.41.1, IEEE C62.41.2, and IEEE 62.45 for Category A1 locations.
4. Mounting: Twist lock complying with IEEE C136.10, with base-and-stem mounting or stem-and-swivel mounting accessories as required to direct sensor to the north sky exposure.

C. Description: Solid state, with SPST,DPST dry contacts rated for 1800 VA to operate connected load, relay, or contactor coils; complying with UL 773.

1. Light-Level Monitoring Range: 1.5 to 10 fc (16.14 to 108 lx), with an adjustment for turn-on and turn-off levels within that range.
2. Time Delay: 30-second minimum, to prevent false operation.
3. Lightning Arrester: Air-gap type.
4. Mounting: Twist lock complying with IEEE C136.10, with base.

2.3. INDOOR OCCUPANCY SENSORS

A. Manufactures: Subject to compliance with requirements, provide:

1. Wattstopper, Inc.
2. Hubbell Lighting.
3. Leviton Mfg. Company Inc.
4. Lithonia Lighting; Acuity Lighting Group, Inc.
5. TORK.
6. Philips Lighting Controls.
7. Or Approved Equal.

B. General Description: Wall- or ceiling-mounting, solid-state units with a separate relay unit.

1. Operation: Unless otherwise indicated, turn lights on when covered area is occupied and off when unoccupied; with a time delay for turning lights off, adjustable over a minimum range of 1 to 15 minutes.

2. Sensor Output: Contacts rated to operate the connected relay, complying with UL 773A. Sensor shall be powered from the relay unit.
3. Relay Unit: Dry contacts rated for 20-A ballast load at 120- V ac, for 13-A tungsten at 120-V ac, and for 1 hp at 120-V ac. Power supply to sensor shall be 24-V dc, 150-mA, Class 2 power source as defined by NFPA 70.
4. Mounting:

   a. Sensor: Suitable for mounting in any position on a standard outlet box.
   b. Relay: Externally mounted through a 1/2-inch (13-mm) knockout in a standard electrical enclosure.
   c. Time-Delay and Sensitivity Adjustments: Recessed and concealed behind hinged door.

5. Indicator: LED, to show when motion is being detected during testing and normal operation of the sensor.
6. Bypass Switch: Override the on function in case of sensor failure.
7. Automatic Light-Level Sensor: Adjustable from 2 to 200 fc (21.5 to 2152 lx); keep lighting off when selected lighting level is present.

C. Dual-Technology Type: Ceiling mounting; detect occupancy by using a combination of PIR and ultrasonic detection methods in area of coverage. Particular technology or combination of technologies that controls on-off functions shall be selectable in the field by operating controls on unit.

1. Sensitivity Adjustment: Separate for each sensing technology.
2. Detector Sensitivity: Detect occurrences of 6-inch- (150-mm-) minimum movement of any portion of a human body that presents a target of not less than 36 sq. in. (232 sq. cm), and detect a person of average size and weight moving not less than 12 inches (305 mm) in either a horizontal or a vertical manner at an approximate speed of 12 inches/s (305 mm/s).
3. Detection Coverage (Standard Room): Detect occupancy anywhere within a circular area of 1000 sq. ft. (93 sq. m) when mounted on a 96-inch- (2440-mm-) high ceiling.

2.4. LIGHTING CONTACTORS

A. Manufactures: Subject to compliance with requirements, provide:

1. Wattstopper, Inc.
2. ASCO Power Technologies, LP; a division of Emerson Electric Co.
3. Eaton Electrical Inc.; Cutler-Hammer Products.
4. GE Industrial Systems; Total Lighting Control.
5. Hubbell Lighting.
6. Lithonia Lighting; Acuity Lighting Group, Inc.
7. Square D; Schneider Electric.
8. TORK.
9. Or Approved Equal.

B. Description: Electrically operated and mechanically held, combination type with fusible switch and non-fused disconnect, complying with NEMA ICS 2 and UL 508.

1. Current Rating for Switching: Listing or rating consistent with type of load served, including tungsten filament, inductive, and high-inrush ballast (ballast with 15 percent or less total harmonic distortion of normal load current).
2. Fault Current Withstand Rating: Equal to or exceeding the available fault current at the point of installation.
3. Enclosure: Comply with NEMA 250.
4. Provide with control and pilot devices as scheduled, matching the NEMA type specified for the enclosure.

2.5. CONDUCTORS AND CABLES

A. Power Wiring to Supply Side of Remote-Control Power Sources: Not smaller than No. 12 AWG. Comply with requirements in Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

B. Class 1 Control Cable: Multiconductor cable with stranded-copper conductors not smaller than No. 14 AWG. Comply with requirements in Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

PART 3 - EXECUTION

3.1. EXECUTION REQUIREMENTS

A. Refer to DDC General Conditions for execution requirements.

3.2. SENSOR INSTALLATION

A. Install and aim sensors in locations to achieve not less than 90 percent coverage of areas indicated. Do not exceed coverage limits specified in manufacturer's written instructions.

3.3. CONTACTOR INSTALLATION

A. A. Mount electrically held lighting contactors with elastomeric isolator pads, to eliminate structure-borne vibration, unless contactors are installed in an enclosure with factory-installed vibration isolators.

3.4. WIRING INSTALLATION

A. Wiring Method: Comply with Section 260519 "Low-Voltage Electrical Power Conductors and Cables." Minimum conduit size shall be ¾" conduit.

B. Wiring within Enclosures: Comply with NECA 1. Separate power-limited and nonpower-limited conductors according to conductor manufacturer's written instructions.

C. Size conductors according to lighting control device manufacturer's written instructions, unless otherwise indicated.

D. Splices, Taps, and Terminations: Make connections only on numbered terminal strips in junction, pull, and outlet boxes; terminal cabinets; and equipment enclosures.

3.5. IDENTIFICATION

A. Identify components and power and control wiring according to Section 260553 "Identification for Electrical Systems."

1. Identify controlled circuits in lighting contactors.
2. Identify circuits or luminaries controlled by photoelectric and occupancy sensors at each sensor.

B. Label time switches and contactors with a unique designation.

3.6. FIELD QUALITY CONTROL

A. Perform the following field tests and inspections and prepare test reports:

1. After installing time switches and sensors, and after electrical circuitry has been energized, adjust and test for compliance with requirements.
2. Operational Test: Verify operation of each lighting control device, and adjust time delays.

B. Lighting control devices that fail tests and inspections are defective work.

3.7. ADJUSTING

A. Occupancy Adjustments: When requested within 12 months of date of Substantial Completion, provide on-site assistance in adjusting sensors to suit occupied conditions. Provide up to two visits to Project during other-than-normal occupancy hours for this purpose.

3.8. DEMONSTRATION

A. Coordinate demonstration of products specified in this Section.

B. Engage a factory-authorized service representative to instruct building's maintenance personnel to adjust, operate, and maintain lighting control devices.

END OF SECTION 260923

SECTION 26 09 33
Distributed Lighting Control System

PART I – GENERAL

1.1 RELATED DOCUMENTS

A. The following documents apply to all required work for the Project: (1) the Contract Drawings, (2) the Specifications, (3) the General Conditions, (4) the Addendum and (5) the Contract [City of New York Standard Construction Contract].
B. LEED / Environmentally Preferable Purchase (EPP) General Requirements:
   1. Refer to DDC General Conditions and the Addendum to the General Conditions
   2. LEED requirements apply to all Phase II work with the exception of the Existing Building scope. EPP requirements apply to the project's Existing Building scope only.

1.2 SUMMARY

A. Section Includes:
   1. Digital Lighting Controls
   2. Relay Panels
   3. Emergency Lighting Control (if applicable)
B. Related Sections:
   1. Section 262726 - Wiring Devices: Receptacles
   2. Section 265113 – Architectural Luminaires, Lamps, and Ballasts.
   3. Electrical Sections, including wiring devices, apply to the work of this Section.
C. Control Intent – Control Intent includes, but is not limited to:
   1. Defaults and initial calibration settings for such items as time delay, sensitivity, fade rates, etc.
   2. Initial sensor and switching zones
   3. Initial time switch settings
   4. Task lighting and receptacle controls

1.3 REFERENCES

A. Building Automation and Controls Networks (BACnet)
B. Digital Lighting Management (DLM)
C. American National Standards Institute/Institute of Electrical and Electronic Engineers (ANSI/IEEE)
D. Underwriter Laboratories of Canada (ULC)
E. International Electrotechnical Commission (IEC)
F. International Organization for Standardization (ISO)
G. National Electrical Manufacturers Association (NEMA)
H. WD1 (R2005) - General Color Requirements for Wiring Devices.
   Underwriters Laboratories, Inc. (UL)
   1. 20 – Plug Load Controls
   2. 508– Industrial Controls
   3. 916 – Energy Management Equipment.
   4. 924 – Emergency Lighting

1.4 SYSTEM DESCRIPTION & OPERATION

A. The Lighting Control and Automation system as defined under this section covers the following equipment:
1. Digital Occupancy Sensors – Self-configuring, digitally addressable and calibrated occupancy sensors with LCD display and two-way active infrared (IR) communications.
2. Digital Switches – Self-configuring, digitally addressable pushbutton on/off, dimming, and scene switches with two-way active infrared (IR) communications.
3. Handheld remotes for personal control – One-button dimming, two-button on/off, or five-button scene remotes provide control using infrared communications. Remote may be configured in the field to control selected loads or scenes without special tools.
4. Digital Daylighting Sensors – Single-zone closed loop, multi-zone open loop and single-zone dual-loop daylighting sensors with two-way active infrared (IR) communications can provide switching, bi-level, tri-level or dimming control for daylight harvesting.
5. Digital Room Controllers – Self-configuring, digitally addressable one, two or three relay plenum-rated controllers for on/off control. Selected models include 0-10 volt or line voltage forward phase control dimming outputs and integral current monitoring capabilities.
6. Digital Plug-Load Controllers – Self-configuring, digitally addressable, single relay, plenum-rated application-specific controllers. Selected models include integral current monitoring capabilities.
7. Configuration Tools – Handheld remote for room configuration and relay panel programming provides two way infrared (IR) communications to digital devices and allows complete configuration and reconfiguration of the device / room from up to 30 feet away. Unit to have Organic LED display, simple pushbutton interface, and allow bi-directional communication of room variables and occupancy sensor settings. Computer software also customizes room settings.
8. Digital Lighting Management (DLM) local network – Free topology, plug-in wiring system (Cat 5e) for power and data to room devices.
9. Digital Lighting Management (DLM) segment network – Linear topology, BACnet MS/TP network (1.5 twisted pair, shielded,) to connect multiple DLM local networks for centralized control
10. Network Bridge – provides BACnet MS/TP-compliant digital networked communication between rooms, panels and the Segment Manager or building automation system (BAS) and automatically creates BACnet objects representative of connected devices.
11. Segment Manager – provides web browser-based user interface for system control, scheduling, power monitoring, room device parameter administration and reporting.
12. Programming and Configuration software – Optional PC-native application capable of accessing DLM control parameters within a room, for the local network, via a USB adapter, or globally, for many segment networks simultaneously, via BACnet/IP communication.
13. Digital Lighting Management Relay Panel – provides up to 8, 24, or 48 mechanically latching relays. Relays include a manual override and a single push-on connector for easy installation or removal from the panel. Panel accepts program changes from handheld configuration tool for date and time, location, holidays, event scheduling, button binding and group programming. Provides BACnet MS/TP-compliant digital networked communication between other lighting controls and/or building automation system (BAS).
14. Digital Zone Controller. Accepts program changes from handheld configuration tool for date and time, location, holidays, event scheduling, button binding and group programming. Provides BACnet MS/TP-compliant digital networked communication between other lighting controls and/or building automation system (BAS).

15. Emergency Lighting Control Unit (ELCU) – allows a standard lighting control device to control emergency lighting in conjunction with normal lighting in any area within a building

1.5 LIGHTING CONTROL APPLICATIONS AND PROGRAMS

A. Provide a minimum application of lighting controls as follows:
   1. Space Control Requirements – Provide occupancy/vacancy sensors with Manual- or Partial-ON functionality in all spaces except toilet rooms, storerooms, library stacks, or other applications where hands-free operation is desirable and Automatic-ON occupancy sensors are more appropriate. Provide Manual-ON occupancy/vacancy sensors for any enclosed office, conference room, meeting room, open plan system and instructing room. For spaces with multiple occupants, or where line-of-sight may be obscured, provide ceiling- or corner-mounted sensors and Manual-ON switches.
   2. Bi-Level Lighting – Provide multi-level controls in all spaces except toilet rooms, storerooms, library stacks, or applications where variable dimming is used.
   3. Task Lighting / Plug Loads – Provide automatic shut off of non-essential plug loads and task lighting in all spaces except toilet rooms and storerooms. Provide Automatic-ON of plug loads whenever spaces are occupied. For spaces with multiple occupants a single shut off consistent with the overhead lighting may be used for the area.
   4. Daylit Areas – Provide daylight-responsive automatic control in all spaces, conditioned or unconditioned, where daylight contribution is available:
      a. All luminaires within code-defined daylight zones shall be controlled separately from luminaires outside of daylit zones.
      b. Daytime setpoints for total ambient illumination, combined daylight and electric light levels that initiate dimming shall be programmed.
      c. Multiple-leveled switched daylight harvesting controls may be utilized for areas marked on drawings.
      d. Provide smooth and continuous daylight dimming for areas marked on drawings. Daylighting control system may be designed to turn off electric lighting when daylight is at or above required lighting levels, only if system functions to turn lamps back on at dimmed level, rather than turning full-on prior to dimming.

B. Emergency Egress (Determined by Commissioner)
   1. Luminaires connected to the emergency system shall be connected to the adjacent zone and seamlessly controlled (dimmed or switched) along with the adjacent luminaires.
   2. Night lights (24-hour emergency fixtures) shall be strategically placed in public circulation areas parking garage, and stairs.

C. Typical Private Offices and Open Offices
   1. Open Offices shall be controlled via a bi-level dimmer switch with four preset buttons (on, med, low, off) plus two/raise lower dimming buttons. When entering the open offices, the lights will turn partially on to 50% of the lighting power and turn off automatically after 20 minutes when no occupancy has been detected via a ceiling mounted occupancy sensor.
   2. Private Office 250 sq/ft or more shall have a bi-level dimmer switch with four preset buttons (on, med, low, off) plus two/raise lower dimming buttons. During working hours, when entering the space, the the lights shall automatically turn on to a preset 50% via the bi-level switch, with the ability to dim the lights up or down as desired. When vacant, a ceiling mounted occupancy sensor shall turn the lights off automatically after 20 minutes of no occupancy.
   3. Private Office 250 sq/ft or less shall have a bi-level dimmer switch with four preset buttons (on, med, low, off) plus two/raise lower dimming buttons. During working hours, when entering the space, the occupant shall manually turn the lights on to a preset 50% via the bi-level switch, with the ability to

dim the lights up or down as desired. When vacant, a wall mounted vacancy sensor shall turn the lights off automatically after 20 minutes of no occupancy.

4. Supplemental task lighting with individual control for each user shall be added for additional flexibility and to allow users to boost illumination if and where desired.

D. Lunch/Breakroom
   1. Fixtures shall be dimmable. These spaces shall be controlled via a bi-level dimmer switch with four preset buttons (on, med, low, off) plus two/raise lower dimming buttons and a ceiling-mounted occupancy sensor. All undercabinet lighting shall be controlled via an integral motion sensor.
   2. During working hours, when entering the space, lights shall automatically turn ON to a preset 50% for energy conservation, with the ability to dim the lights up or down as desired, via a bi-level dimmer switch. When vacant, the occupancy sensor shall automatically turn the lights OFF after a predetermined time as required by code.
   3. Per code, fixtures located within the "daylight zones" shall be zoned separately from the ambient lighting in the space, in each cardinal direction (i.e. north, south, east and west). The daylight zone shall be controlled via automatic daylight controls and photosensors. All spaces with a connected load lower than 150W shall be exempt from automatic daylight controls.

E. Typical Meeting Room, Muster Area
   1. Fixtures shall be dimmable. These spaces shall be controlled via bi-level dimmer switch with four preset buttons (on, med, low, off) plus two/raise lower dimming buttons and a ceiling occupancy sensor.
   2. During working hours, when entering the space, lights shall automatically turn ON to a preset 50% for energy conservation, with the ability to dim the lights up or down as desired, via a bi-level dimmer switch. When vacant, the occupancy sensor shall automatically turn the lights OFF 20 minutes.
   3. Per code, fixtures located in the "daylight zones" shall be zoned separately from the ambient lighting in the space. In each cardinal direction (i.e. north, south, east and west). The daylight zone shall be controlled via automatic daylight controls and photosensors. All spaces with a connected load lower than 150W shall be exempt from automatic daylight controls.

F. Locker Room and Restrooms
   1. Shower Areas: Due to the height of the partitions, multiple sensors may be required as to not leave an occupant in the dark at any time. For good sanitation and health practices, these spaces shall be controlled via ceiling-mounted occupancy sensors.
   2. Locker Rooms: When entering the space, the lights shall automatically turn on to 70% or as prescribed by the Commissioner. When the space is left unoccupied, the lights shall automatically turn OFF when unoccupied for 30 minutes or as prescribed by the Commissioner. A wall-mounted bi-level dimmer switch shall provide the ability to override the occupancy sensor at any time for a period as permitted by code. These override switches shall be in an area controlled by staff or as determined by code. If located in public spaces, all controls shall be locked in a wall box with access by staff only.
   3. Restrooms: When entering the space, the lights shall automatically turn on to 100%. When the space is left unoccupied for 30 minutes, the lights shall automatically dim to 50%. Local control with lock box to be provided. For bathrooms 150 sq/ft or less locked wall boxes are not required and lights can be automatically turn off after 20 minutes.

G. Storage, Janitor's Closets, IT Rooms
   1. Storage Room 50 sq/ft or less will have a local control of on/off with integral wall mounted vacancy sensor.
   2. Storage Room 50sq/ft -1000 sq/ft shall have ceiling mounted occupancy sensors that turn lights on to 50% of power automatically. Lights will automatically turn off when 20 minutes if no occupancy has been detected. Local bi-level with four preset buttons (on, med, low, off) control to be provided per code.

3. Storage Rooms 1000 sq/ft or more shall have ceiling mounted occupancy sensors that turn lights on to 50% of power automatically. Lights will automatically reduce to 50% of power in space when 20 minutes of no occupancy has been detected. After 40 minutes lights will automatically turn off if no occupancy has been detected. Local bi-level with four preset buttons (on, med, low, off) control to be provided per code.

H. Electrical and Mechanical Rooms
   1. These spaces shall be controlled via local bi-level dimming switch only.
   2. When using the switch, the occupants shall manually turn the lights ON/OFF or dim.

I. Public Circulation, Vestibules, Elevator Lobbies
   1. Fixtures shall be dimmable.
   2. These spaces shall be controlled via a local switch and occupancy sensor.
   3. During working hours, the lights shall be turned on to 100%. When unoccupied, the occupancy sensor shall partially dim the lights to 50% and off after a certain time. During after-hours, when moving through the space, the occupancy sensors shall turn the lights on and will shut off the same zone of lighting after 20 minutes if motion is not detected. Final scenes to be approved by the Commissioner.
   4. Ceiling-mounted occupancy sensors shall be used wherever possible.
   5. A wall-mounted dimmer switch shall provide the ability to override the occupancy sensor at any time for a period as permitted by code. These override switches shall be in an area controlled by staff or as determined by code. If located in public spaces, all controls shall be locked in a wall box with access by staff only.
   6. Per code, fixtures located within the "daylight zones" shall be zoned separately from the ambient lighting in the space. In each cardinal direction (i.e north, south, east and west). The daylight zone shall be controlled via automatic daylight controls and photosensors. All spaces with a connected load lower than 150W shall be exempt from automatic daylight controls.

J. Stairs
   1. Lighting required for egress and emergency shall be on 24 hours a day as prescribed by code.
   2. Per code, fixtures located in the "daylight zones" shall be zoned separately from the ambient lighting in the space. In each cardinal direction (i.e. north, south, east and west). The daylight zone shall be controlled via automatic daylight controls and photosensors. All spaces with a connected load lower than 150W shall be exempt from automatic daylight controls.
   3. Ceiling or fixture mounted occupancy sensors (auto on/off) shall reduce stairwell lighting by at least 50% for additional load shedding.

K. Parking Garage
   1. An astronomical time clock will engage the lighting to a set level as prescribed by the Commissioner.
   2. Washbays will be zoned separately and shall have wet location occ sensors that will reduce light levels by 30% after 20 min of not detecting motion.
   3. When the space is unoccupied the occupancy sensors shall automatically reduce light levels by 30% when there is no detected activity within a lighting zone for 20 minutes. When motion is detected, lighting fixtures within the appropriate zone shall be brought to full output. Lighting zones shall be no larger than 3600 sq. ft.
   4. For safety reasons, Repair Areas shall be exempt and operate strictly through an ON/OFF switch.
   5. These switches shall be in an area controlled by staff or as determined by code. If located in public spaces, all controls shall be locked in a wall box with access by staff only.
   6. Threshold lighting shall be controlled separately from ambient lighting fixtures to improve visual adaptation of drivers and pedestrians entering from the exterior. These fixtures shall slowly dim down/up as the sun is setting/rising and shall be dimmed during night hours.
   7. controllers, interfaces, and network bridges for designated lighting zones accordingly.

L. Exterior Parking, Vehicular Lanes, and Terrace
1. Number of zones to be determined.
2. X10 adjustable cylinder fixtures at the New Building Level 02 exterior landscape area to be dimmable. Dimming switches shall be in an area controlled by staffed or as determined by code. If located in public spaces, all controls shall be locked in a wall box with access by staff only. The Commissioner to approve switch locations.
3. Pole Lights will have integral photocell.
4. These spaces shall be controlled via an astronomical time clock and photocell.
5. Site lighting Fueling station / Building-mounted lighting: An astronomical time clock will engage the lighting to a set level and stay ON after dusk and during the night.
6. Salt shed lighting to have local dimmable control located in the New Building to set the correct light levels. An astronomical time clock will engage the lighting to a set level and stay ON after dusk and during the night.
7. Signage / flag pole lighting: An astronomical timeclock will engage the lighting to a set level after Dusk. Light shall be OFF from 12am to 6am, per LEED requirements.
8. OSHA bollards adjacent to the Salt Shed shall have local ON/OFF switches located in the Existing Building.

1.6 SUBMITTAL PROCEDURES

A. Refer to DDC General Conditions Section 01 33 00 "Submittal Procedures".

1.7 SUBMITTALS

A. Shop Drawings:
1. Composite wiring and/or schematic diagram of each control circuit as proposed to be installed.
2. Show exact location of all digital devices, including at minimum sensors, room controllers, and switches for each area on reflected ceiling plans. Contractor must provide AutoCAD format reflected ceiling plans.
3. Provide room/area details including products and sequence of operation for each room or area. Illustrate typical acceptable room/area connection topologies.
4. Network riser diagram including floor and building level details. Include network cable specification and end-of-line termination details, if required. Illustrate points of connection to integrated systems. Coordinate integration with mechanical and/or other trades.

B. Product Data: Catalog sheets, specifications and installation instructions.
C. Include data for each device which:
1. Indicates where sensor is proposed to be installed.
2. Prove that the sensor is suitable for the proposed application.

1.8 PROJECT CONDITIONS

A. Do not install equipment until following conditions can be maintained in spaces to receive equipment:
1. Ambient temperature: 0° to 40° C (32° to 104° F).
2. Relative humidity: Maximum 90 percent, non-condensing.

1.9 QUALITY ASSURANCE

A. Refer to DDC General Conditions Section 01 40 00 "Quality Requirements".

PART II - PRODUCTS

2.1 MANUFACTURERS

A. Basis of Design: Subject to compliance with requirements, provide WattStopper DLM or comparable product by one of the following::
   1. Leviton IRC
   2. Acuity nLight
   3. Or approved equal

2.2 DIGITAL LIGHTING CONTROLS

A. Furnish system which accommodates the square-footage coverage requirements for each area controlled, utilizing room controllers, digital occupancy sensors, switches, daylighting sensors and accessories which suit the lighting and electrical system parameters.

2.3 DIGITAL WALL SWITCH OCCUPANCY SENSORS

A. Wallbox mounted passive infrared PIR or dual technology, passive infrared and ultrasonic, digital occupancy sensor with 1 or 2 switch buttons.
B. Digital Occupancy Sensors shall provide scrolling LCD display for digital calibration and electronic documentation. Features include the following:
   1. Digital calibration and pushbutton configuration for the following variables:
      a. Sensitivity – 0-100% in 10% increments
      b. Time delay – 1-30 minutes in 1 minute increments
      c. Test mode – Five second time delay
      d. Detection technology – PIR, Dual Technology activation and/or re-activation.
      e. Walk-through mode
      f. Load parameters including Auto/Manual-ON, blink warning, and daylight enable/disable when photosensors are included in the DLM local network.
   2. Programmable control functionality including:
      a. Each sensor may be programmed to control specific loads within a local network.
      b. Sensor shall be capable of activating one of 16 user-definable lighting scenes.
      c. Adjustable retrigger time period for manual-on loads. Load will retrigger (turn on) automatically during the configurable period of time, default 10 seconds, after turning off.
      d. On dual technology sensors, independently configurable trigger modes are available for both Normal (NH) and After Hours (AH) time periods. The retrigger mode can be programmed to use the following technologies:
         1. Ultrasonic and Passive Infrared
         2. Ultrasonic or Passive Infrared
         3. Ultrasonic only
         4. Passive Infrared only

3. Independently configurable sensitivity settings for passive infrared and ultrasonic technologies on dual technology sensors for both Normal (NH) and After Hour (AH) time periods.
4. Two ports for connection to DLM local network.
5. Two-way infrared (IR) transceiver to allow remote programming through handheld configuration tool and control by remote personal controls.
6. Device Status LEDs including:
   a. PIR detection
   b. Ultrasonic detection
   c. Configuration mode
   d. Load binding
7. Assignment of occupancy sensor to a specific load within the room without wiring or special tools.
8. Assignment of local buttons to specific loads within the room without wiring or special tools
9. Manual override of controlled loads.
10. All digital parameter data programmed into an individual wall switch sensor shall be retained in non-volatile FLASH memory within the wall switch sensor itself. Memory shall have an expected life of no less than 10 years.

C. BACnet object information shall be available for the following objects:
   1. Detection state
   2. Occupancy sensor time delay
   3. Occupancy sensor sensitivity, PIR and Ultrasonic
   4. Button state
   5. Switch lock control
   6. Switch lock status
D. Units shall not have any dip switches or potentiometers for field settings.
E. Multiple occupancy sensors may be installed in a room by simply connecting them to the free topology DLM local network. No additional configuration will be required.
F. Two-button wall switch occupancy sensors, when connected to a single relay dimming room controller, shall operate in the following sequence as a factory default:
   1. Left button
      a. Press and release - Turn load on
      b. Press and hold - Raise dimming load
   2. Right button
      a. Press and release - Turn load off
      b. Press and hold - Lower dimming load
G. Low voltage momentary pushbuttons shall include the following features:
   1. Load/Scene Status LED on each switch button with the following characteristics:
      a. Bi-level LED
      b. Dim locator level indicates power to switch
      c. Bright status level indicates that load or scene is active
   2. The following button attributes may be changed or selected using a wireless configuration tool:
      a. Load and Scene button function may be reconfigured for individual buttons (from Load to Scene, and vice versa).
      b. Individual button function may be configured to Toggle, On only or Off only.
      c. Individual scenes may be locked to prevent unauthorized change.
      d. Fade Up and Fade Down times for individual scenes may be adjusted from 0 seconds to 18 hours.
      e. Ramp rate may be adjusted for each dimmer switch.

f. Switch buttons may be bound to any load on a room controller and are not load type dependent; each button may be bound to multiple loads.

2.4 DIGITAL WALL OR CEILING MOUNTED OCCUPANCY SENSOR

A. Wall or ceiling mounted, to suit installation, passive infrared (PIR), ultrasonic or dual technology digital, passive infrared and ultrasonic occupancy sensor.

B. Digital Occupancy Sensors shall provide graphic LCD display for digital calibration and electronic documentation. Features include the following:
   1. Digital calibration and pushbutton configuration for the following variables:
      a. Sensitivity – 0-100% in 10% increments
      b. Time delay – 1-30 minutes in 1 minute increments
      c. Test mode – Five second time delay
      d. Detection technology – PIR, Ultrasonic or Dual Technology activation and/or re-activation.
      e. Walk-through mode
      f. Load parameters including Auto/Manual-ON, blink warning, and daylight enable/disable when photosensors are included in the DLM local network.
   2. Programmable control functionality including:
      a. Each sensor may be programmed to control specific loads within a local network.
      b. Sensor shall be capable of activating one of 16 user-definable lighting scenes.
      c. Adjustable retrigger time period for manual-on loads. Load will retrigger (turn on) automatically within a configurable period of time, default 10 seconds, after turning off.
      d. On dual technology sensors, independently configurable trigger modes are available for both Normal (NH) and After Hours (AH) time periods. The retrigger mode can be programmed to use the following technologies:
         i Ultrasonic and Passive Infrared
         ii Ultrasonic or Passive Infrared
         iii Ultrasonic only
         iv Passive Infrared only
   3. Independently configurable sensitivity settings for passive infrared and ultrasonic technologies on dual technology sensors for both Normal (NH) and After Hour (AH) time periods.
   4. One or two RJ-45 port(s) for connection to DLM local network.
   5. Two-way infrared (IR) transceiver to allow remote programming through handheld commissioning tool and control by remote personal controls.
   6. Device Status LEDs, which may be disabled for selected applications, including:
      a. PIR detection
      b. Ultrasonic detection
      c. Configuration mode
      d. Load binding
   7. Assignment of occupancy sensor to a specific load within the room without wiring or special tools.
   8. Manual override of controlled loads.
   9. All digital parameter data programmed into an individual occupancy sensor shall be retained in non-volatile FLASH memory within the sensor itself. Memory shall have an expected life of no less than 10 years.

C. BACnet object information shall be available for the following objects:
   1. Detection state
   2. Occupancy sensor time delay
   3. Occupancy sensor sensitivity, PIR and Ultrasonic

D. Units shall not have any dip switches or potentiometers for field settings.
E. Multiple occupancy sensors may be installed in a room by simply connecting them to the free topology DLM local network. No additional configuration will be required.

2.5 DIGITAL WALL SWITCHES

A. Low voltage momentary pushbutton switches in 1, 2, 3, 4, 5 and 8 button configurations. Wall switches shall include the following features.
   1. Two-way infrared (IR) transceiver for use with personal and configuration remote controls.
   2. Removable buttons for field replacement with engraved buttons and/or alternate color buttons. Button replacement may be completed without removing the switch from the wall.
   3. Configuration LED on each switch that blinks to indicate data transmission.
   4. Load/Scene Status LED on each switch button with the following characteristics:
      a. Bi-level LED
      b. Dim locator level indicates power to switch
      c. Bright status level indicates that load or scene is active
   5. Dimming switches shall include seven bi-level LEDs to indicate load levels using 14 steps.
   6. Programmable control functionality including:
      a. Button priority may be configured to any BACnet priority level, from 1-16, corresponding to networked operation allowing local actions to utilize life safety priority
      b. Scene patterns may be saved to any button other than dimming rockers. Once set, buttons may be digitally locked to prevent overwriting of the preset levels.
   7. All digital parameter data programmed into an individual wall switch shall be retained in non-volatile FLASH memory within the wall switch itself. Memory shall have an expected life of no less than 10 years.
B. BACnet object information shall be available for the following objects:
   1. Button state
   2. Switch lock control
   3. Switch lock status
C. Two RJ-45 ports for connection to DLM local network.
D. Multiple digital wall switches may be installed in a room by simply connecting them to the free topology DLM local network. No additional configuration shall be required to achieve multi-way switching.
E. The following switch attributes may be changed or selected using a wireless configuration tool:
   1. Load and Scene button function may be reconfigured for individual buttons (from Load to Scene, and vice versa).
   2. Individual button function may be configured to Toggle, On only or Off only.
   3. Individual scenes may be locked to prevent unauthorized change.
   4. Fade Up and Fade Down times for individual scenes may be adjusted from 0 seconds to 18 hours.
   5. Ramp rate may be adjusted for each dimmer switch.
   6. Switch buttons may be bound to any load on a room controller and are not load type dependent; each button may be bound to multiple loads.

2.6 HANDHELD REMOTE CONTROLS

A. Battery-operated handheld devices in 1, 2 and 5 button configurations for remote switching or dimming control. Remote controls shall include the following features:
   1. Two-way infrared (IR) transceiver for line of sight communication with DLM local network within up to 30 feet.

2. LED on each button confirms button press.
3. Load buttons may be bound to any load on a room controller and are not load type dependent; each button may be bound to multiple loads.
4. Inactivity timeout to save battery life.

B. A wall mount holster and mounting hardware shall be included with each remote control.

2.7 DIGITAL PARTITION CONTROLS

A. Partition controls shall enable manual or automatic coordination of lighting controls in flexible spaces with up to four moveable walls by reconfiguring the connected digital switches and occupancy sensors.

B. Four-button low voltage pushbutton switch for manual control.
1. Two-way infrared (IR) transceiver for use with configuration remote control.
2. Removable buttons for field replacement with engraved buttons and/or alternate color buttons. Button replacement may be completed without removing the switch from the wall.
3. Configuration LED on each switch that blinks to indicate data transmission.
4. Each button represents one wall; Green button LED indicates status.
5. Two RJ-45 ports for connection to DLM local network.

C. Contact closure interface for automatic control via input from limit switches on movable walls.
1. Operates on Class 2 power supplied by DLM local network.
2. Includes 24VDC output and four input terminals for maintained third party contract closure inputs.
   a. Input max. sink/source current: 1-5mA
   b. Logic input signal voltage High: >18VDC
   c. Logic input signal voltage Low: <2VDC
3. Four status LEDs under hinged cover indicate if walls are open or closed.
4. Two RJ-45 ports for connection to DLM local network.

2.8 DIGITAL DAYLIGHTING SENSORS

A. Digital daylighting sensors shall work with room controllers to provide automatic switching, bi-level, or tri-level or dimming daylight harvesting capabilities for any load type connected to a room controller. Daylighting sensors shall be interchangeable without the need for rewiring.
1. Closed loop sensors measure the ambient light in the space and control a single lighting zone.
2. Open loop sensors measure incoming daylight in the space and are capable of controlling up to three lighting zones.
3. Dual loop sensors measure both ambient and incoming daylight in the space to ensure that proper light levels are maintained as changes to reflective materials are made in a single zone.

B. Digital daylighting sensors shall include the following features:
1. The sensor's internal photodiode shall only measure lightwaves within the visible spectrum. The photodiode's spectral response curve shall closely match the entire photopic curve. The photodiode shall not measure energy in either the ultraviolet or infrared spectrums. The photocell shall have a sensitivity of less than 5% for any wavelengths less than 400 nanometers or greater than 700 nanometers.
2. Sensor light level range shall be from 1-6,553 footcandles (fc).
3. The capability of ON/OFF, bi-level or tri-level switching, or dimming, for each controlled zone, depending on the selection of room controller(s) and load binding to room controller(s).
4. For switching daylight harvesting, the photosensor shall provide a field-selectable deadband, or a separation, between the "ON Setpoint" and the "OFF Setpoint" that will prevent the lights from cycling excessively after they turn off.

5. For dimming daylight harvesting, the photosensor shall provide the option, when the daylight contribution is sufficient, of turning lights off or dimming lights to a field-selectable minimum level.
6. Photosensors shall have a digital, independently configurable fade rate for both increasing and decreasing light level in units of percent per second.
7. Photosensors shall provide adjustable cut-off time. Cut-off time is defined by the number of selected minutes the load is at the minimum output before the load turns off. Selectable range between 0-240 minutes including option to never cut-off.
8. Optional wall switch override shall allow occupants to reduce lighting level to increase energy savings or, if permitted by system administrator, raise lighting levels for a selectable period of time or cycle of occupancy.
9. Integral infrared (IR) transceiver for configuration and/or commissioning with a handheld configuration tool, to transmit detected light level to wireless configuration tool, and for communication with personal remote controls.
10. Configuration LED status light on device that blinks to indicate data transmission.
11. Status LED indicates test mode, override mode and load binding.
12. Recessed switch on device to turn controlled load(s) ON and OFF.
13. BACnet object information shall be available for the following daylighting sensor objects, based on the specific photocell's settings:
    a. Light level
    a. Day and night setpoints
    b. Off time delay
    c. On and off setpoints
    d. Up to three zone setpoints
    e. Operating mode – on/off, bi-level, tri-level or dimming
14. One port for connection to DLM local network.
15. A choice of accessories to accommodate multiple mounting methods and building materials. The photosensors may be mounted on a ceiling tile, skylight light well, suspended lighting fixture or backbox. Standard tube photosensors accommodate mounting materials from 0-0.62" thickness Extended tube photosensors accommodate mounting materials from 0.62"-1.25" thickness. Mounting brackets are compatible with J boxes and wall mounting. Photosensor to be mounted on included bracket below skylight well.
16. Any load or group of loads in the room can be assigned to a daylighting zone
17. Each load within a daylighting zone can be individually enabled or disabled for discrete control of load independence.
18. All digital parameter data programmed into a photosensor shall be retained in non-volatile FLASH memory within the photosensor itself. Memory shall have an expected life of no less than 10 years.

C. Closed loop digital photosensors shall include the following additional features:
   1. An internal photodiode that measures light in a 100-degree angle, cutting off the unwanted light from bright sources outside of this cone.
   2. Automatic self-calibration, initiated from the photosensor, a wireless configuration tool or a PC with appropriate software.
   3. Automatically establishes application-specific setpoints following self-calibration. For switching operation, an adequate deadband between the ON and OFF setpoints shall prevent the lights from cycling; for dimming operation a sliding setpoint control algorithm with separate Day and Night setpoints shall prevent abrupt ramping of loads.

D. Open loop digital photosensors shall include the following additional features:
   1. An internal photodiode that measures light in a 60-degree angle cutting off the unwanted light from the interior of the room.

2. Automatically establishes application-specific setpoints following manual calibration using a wireless configuration tool or a PC with appropriate software. For switching operation, an adequate deadband between the ON and OFF setpoints for each zone shall prevent the lights from cycling; for dimming operation, a proportional control algorithm shall maintain the design lighting level in each zone.
3. Each of the three discrete daylight zones can include any non overlapping group of loads in the room.

E. Dual loop digital photosensors shall include the following additional features:
1. Close loop portion of dual loop device must have an internal photodiode that measures light in a 100 degree angle, cutting off the unwanted light from outside sources.
2. Open loop portion of dual loop device must have an internal photodiode that can measure light in a 60 degree angle, cutting off the unwanted light from the interior of the room.
3. Automatically establishes application-specific set-points following self-calibration. For switching operation, an adequate deadband between the ON and OFF setpoints shall prevent the lights from cycling; for dimming operation a sliding setpoint control algorithm with separate Day and Night setpoints shall prevent abrupt ramping of load.
4. Device must reference closed loop photosensor information as a base line reference. The device must be able to analyze the open loop photosensor information to determine if an adjustment in light levels is required.
5. Device must be able to automatically commission setpoints each night to provide adjustments to electrical lighting based on changes in overall lighting in the space due to changes in reflectance within the space or changes to daylight contribution based on seasonal changes.
6. Device must include extendable mounting arm to properly position sensor within a skylight well.

2.9 DIGITAL ROOM CONTROLLERS AND PLUG-LOAD CONTROLLERS

A. Digital controllers for lighting and plug loads automatically bind the room loads to the connected devices in the space without commissioning or the use of any tools. Room and plug load controllers shall be provided to match the room lighting and plug load control requirements. The controllers will be simple to install, and will not have dip switches or potentiometers, or require special configuration for standard. The control units will include the following features:
1. Automatic room configuration to the most energy-efficient sequence of operation based upon the devices in the room.
2. Simple replacement – Using the default automatic configuration capabilities, a room controller may be replaced with an off-the-shelf.
3. Multiple room controllers connected together in a local network must automatically prioritize each room controller, without requiring any configuration or setup, so that loads are sequentially assigned using room controller device ID's from highest to lowest.
4. Device Status LEDs to indicate:
   a. Data transmission
   b. Device has power
   c. Status for each load
   d. Configuration status
5. Quick installation features including:
   a. Standard junction box mounting
   b. Quick low voltage connections using standard patch cable
6. Based on individual configuration, each load shall be capable of the following behavior on power up following the loss of normal power:
   a. Turn on to 100%
   b. Remain off

c. Turn on to last level

7. Each load shall be configurable to operate in the following sequences based on occupancy:
   a. Auto-on/Auto-off (Follow on and off)
   b. Manual-on/Auto-off (Follow off only)
8. The polarity of each load output shall be reversible, via digital configuration, so that on is off and off is on.
9. BACnet object information shall be available for the following objects:
   a. Load status
   b. Electrical current
   c. Total watts per controller
   d. Schedule state – normal or after-hours
   e. Demand response control and cap level
   f. Room occupancy status
   g. Total room lighting and plug loads watts
   h. Total room watts/sq ft
   i. Force on/off all loads
10. UL 2043 plenum rated
11. Manual override and LED indication for each load
12. Dual voltage (120/277 VAC, 60 Hz), or 347 VAC, 60 Hz, selected models only. 120/277 volt models rated for 20A total load, derating to 16A required for some dimmed loads (forward phase dimming); 347 volt models rated for 15A total load; plug load controllers carry application-specific UL 20 rating for receptacle control.
13. Zero cross circuitry for each load
14. All digital parameter data programmed into an individual room controller or plug load controller shall be retained in non-volatile FLASH memory within the controller itself. Memory shall have an expected life of no less than 10 years.

B. On/Off Room Controllers shall include:
   1. One or two relay configuration
   2. Efficient 150 mA switching power supply
   3. Three local network ports with integral strain relief and dust cover

C. On/Off/Dimming enhanced Room Controllers shall include:
   1. Real time current monitoring
   2. Multiple relay configurations
      a. One, two or three relays
      b. One or two relays
   3. Efficient 250 mA switching power supply
   4. Four local network ports with integral strain relief and dust cover
   5. One dimming output per relay
      a. 0-10V Dimming - Where indicated, one 0-10 volt analog output per relay for control of compatible ballasts and LED drivers. The 0-10 volt output shall automatically open upon loss of power to the Room Controller to assure full light output from the controlled lighting.
      b. Line Voltage, Forward Phase Dimming - Where indicated, one forward phase control line voltage dimming output per relay for control of compatible two-wire or three-wire ballasts, LED drivers, MLV, forward phase compatible ELV, neon/cold cathode and incandescent loads.
      c. Each dimming output channel shall have an independently configurable minimum and maximum calibration trim level to set the dimming range to match the true dynamic range of the connected ballast or driver.

d. The LED level indicators on bound dimming switches shall utilize this new maximum and minimum trim.
e. Each dimming output channel shall have an independently configurable minimum and maximum trim level to set the dynamic range of the output within the new 0-100% dimming range defined by the minimum and maximum calibration trim.
f. Calibration and trim levels must be set per output channel.
g. Devices that set calibration or trim levels per controller are not acceptable.
h. All configuration shall be digital. Devices that set calibration or trim levels per output channel via trim pots or dip-switches are not acceptable.

6. Each load shall have an independently configurable preset on level for Normal Hours and After Hours events to allow different dimmed levels to be established at the start of both Normal Hours and After Hours events.
7. Fade rates for dimming loads shall be specific to bound switch buttons, and the load shall maintain a default value for any bound buttons that do not specify a unique value.
8. The following dimming attributes may be changed or selected using a wireless configuration tool:
   a. Establish preset level for each load from 0-100%
   b. Set high and low trim for each load
   c. Set lamp burn in time for each load up to 100 hours
9. Override button for each load provides the following functions:
   a. Press and release for on/off control
   b. Press and hold for dimming control

D. Plug Load Room Controllers shall include:
1. One relay configuration with additional connection for unswitched load
2. Configurable additive time delay to extend plug load time delay beyond occupancy sensor time delay, e.g. a 10 minute additive delay in a space with a 20 minute occupancy sensor delay ensures that plug loads turn off 30 minutes after the space is vacated.
3. Factory default operation is Auto-on/Auto-off, based on occupancy
4. Real time current monitoring of both switched and un-switched load
5. Efficient switching power supply
   a. 150mA
   b. 250mA
6. Local network ports
   a. Three ports
   b. Four ports

2.10 DLM LOCAL NETWORK - Room Network

A. The DLM local network is a free topology lighting control physical connection and communication protocol designed to control a small area of a building.
B. Features of the DLM local network include:
1. Automatic configuration and binding of occupancy sensors, switches and lighting loads to the most energy-efficient sequence of operation based upon the device attached.
2. Simple replacement of any device in the network with a standard off the shelf unit without requiring commissioning, configuration or setup.
3. Configuration to change the automatic configuration, including binding and load parameters without tools, using only the buttons on the digital devices in the local network.

4. Two-way infrared communications for control by handheld remotes, and configuration by a handheld tool including adjusting load parameters, sensor configuration and binding, within a line of sight of up to 30 feet from a sensor, wall switch or IR receiver.

C. Digital room devices connect to the local network using pre-terminated Cat 5e cables with RJ-45 connectors, which provide both data and power to room devices. Systems that utilize patch cords but do not provide serial communication data from individual end devices are not acceptable.

D. If manufacturer's pre-terminated Cat 5e cables are not used for the installation, the Contractor is responsible for testing each cable following installation and supplying manufacturer with test results.

2.11 DLM SEGMENT NETWORK - Room to Room Network

A. The segment network shall be a linear topology, BACnet-based MS/TP subnet to connect DLM local networks (rooms) and relay panels for centralized control.

B. Each connected DLM local network shall include a single network bridge, and the network bridge is the only room-based device that is connected to the segment network.

C. Network bridges, relay panels and segment managers shall include terminal blocks, with provisions for separate "in" and "out" terminations, for segment network connections.

D. The segment network shall utilize 1.5 twisted pair, shielded, cable supplied by the lighting control manufacturer. The maximum cable run for each segment is 4,000 feet. Conductor-to-conductor capacitance of the twisted pair shall be less than 30 pf/ft and have a characteristic impedance of 120 Ohms.

E. Network signal integrity requires that each conductor and ground wire be correctly terminated at every connected device.

F. Utilization of non-manufacturer-supplied cable must be pre-approved: Manufacturer will not certify network reliability, and reserves the right to void warranty, if non-approved cable is installed, and if terminations are not completed according to manufacturer's specific requirements.

G. Segment networks shall be capable of connecting to BACnet-compliant BAS (provided by others) either directly, via MS/TP, or through NB-ROUTERs, via BACnet/IP or BACnet/Ethernet. Systems whose room-connected network infrastructure require gateway devices to provide BACnet data to a BAS are unacceptable.

2.12 CONFIGURATION TOOLS

A. A wireless configuration tool facilitates optional customization of DLM local networks using two-way infrared communications, while PC software connects to each local network via a USB interface.

B. Features and functionality of the wireless configuration tool shall include but not be limited to:
   1. Two-way infrared (IR) communication with DLM IR-enabled devices within a range of approximately 30 feet.
   2. High visibility organic LED (OLED) display, pushbutton user interface and menu-driven operation.
   3. Must be able to read and modify parameters for room controllers, occupancy sensors, wall switches, daylighting sensors, network bridges and relay panels, and identify room devices by type and serial number.
   4. Save up to eight occupancy sensor setting profiles, and apply profiles to selected sensors.
   5. Temporarily adjust light level of any load(s) on the local network, and incorporate those levels in scene setting. Set room mode for testing of Normal Hours (NH) and After Hours (AH) parameter settings.
   6. Adjust or fine-tune daylighting settings established during auto-configuration, and input light level data to complete configuration of open loop daylighting controls.
   7. Set room mode for testing of Normal Hours (NH) and After Hours (AH) parameter settings.
   8. Verify status of building level network devices.

2.13 NETWORK BRIDGE

A. The network bridge module connects a DLM local network to a BACnet-compliant segment network for communication between rooms, relay panels and a segment manager or BAS. Each local network shall include a network bridge component to provide a connection to the local network room devices. The network bridge shall use industry standard BACnet MS/TP network communication and an optically isolated EIA/TIA RS-485 transceiver.
   1. The network bridge shall be provided as a separate module connected on the local network through an available port.
   2. Provide operation to automatically discover room devices connected to the local network and make all device parameters visible to the segment manager via the segment network. No commissioning shall be required for set up of the network bridge on the local network.
   3. The network bridge shall automatically create standard BACnet objects for selected room device parameters to allow any BACnet-compliant BAS to include lighting control and power monitoring features as provided by the DLM room devices on each local network. BACnet objects will be created for the addition or replacement of any given in-room DLM device for the installed life of the system. Products requiring that an application-specific point database be loaded to create or map BACnet objects are not acceptable. Systems not capable of providing BACnet data for control devices via a dedicated BACnet Device ID and physical MS/TP termination per room are not acceptable. Standard BACnet objects shall be provided as follows:
      a. Read/write the normal or after hours schedule state for the room
      b. Read the detection state of each occupancy sensor
      c. Read the aggregate occupancy state of the room
      d. Read/write the On/Off state of loads
      e. Read/write the dimmed light level of loads
      f. Read the button states of switches
      g. Read total current in amps, and total power in watts through the room controller
      h. Read/write occupancy sensor time delay, PIR sensitivity and ultrasonic sensitivity settings
      i. Activate a preset scene for the room
      j. Read/write daylight sensor fade time and day and night setpoints
      k. Read the current light level, in footcandles, from interior and exterior photosensors and photocells
      l. Set daylight sensor operating mode
      m. Read/write wall switch lock status
      n. Read watts per square foot for the entire controlled room
      o. Write maximum light level per load for demand response mode
      p. Read/write activation of demand response mode for the room
      q. Activate/restore demand response mode for the room

2.14 SEGMENT MANAGER

A. For networked applications, the Digital Lighting Management system shall include at least one segment manager to manage network communication. It shall be capable of serving up a graphical user interface via a standard web browser utilizing either unencrypted TCP/IP traffic via a configurable port (default is 80) or 256 bit AES encrypted SSL TCP/IP traffic via a configurable port (default is 443).

B. Each segment manager shall have integral support for at least three segment networks. Segment networks may alternately be connected to the segment manger via external routers and switches, using standard Ethernet structured wiring. Each router shall accommodate one segment network. Provide the quantity of routers and switches as shown on the plans.

C. Operational features of the Segment Manager shall include the following:
   1. Connection to PC or LAN via standard Ethernet TCP/IP via standard Ethernet TCP/IP with the option to use SSL encrypted connections for all traffic.
   2. Easy to learn and use graphical user interface, compatible with a website browser. Shall not require installation of any lighting control software to an end-user PC.
   3. Log in security capable of restricting some users to view-only or other limited operations.
   4. Automatic discovery of DLM devices and relay panels on the segment network(s). Commissioning beyond activation of the discovery function shall not be required to provide communication, monitoring or control of all local networks and lighting control panels.
   5. After discovery, all rooms and panels shall be presented in a standard navigation tree format. Selecting a device from the tree will allow the device settings and operational parameters to be viewed and changed by the user.
   6. Ability to view and modify room device operational parameters. It shall be possible to set device parameters independently for normal hours and after hours operation including sensor time delays and sensitivities, and load response to sensor including Manual-On or Auto-On.
   7. Ability to set up schedules for rooms and panels, view and override current status of panel channels and relays, and assign relays to groups. Schedules shall automatically set controlled zones or areas to either a normal hours or after hours mode of operation. Support for a minimum of 100 unique schedules, each with up to four time events per day. Support for annual schedules, holiday schedules and unique date-bound schedules.
   8. Ability to group rooms and loads for common control by schedules, switches or network commands.
   9. Ability to monitor connected load current and display power consumption for areas equipped with room controllers incorporating the integral current monitoring feature.
   10. Provide capabilities for integration with a BAS via BACnet protocol. At a minimum, the following points shall be available to the BAS via BACnet IP connection to the segment manager: room occupancy state; room schedule mode; room switch lock control; individual occupancy sensor state; room lighting power; room plug-load power; load ON/OFF state; load dimming level; panel channel schedule state; panel relay state; and Segment Manager Group schedule state control.

D. Segment Manager shall support multiple DLM rooms as follows:
   1. Support up to 120 network bridges and 900 digital in-room devices.
   2. Support up to 300 network bridges and 2,200 digital in room devices, connected via network routers and switches.

2.15 PROGRAMMING, CONFIGURATION AND DOCUMENTATION SOFTWARE

A. PC-native application for optional programming of detailed technician-level parameter information for all DLM products, including all parameters not accessible via BACnet and the handled IR configuration tool. Software must be capable of accessing room-level parameter information locally within the room when connected via the programming adapter, or globally for many segment networks simultaneously utilizing standard BACnet/IP communication.
   1. Additional parameters exposed through this method include:
      a. Occupancy sensor detection LED disable for performance and other aesthetic spaces where blinking LEDs present a distraction.
      b. Six occupancy sensor action behaviors for each controlled load, separately configurable for normal hours and after hours modes. Modes include: No Action, Follow Off Only, Follow On Only, Follow On and Off, Follow On Only with Override Time Delay, Follow Off Only with Blink Warn Grace Time, Follow On and Off with Blink Warn Grace Time.
      c. Separate fade time adjustments per load for both normal and after hours from 0 - 4 hours.

d. Configurable occupancy sensor re-trigger grace period from 0 - 4 minutes separate for both normal hours and after hours.
e. Separate normal hours and after hours per-load button mode with modes including: Do nothing, on only, off only, on and off.
f. Load control polarity reversal so that on events turn loads off and vice versa.
g. Per-load DR (demand response) shed level in units of percent.
h. Load output pulse mode in increments of 1second.
i. Fade trip point for each load for normal hours and after hours that establishes the dimmer command level at which a switched load closes its relay to allow for staggered On of switched loads in response to a dimmer.

2. Generation of reports at the whole file, partial file, or room level. Reports include but are not limited to:
   a. Device list report: All devices in a project listed by type.
   b. Load binding report: All load controller bindings showing interaction with sensors, switches, and daylighting.
   c. BACnet points report: Per room Device ID report of the valid BACnet points for a given site's BOM.
   d. Room summary report: Device manifest for each room, aggregated by common BOM, showing basic sequence of operations.
   e. Device parameter report: Per-room lists of all configured parameters accessible via hand held IR programmer for use with O&M documentation.
   f. Scene report: All project scene pattern values not left at defaults (i.e. 1 = all loads 100%, 2 = all loads 75%, 3 = all loads 50%, 4 = all loads 25%, 5-16 = same as scene 1).
   g. Occupancy sensor report: Basic settings including time delay and sensitivity(ies) for all occupancy sensors.

3. Network-wide programming of parameter data in a spreadsheet-like programming environment including but not limited to the following operations:
   a. Set, copy/paste an entire project site of sensor time delays.
   b. Set, copy/paste an entire project site of sensor sensitivity settings.
   c. Search based on room name and text labels.
   d. Filter by product type to allow parameter set by product.
   e. Filter by parameter value to search for product with specific configurations.
4. Network-wide firmware upgrading remotely via the BACnet/IP network.
   a. Mass firmware update of entire rooms.
   b. Mass firmware update of specifically selected rooms or areas.
   c. Mass firmware upgrade of specific products.

2.16 LIGHTING CONTROL PANELS

A. Provide lighting control panels in the locations and capacities as indicated on the plans and schedules. Each panel shall be of modular construction and consist of the following components:
   1. Enclosure/Tub shall be NEMA 1, sized to accept an interior with 1 - 8 relays, 1 - 24 relays and 6 four-pole contactors, or 1 - 48 relays and 6 four-pole contactors.
   2. Cover shall be configured for surface or flush wall mounting of the panel as indicated on the plans. The panel cover shall have a hinged and lockable door with restricted access to line voltage section of the panel.

3. Interior assembly shall be supplied as a factory assembled component specifically designed and listed for field installation. The interior construction shall provide total isolation of high voltage (Class 1) wiring from low voltage (Class 2) wiring within the assembled panel. The interior assembly shall include intelligence boards, power supply, DIN rails for mounting optional Class 2 control devices, and individually replaceable latching type relays. The panel interiors shall include the following features:
   a. Removable, plug-in terminal blocks with connections for all low voltage terminations.
   b. Individual terminal block, override pushbutton, and LED status light for each relay.
   c. Direct wired switch inputs associated with each relay shall support 2-wire momentary switches only.
   d. Digital inputs (four RJ-45 jacks) shall support 1-, 2-, 3-, 4-, and 8-button digital switches; digital IO modules capable of receiving 0-5V or 0-10V analog photocell inputs; digital IO modules capable of receiving momentary or maintained contact closure inputs or analog sensor inputs; digital daylighting sensors; and digital occupancy sensors. Inputs are divided into two separate digital networks, each capable of supplying 250mA to connected devices.
   e. True relay state shall be indicated by the on-board LED and shall be available to external control devices and systems via BACnet.
   f. Automatically sequenced operation of relays to reduce impact on the electrical distribution system when large loads are controlled simultaneously.
   g. Group and pattern control of relays shall be provided through a simple keypad interface from a handheld IR programmer. Any set of relays can be associated with a group for direct on/off control or pattern (scene) control via a simple programming sequence using the relay override pushbuttons and LED displays for groups 1-8 or a handheld IR programmer for groups 1-99.
   h. Relay group status for shall be provided through LED indicators for groups 1-8 and via BACnet for groups 1-99. A solid LED indicates that the last group action called for an ON state and relays in the group are on or in a mixed state.
   i. Single-pole latching relays with modular plug-in design. Relays shall provide the following ratings and features:
      a) Electrical:
         i. 30 amp ballast at 277V
         ii. 20 amp ballast at 347V
         iii. 20amp tungsten at 120V
         iv. 30 amp resistive at 347V
         v. HP motor at 120V
         vi. 14,000 amp short circuit current rating (SCCR) at 347V
         vii. Relays shall be specifically UL 20 listed for control of plug-loads
      b) Mechanical:
         i. Replaceable, ½" KO mounting with removable Class 2 wire harness.
         ii. Actuator on relay housing provides manual override and visual status indication, accessible from Class 2 section of panel.
         iii. Dual line and load terminals each support two #14 - #12 solid or stranded conductors.
         iv. Tested to 300,000 mechanical on/off cycles.
4. Isolated low voltage contacts provide for true relay status feedback and pilot light indication.
5. Power supply shall be a multi-voltage transformer assembly with rated power to supply all electronics, occupancy sensors, switches, pilot lights, and photocells as necessary to meet the project requirements. Power supply to have internal over-current protection with automatic reset and metal oxide varistor protection.
6. Where indicated, lighting control panels designated for control of emergency lighting shall be provided with factory installed provision for automatic by pass of relays controlling emergency circuits upon

loss of normal power. Panels shall be properly listed and labeled for use on emergency lighting circuits and shall meet the requirements of UL924 and NFPA 70 - Article 700.

7. Integral system clock shall provide scheduling capabilities for panel-only projects without DLM segment networks or BAS control.
   a. Each panel shall include digital clock capability able to issue system wide automation commands to up to (11) eleven other panels for a total of (12) twelve networked lighting control panels. The clock shall provide capability for up to 254 independent schedule events per panel for each of the ninety-nine system wide channel groups.
   b. The clock capability of each panel shall support the time-based energy saving requirements.
   c. The clock module shall provide astronomic capabilities, time delays, blink warning, daylight savings, and holiday functions and will include a battery back up for the clock function and program retention in non-volatile FLASH memory. Clocks that require multiple events to meet local code lighting shut off requirements shall not be allowed.
   d. The clock capability of each panel shall operate on a basis of ON/OFF or Normal Hours/After Hours messages to automation groups that implement pre-configured control scenarios. Scenarios shall include:
      i Scheduled ON / OFF
      ii Manual ON / Scheduled OFF
      iii Astro ON / OFF (or Photo ON / OFF)
      iv Astro and Schedule ON / OFF (or Photo and Schedule ON / OFF)
   e. The user interface shall be a portable IR handheld remote control capable of programming any panel in the system (LMCT-100)
   f. The clock capability of each panel shall employ non-volatile memory and shall retain user programming and time for a minimum of 10 years.
   g. Schedules programmed into the clock of any one panel shall be capable of executing panel local schedule or Dark/Light (photocell or Astro) events for that panel in the event that global network communication is lost. Lighting control panels that are not capable of executing events independently of the global network shall not be acceptable.
8. The lighting control panel can operate as a stand-alone system, or can support schedule, group, and photocell control functions via a segment network connection.
9. The lighting control panel shall support digital communications to facilitate the extension of control to include interoperation with building automation systems and other intelligent field devices. Digital communications shall be RS485 MS/TP-based using the BACnet protocol.
   a. The panel shall have provision for an individual BACnet device ID and shall support the full 2^{22} range (0 – 4,193,304). The device ID description property shall be writable via the network to allow unique identification of the lighting control panel on the network.
   b. The panel shall support MS/TP MAC addresses in the range of 0 – 127 and baud rates of 9600k, 38400k, 76800k, and 115.2k bits per second.
   c. Lighting control relays shall be controllable as binary output objects in the instance range of 1 – 64. The state of each relay shall be readable and writable by the BAS via the object present value property.
   d. Lighting control relays shall report their true on/off state as binary input objects in the instance range of 1 – 64.
   e. The 99 group Normal Hours/After Hours control objects associated with the panel shall be represented by binary value objects in the instance range of 201 – 299. The occupancy state of each channel group shall be readable and writable by the BAS via the object present value

property. Commanding 1 to a channel group will put all relays associated with the channel into the normal hours mode. Commanding 0 or NULL shall put the relays into the after hours mode.

f. Setup and commissioning of the panel shall not require manufacturer-specific software or a computer. All configuration of the lighting control panel shall be performed using standard BACnet objects or via the handheld IR programming remote. Provide BACnet objects for panel setup and control as follows:

   i Binary output objects in the instance range of 1 – 64 (one per relay) for on/off control of relays.

   ii Binary value objects in the instance range of 1 – 99 (one per channel) for normal hours/after hours schedule control.

   iii Binary input objects in the instance range of 1 – 64 (one per relay) for reading true on/off state of the relays.

   iv Analog value objects in the instance range of 101 – 199 (one per channel group) shall assign a blink warn time value to each channel. A value of 5 shall activate the blink warn feature for the channel and set a 5-minute grace-time period. A value of 250 shall activate the sweep feature for the channel and enable the use of sweep type automatic wall switches.

g. The description property for all objects shall be writable via the network and shall be saved in non-volatile memory within the panel.

h. The BO and BV 1 – 99 objects shall support BACnet priority array with a relinquish default of off and after hours respectively. Prioritized writes to the channel BV objects shall propagate prioritized control to each member relay in a way analogous to the BACnet Channel object described in addendum aa.

i. Panel-aggregate control of relay Force Off at priority 2 shall be available via a single BV5 object. Force On at priority 1 shall be available via a single BV4 object.

j. Lockout of all digital switch buttons connected to a given panel shall be command-able via a single BV2 object. The lock status of any connected switch station shall be represented as BV101-196.

B. USER INTERFACE

1. Each lighting control panel system shall be supplied with at least (1) handheld configuration tool. As a remote programming interface the configuration tool shall allow setup, configuration, and diagnostics of the panel without the need for software or connection of a computer. The user interface shall have the following panel-specific functions as a minimum:
2. Set network parameters including panel device ID, MS/TP MAC address, baud rate and max master range.
3. Relay Group creation of up to 99 groups. Group creation shall result in programming of all seven key relay parameters for member relays. The seven parameters are as follows: After-hours Override Time Delay, Normal Hours Override Time Delay, Action on Transition to Normal Hours, Action on Transition to After Hours, Sensor Action During Normal Hours, Sensor Action During After Hours, Blink-Warn Time for After Hours.
4. Program up to 254 separate scheduled events. Events shall occur on seven day intervals with each day selectable as active or inactive, and shall be configurable as to whether the event is active on holidays. Holidays are also defined through the User Interface.
5. Program up to 32 separate Dark/Light events. Events shall have a selectable source as either calculated Astro with delay, or a digital IO module with an integral 0-5V or 0-10V analog photocell. Dark/Light events shall occur on seven day intervals with each day selectable as active or inactive, and shall be configurable as to whether the event is active on holidays.

6. Button binding of digital switches to groups shall be accessible via the handheld IR remote and accomplished from the digital switch station.
7. Programming of panel location information shall be accomplished by the handheld IR remote and include at a minimum LAT, LON, DST zone, and an approximate city/state location.

2.17 EMERGENCY LIGHTING CONTROL DEVICES

A. Emergency Lighting Control Unit – A UL 924 listed device that monitors a switched circuit providing normal lighting to an area. The unit provides normal ON/OFF control of emergency lighting along with the normal lighting. Upon normal power failure the emergency lighting circuit will close, forcing the emergency lighting ON until normal power is restored. Features include:
   1. 120/277 volts, 50/60 Hz, 20 amp ballast rating
   2. Push to test button
   3. Auxiliary contact for remote test or fire alarm system interface

PART 3 – EXECUTION

3.1 EXECUTION REQUIREMENTS

A. Refer to DDC General Conditions for execution requirements.

3.2 OPTIONAL PRE-INSTALLATION MEETING

A. A factory authorized manufacturer's representative shall provide a functional overview of the lighting control system prior to installation. The Contractor shall schedule the pre-installation site visit after receipt of approved submittals to review the following:
   1. Confirm the location and mounting of all digital devices, with special attention to placement of occupancy and daylighting sensors.
   2. Review the specifications for low voltage control wiring and termination.
   3. Discuss the functionality and configuration of all products, including sequences of operation, per design requirements.
   4. Discuss requirements for integration with other trades.

3.3 CONTRACTOR INSTALLATION AND SERVICES

A. All line voltage connections to be tagged to indicate circuit and switched legs.
B. Contractor to install all room/area devices using manufacturer's factory-tested Cat 5e cable with pre-terminated RJ-45 connectors. If pre-terminated cable is not used for room/area wiring, the Contractor is responsible for testing each field-terminated cable following installation, and shall supply the lighting controls manufacturer with test results. Contractor to install any room to room network devices using manufacturer-supplied network wire. Network wire substitution is not permitted. Low voltage wiring topology must comply with manufacturer's specifications. Contractor shall route network wiring as shown in submittal drawings as closely as possible, and shall document final wiring location, routing and topology on as built drawings.
C. Install the work of this Section in accordance with manufacturer's printed instructions unless otherwise indicated. Before start up, Contractor shall test all devices to ensure proper communication.

D. Calibrate all sensor time delays and sensitivity to guarantee proper detection of occupants and energy savings.
   1. Adjust time delay so that controlled area remains lighted while occupied.
E. Provide written or computer-generated documentation on the configuration of the system including room by room description including:
   1. Sensor parameters, time delays, sensitivities, and daylighting setpoints.
   2. Sequence of operation, (e.g. manual ON, Auto OFF. etc.)
   3. Load Parameters (e.g. blink warning, etc.)
F. Post start-up tuning – After 30 days from occupancy Contractor shall adjust sensor time delays and sensitivities to meet the City of New York's requirements. Provide a detailed report to the Commissioner of post start-up activity.

3.4 FACTORY SERVICES

A. Upon completion of the installation, the manufacturer's factory authorized representative shall assist the Contractor with verify a complete fully functional system.
B. The Contractor shall provide both the manufacturer and the Commissioner with three weeks written notice of the system start up and adjustment date.
C. Upon completion of the system start up, the factory-authorized technician shall provide the proper instructing to the City of New York's personnel on the adjustment and maintenance of the system.

END OF SECTION 26 09 33

SECTION 262200
Low-Voltage Transformers

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The following documents apply to all required work for the Project: (1) the Contrast Drawings, (2) the Specifications, (3) the General Conditions, (4) the Addendum and (5) the Contract (City of New York Standard Construction).

B. LEED General Requirements:

1. Refer to DDC General Conditions.

a. Section 01 33 00 "Submittal Procedures."

b. Section 01 81 13.04 "Sustainable Design Requirements for LEED v4 Buildings."

1.2 SUMMARY

A. This Section includes the following types of dry-type transformers rated 600 V and less, with capacities up to 500 kVA:

1. Dry type transformers.

1.3 SUBMITTALS

A. Refer to DDC General Conditions Section 01 33 00 "Submittal Procedures."

B. Product Data: Include rated nameplate data, capacities, weights, dimensions, minimum clearances, installed devices and features, and performance for each type and size of transformer indicated.

C. Shop Drawings: Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.

1. Wiring Diagrams: Power, signal, and control wiring.

D. Manufacturer Seismic Qualification Certification: Submit certification that transformers, accessories, and components will withstand seismic forces defined in Section 260548 "Vibration and Seismic Controls for Electrical Systems." Include the following:

1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.

a. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified."

2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

E. Source quality-control test reports.

F. Field quality-control test reports.

G. Operation and Maintenance Data: For transformers to include in emergency, operation, and maintenance manuals.

1.4 QUALITY ASSURANCE

A. Refer to DDC General Conditions Section 01 40 00 "Quality Requirements."

B. Source Limitations: Obtain each transformer type through one source from a single manufacturer.

C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to the NYC Electrical Code, and marked for intended use.

D. Comply with IEEE C57.12.91, UL Standard 506 & 1561, ANSI C57.12.00, C57.96, CE7.110, JEMA TP1 and TP2, "Test Code for Dry-Type Distribution and Power Transformers."

1.5 DELIVERY, STORAGE, AND HANDLING

A. Temporary Heating: Apply temporary heat according to manufacturer's written instructions within the enclosure of each ventilated-type unit, throughout periods during which equipment is not energized and when transformer is not in a space that is continuously under normal control of temperature and humidity.

1.6 COORDINATION

A. Coordinate size and location of concrete bases with actual transformer provided. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified in Division 03.

B. Coordinate installation of wall-mounting and structure-hanging supports with actual transformer provided.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. ACME Electric Corporation; Power Distribution Products Division.
2. Challenger Electrical Equipment Corp.; a division of Eaton Corp.
3. Controlled Power Company.
4. Eaton Electrical Inc.; Cutler-Hammer Products.
5. Federal Pacific Transformer Company; Division of Electro-Mechanical Corp.
6. General Electric Company.
7. Hammond Co.; Matra Electric, Inc.
8. Micron Industries Corp.
9. Myers Power Products, Inc.
10. Siemens Energy & Automation, Inc.
11. Square D; Schneider Electric.
12. Or approved equal.

2.2 GENERAL TRANSFORMER REQUIREMENTS

A. Description: Factory-assembled and -tested, air-cooled units for 60-Hz service. Transformers shall be 115°C temperature rise above 40°C ambient. Transformers shall be capable of carrying @ 15% continuous overload without exceeding a 150°C rise in a 40°C ambient.

B. Cores: Grain-oriented, non-aging silicon steel.

C. Coils: Continuous windings without splices except for taps.

1. Internal Coil Connections: Brazed or pressure type.
2. Coil Material: Copper.

2.3 DRY TYPE TRANSFORMERS

A. Comply with NEMA ST 20, and list and label as complying with UL 1561.

B. Provide transformers that are constructed to withstand seismic forces specified in Section 260548 "Vibration and Seismic Controls for Electrical Systems."

C. Cores: One leg per phase.

D. Enclosure: Totally enclosed, nonventilated, NEMA 250, Type 2.

1. Core and coil shall be encapsulated within resin compound, sealing out moisture and air.

E. Transformer Enclosure Finish: Comply with NEMA 250.

1. Finish Color: ANSI 49 gray.

F. Taps for Transformers Smaller Than 3 kVA.

G. Taps for Transformers 7.5 to 24 kVA: One 5 percent tap above and one 5 percent tap below normal full capacity.

H. Taps for Transformers 25 kVA and Larger: Two 2.5 percent taps above and two 2.5 percent taps below normal full capacity.

I. Insulation Class: 220 deg C, UL-component-recognized insulation system with a maximum of deg C rise above 40 deg C ambient temperature.

J. Energy Efficiency for Transformers Rated 15 kVA and Larger:

1. Complying with NEMA TP 1, Class 1 efficiency levels.
2. Tested according to NEMA TP 2.

K. K-Factor Rating: Transformers indicated to be K-factor rated shall comply with UL 1561 requirements for nonsinusoidal load current-handling capability to the degree defined by designated K-factor.

1. Unit shall not overheat when carrying full-load current with harmonic distortion corresponding to designated K-factor.
2. Indicate value of K-factor on transformer nameplate.

L. Electrostatic Shielding: Each winding shall have an independent, single, full-width copper electrostatic shield arranged to minimize interwinding capacitance.

1. Arrange coil leads and terminal strips to minimize capacitive coupling between input and output terminals.
2. Include special terminal for grounding the shield.
3. Shield Effectiveness:

a. Capacitance between Primary and Secondary Windings: Not to exceed 33 picofarads over a frequency range of 20 Hz to 1 MHz.
b. Common-Mode Noise Attenuation: Minimum of minus 120 dBA at 0.5 to 1.5 kHz; minimum of minus 65 dBA at 1.5 to 100 kHz.
c. Normal-Mode Noise Attenuation: Minimum of minus 52 dBA at 1.5 to 10 kHz.

M. Wall Brackets: Manufacturer's standard brackets.

N. Fungus Proofing: Permanent fungicidal treatment for coil and core.

O. Low-Sound-Level Requirements: Minimum of 3 dBA less than NEMA ST 20 standard sound levels when factory tested according to IEEE C57.12.91.

P. Low-Sound-Level Requirements: Maximum sound levels, when factory tested according to IEEE C57.12.91, as follows:

Size in KVA	Specification	ANSI Standard
9 KVA and Less	37 dB	40 dB
30 to 50 KVA	45 dB	45 dB

51 to 150 KVA	45 dB	50 dB
151 to 300 KVA	45 dB	55 dB
301 to 500 KVA	55 dB	60 dB
501 to 750 KVA	60 dB	62 dB
751 to 1000 KVA	62 dB	64 dB

2.4 IDENTIFICATION DEVICES

A. Nameplates: Engraved, laminated-plastic or metal nameplate for each **distribution** transformer, mounted with corrosion-resistant screws. Nameplates and label products are specified in Section 260553 "Identification for Electrical Systems."

2.5 SOURCE QUALITY CONTROL

A. Test and inspect transformers according to IEEE C57.12.91.

B. Factory Sound-Level Tests: Conduct sound-level tests on equipment for this Project.

PART 3 - EXECUTION

3.1 EXECUTION REQUIREMENTS

A. Refer to DDC General Conditions for execution requirements.

3.2 EXAMINATION

A. Examine conditions for compliance with enclosure- and ambient-temperature requirements for each transformer.

B. Verify that field measurements are as needed to maintain working clearances required by NFPA 70 and manufacturer's written instructions.

C. Examine walls, floors, roofs, and concrete bases for suitable mounting conditions where transformers will be installed.

D. Verify that ground connections are in place and requirements in Division 26 Section 260548 "Grounding and Bonding for Electrical Systems" have been met. Maximum ground resistance shall be 5 ohms at location of transformer.

E. Proceed with installation only after unsatisfactory conditions have been corrected.

3.3 INSTALLATION

A. Install wall-mounting transformers level and plumb with wall brackets fabricated by transformer manufacturer.

1. Brace wall-mounting transformers as specified in Division 26 Section 260548 "Vibration and Seismic Controls for Electrical Systems.

B. Construct concrete bases (house-keeping pad 4" high concrete) and anchor floor-mounting transformers according to manufacturer's written instructions and requirements in Section 260548 "Vibration and Seismic Controls for Electrical Systems."

3.4 CONNECTIONS

A. Ground equipment according to Section 260526 "Grounding and Bonding for Electrical Systems."

B. Connect wiring according to Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

3.5 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections and prepare test reports.

B. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections. Report results in writing.

C. Remove and replace units that do not pass tests or inspections and retest as specified above.

D. Infrared Scanning: Two months after Substantial Completion, perform an infrared scan of transformer connections.

1. Use an infrared-scanning device designed to measure temperature or detect significant deviations from normal values. Provide documentation of device calibration.
2. Perform 2 follow-up infrared scans of transformers, one at 4 months and the other at 11 months after Substantial Completion.
3. Prepare a certified report identifying transformer checked and describing results of scanning. Include notation of deficiencies detected, remedial action taken, and scanning observations after remedial action.

E. Test Labeling: On completion of satisfactory testing of each unit, attach a dated and signed "Satisfactory Test" label to tested component.

3.6 ADJUSTING

A. Record transformer secondary voltage at each unit for at least 48 hours of typical occupancy period. Adjust transformer taps to provide optimum voltage conditions at secondary terminals. Optimum is defined as not exceeding nameplate voltage plus 10 percent and not being lower than nameplate voltage minus 3 percent at maximum load conditions. Submit recording and tap settings as test results.

B. Output Settings Report: Prepare a written report recording output voltages and tap settings.

3.7 CLEANING

A. Vacuum dirt and debris; do not use compressed air to assist in cleaning.

END OF SECTION 262200

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SECTION 262413
Switchboards

PART 1 - GENERAL

1.1. RELATED DOCUMENTS

A. The following documents apply to all required work for the Project: (1) the Contract Drawings, (2) the Specifications, (3) the General Conditions, (4) the Addendum and (5) the Contract (City of New York Standard Construction Contract).

B. LEED General Requirements:

1. Refer to DDC General Conditions.

a. Section 01 33 00 "Submittal Procedures"

b. Section 01 81 13.04 "Sustainable Design Requirements for LEED v4 Buildings."

1.2. SUMMARY

A. Section Includes:

1. Service and distribution switchboards rated 600 V and less.
2. Disconnecting and overcurrent protective devices.
3. Accessory components and features.

1.3. PERFORMANCE REQUIREMENTS

A. Seismic Performance: Switchboards shall withstand the effects of earthquake motions determined according to SEI/ASCE 7.

1. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified .

1.4. SUBMITTALS

A. Refer to DDC General Conditions Section 01 33 00 "Submittal Procedures."

B. Product Data: For each type of switchboard, overcurrent protective device, transient voltage suppression device, ground-fault protector, accessory, and component indicated. Include dimensions and manufacturers' technical data on features, performance, electrical characteristics, ratings, accessories, and finishes.

C. Shop Drawings: For each switchboard and related equipment.

1. Include dimensioned plans, elevations, sections, and details, including required clearances and service space around equipment. Show tabulations of installed devices, equipment features, and ratings.

2. Detail enclosure types for types other than NEMA 250, Type 1.
3. Detail bus configuration, current, and voltage ratings.
4. Detail short-circuit current rating of switchboards and overcurrent protective devices.
5. Include descriptive documentation of optional barriers specified for electrical insulation and isolation.
6. Detail utility company's metering provisions with indication of approval by utility company.
7. Include evidence of NRTL listing for series rating of installed devices.
8. Detail features, characteristics, ratings, and factory settings of individual overcurrent protective devices and auxiliary components.
9. Include time-current coordination curves for each type and rating of overcurrent protective device included in switchboards. Submit on translucent log-log graft paper; include selectable ranges for each type of overcurrent protective device.
10. Include diagram and details of proposed mimic bus.
11. Include schematic and wiring diagrams for power, signal, and control wiring.

D. Samples: Representative portion of mimic bus with specified material and finish, for color selection.

E. Both NECA 400 and NEMA PB 2.1 recommend that installers be "qualified," which is defined in NFPA 70.

F. Seismic Qualification Certificates: Submit certification that switchboards, overcurrent protective devices, accessories, and components will withstand seismic forces defined in Section 260548 "Vibration and Seismic Controls for Electrical Systems." Include the following:

1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

G. Field Quality-Control Reports:

1. Test procedures used.
2. Test results that comply with requirements.
3. Results of failed tests and corrective action taken to achieve test results that comply with requirements.

H. Operation and Maintenance Data: For switchboards and components to include in emergency, operation, and maintenance manuals. In addition to items specified in DDC General Conditions," include the following:

1. Routine maintenance requirements for switchboards and all installed components.
2. Manufacturer's written instructions for testing and adjusting overcurrent protective devices.
3. Time-current coordination curves for each type and rating of overcurrent protective device included in switchboards. Submit on translucent log-log graft paper; include selectable ranges for each type of overcurrent protective device.

1.5. QUALITY ASSURANCE

A. Refer to DDC General Conditions Section 01 40 00 "Quality Requirements."

B. Installer Qualifications: Qualified as defined in NEMA PB 2.1 and properly trained in electrical safety as required by NFPA 70E.

C. Testing Agency Qualifications: Member company of NETA or an NRTL.

1. Testing Agency's Field Supervisor: Currently certified by NETA to supervise on-site testing.

D. Source Limitations: Obtain switchboards, overcurrent protective devices, components, and accessories from single source from single manufacturer.

E. Product Selection for Restricted Space: Drawings indicate maximum dimensions for switchboards including clearances between switchboards and adjacent surfaces and other items. Comply with indicated maximum dimensions.

F. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

G. Comply with NEMA PB 2.

H. Comply with NFPA 70.

I. Comply with UL 891.

1.6. DELIVERY, STORAGE, AND HANDLING

A. Deliver switchboards in sections or lengths that can be moved past obstructions in delivery path.

B. Remove loose packing and flammable materials from inside switchboards and install temporary electric heating (250 W per section) to prevent condensation.

C. Handle and prepare switchboards for installation according to NECA 400, NEMA PB 2.

1.7. PROJECT CONDITIONS

A. Installation Pathway: Remove and replace access fencing, doors, lift-out panels, and structures to provide pathway for moving switchboards into place.

B. Environmental Limitations:

1. Do not deliver or install switchboards until spaces are enclosed and weathertight, wet work in spaces is complete and dry, work above switchboards is complete, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.

2. Rate equipment for continuous operation under the following conditions unless otherwise indicated:

   a. Ambient Temperature: Not exceeding 104 deg F (40 deg C).
   b. Altitude: Not exceeding 6600 feet (2000 m).

C. Service Conditions: NEMA PB 2, usual service conditions, as follows:

1. Ambient temperatures within limits specified.
2. Altitude not exceeding 6600 feet (2000 m).

1.8. COORDINATION

A. Coordinate layout and installation of switchboards and components with other construction that penetrates walls or is supported by them, including electrical and other types of equipment, raceways, piping, encumbrances to workspace clearance requirements, and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.

B. Coordinate sizes and locations of concrete bases with actual equipment provided. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified in concrete specification sections.

1.9. WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to restore or replace transient voltage suppression devices that fail in materials or workmanship within specified warranty period.

1. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1. MANUFACTURED UNITS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following available manufacturers offering products that may be incorporated into the Work include the following:

1. Electric Switchboard.
2. All City Switchboard.
3. Electrotech.
4. Lincoln Electric.
5. Or Approved Equal

B. Front-Connected, Front-Accessible Switchboards:

1. Main Devices: Fixed, individually mounted.
2. Branch Devices: Panel mounted.
3. Sections front and rear aligned.

C. Nominal System Voltage: 480/277VY.

D. Main-Bus Continuous: As noted.

E. Seismic Requirements: Fabricate and test switchboards according to IEEE 344 to withstand seismic forces defined in Section 260548 "Vibration and Seismic Controls for Electrical Systems."

F. Indoor Enclosures: Steel, NEMA 250, Type 1.

G. Enclosure Finish for Indoor Units: Factory-applied finish in manufacturer's standard gray finish over a rust-inhibiting primer on treated metal surface.

H. Insulation and isolation for main and vertical buses of feeder sections.

I. Cubical Space Heaters: Factory-installed electric space heaters of sufficient wattage in each vertical section to maintain enclosure temperature above expected dew point.

J. Utility Metering Compartment: Fabricated, barrier compartment and section complying with utility company's requirements; hinged sealed door; buses provisioned for mounting utility company's current transformers and potential transformers or potential taps as required by utility company. If separate vertical section is required for utility metering, match and align with basic switchboard. Provide service entrance label and necessary applicable service entrance features.

K. Customer Metering Compartment: A separate customer metering compartment and section with front hinged door, for indicated metering, and current transformers for each meter. Current transformer secondary wiring shall be terminated on shorting-type terminal blocks. Include potential transformers having primary and secondary fuses with disconnecting means and secondary wiring terminated on terminal blocks.

L. Bus Transition and Incoming Pull Sections: Matched and aligned with basic switchboard.

M. Removable, Hinged Rear Doors and Compartment Covers: Secured by standard bolts, for access to rear interior of switchboard.

N. Hinged Front Panels: Allow access to circuit breaker, metering, accessory, and blank compartments.

O. Pull Box on Top of Switchboard:

1. Adequate ventilation to maintain temperature in pull box within same limits as switchboard.
2. Set back from front to clear circuit-breaker removal mechanism.
3. Removable covers shall form top, front, and sides. Top covers at rear shall be easily removable for drilling and cutting.
4. Bottom shall be insulating, fire-resistive material with separate holes for cable drops into switchboard.
5. Cable supports shall be arranged to facilitate cabling and adequate to support cables indicated, including those for future installation.

P. Buses and Connections: Three phase, four wire unless otherwise indicated.

1. Phase- and Neutral-Bus Material: Hard-drawn copper of 98 percent conductivity, silver-plated, with copper tin-plated copper feeder circuit-breaker line connections.
2. Load Terminals: Insulated, rigidly braced, runback bus extensions, of same material as through buses, equipped with mechanical connectors for outgoing circuit conductors. Provide load terminals for future circuit-breaker positions at full-ampere rating of switches position.
3. Ground Bus: Minimum-size required by UL 891, hard-drawn copper of 98 percent conductivity, equipped with mechanical connectors for feeder and branch-circuit ground conductors.
4. Main Phase Buses and Equipment Ground Buses: Uniform capacity for entire length of switchboard's main and distribution sections. Provide for future extensions from both ends.
5. Neutral Buses: 100 percent of the ampacity of phase buses unless otherwise indicated, equipped with mechanical connectors for outgoing circuit neutral cables.
6. Isolation Barrier Access Provisions: Permit checking of bus-bolt tightness.

Q. Future Devices: Equip compartments with mounting brackets, supports, bus connections, and appurtenances at full rating of switch compartment.

R. Bus-Bar Insulation: Factory-applied, flame-retardant, tape wrapping of individual bus bars or flame-retardant, spray-applied insulation. Minimum insulation temperature rating of 105 deg C.

2.2. DISCONNECTING AND OVERCURRENT PROTECTIVE DEVICES

A. Bolted-Pressure Contact Switch: (over 800A) OPERATING mechanism uses rotary-mechanical-bolting action to produce and maintain high clamping pressure on the switch blade after it engages the stationary contacts.

1. Manufacturers: Subject to compliance with requirements:

   a. Boltswitch, Inc.
   b. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
   c. Pringle Electrical Manufacturing Company, Inc.
   d. Siemens Energy & Automation, Inc.
   e. Square D; a brand of Schneider Electric.
   f. Or Approved Equal

2. Main-Contact Interrupting Capability: Minimum of 12 times the switch current rating.
3. Operating Mechanism: Manual handle operation to close switch; stores energy in mechanism for opening and closing.

   a. Electrical Trip: Operation of lever or push-button trip switch, or trip signal from ground-fault relay or remote-control device, causes switch to open.
   b. Mechanical Trip: Operation of mechanical lever, push button, or other device causes switch to open.

4. Auxiliary Switches: Factory installed, single pole, double throw, with leads connected to terminal block, and including one set more than quantity required for functional performance indicated.
5. Service-Rated Switches: Labeled for use as service equipment.

B. Fused Switch: NEMA KS 1, Type HD; clips to accommodate specified fuses; lockable handle.

C. Fuses are specified in Section 262813 "Fuses."

2.3. IDENTIFICATION

A. Service Equipment Label: NRTL labeled for use as service equipment for switchboards with one or more service disconnecting and overcurrent protective devices.

PART 3 - EXECUTION

3.1. EXECUTION REQUIREMENTS

A. Refer to DDC General Conditions for execution requirements.

3.2. EXAMINATION

A. Receive, inspect, handle, and store switchboards according to NECA 400, NEMA PB 2.1.

B. Examine switchboards before installation. Reject switchboards that are moisture damaged or physically damaged.

C. Examine elements and surfaces to receive switchboards for compliance with installation tolerances and other conditions affecting performance of the Work.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.3. INSTALLATION

A. Install switchboards and accessories according to NECA 400, NEMA PB 2.1.

B. Equipment Mounting: Install switchboards on concrete base, 4-inch (100-mm) nominal thickness. Comply with requirements for concrete base specified in Section 033000 "Cast-in-Place Concrete."

1. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch (450-mm) centers around the full perimeter of concrete base.
2. For supported equipment, install epoxy-coated anchor bolts that extend through concrete base and anchor into structural concrete floor.
3. Place and secure anchorage devices. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
4. Install anchor bolts to elevations required for proper attachment to switchboards.

C. Temporary Lifting Provisions: Remove temporary lifting eyes, channels, and brackets and temporary blocking of moving parts from switchboard units and components.

D. Comply with mounting and anchoring requirements specified in Section 260548 "Vibration and Seismic Controls for Electrical Systems."

E. Operating Instructions: Frame and mount the printed basic operating instructions for switchboards, including control and key interlocking sequences and emergency procedures. Fabricate frame of finished wood or metal and cover instructions with clear acrylic plastic. Mount on front of switchboards.

F. Install filler plates in unused spaces of panel-mounted sections.

G. Install overcurrent protective devices, transient voltage suppression devices, and instrumentation.

1. Set field-adjustable switches/fuse ranges.

H. Install spare-fuse cabinet.

I. Comply with NECA 1.

3.4. CONNECTIONS

A. Comply with requirements for terminating feeder bus specified in electrical specification sections. Drawings indicate general arrangement of bus, fittings, and specialties.

3.5. IDENTIFICATION

A. Switchboard Nameplates: Label each switchboard compartment with a nameplate complying with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

3.6. FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

B. Acceptance Testing Preparation:

1. Test insulation resistance for each switchboard bus, component, connecting supply, feeder, and control circuit.
2. Test continuity of each circuit.

C. Tests and Inspections:

1. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.
3. Perform the following infrared scan tests and inspections and prepare reports:

a. Initial Infrared Scanning: After Substantial Completion, but not more than 60 days after Final Acceptance, perform an infrared scan of each switchboard. Remove front and rear panels so joints and connections are accessible to portable scanner.
b. Follow-up Infrared Scanning: Perform an additional follow-up infrared scan of each switchboard 11 months after date of Substantial Completion.

c. Instruments and Equipment:

1) Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.

4. Test and adjust controls, remote monitoring, and safeties. Replace damaged and malfunctioning controls and equipment.

D. Switchboard will be considered defective if it does not pass tests and inspections.

E. Prepare test and inspection reports, including a certified report that identifies switchboards included and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

3.7. ADJUSTING

A. Adjust moving parts and operable components to function smoothly, and lubricate as recommended by manufacturer.

B. Set field-adjustable circuit-breaker trip ranges as indicated.

3.8. PROTECTION

A. Temporary Heating: Apply temporary heat, to maintain temperature according to manufacturer's written instructions, until switchboard is ready to be energized and placed into service.

3.9. INSTRUCTION

A. Engage a factory-authorized service representative to instruct building's operating personnel to adjust, operate, and maintain switchboards, overcurrent protective devices, instrumentation, and accessories.

END OF SECTION 262413

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SECTION 262414
Electronic Sub-Metering System

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The following documents apply to all required work for the Project: (1) the Contract Drawings, (2) the Specifications, (3) the General Conditions, (4) the Addendum and (5) the Contract (City of New York Standard Construction Contract).

B. LEED General Requirements:

1. Refer to DDC General Conditions:

a. Section 01 33 00 "Submittal Procedures."

b. Section 01 81 13.04 "Sustainable Design Requirements for LEED v4 Buildings."

1.2 SUMMARY

A. Contractor shall provide the Automated Metering System in accordance with Contract Documents.

B. The system shall consist of revenue grade meters with electronic electricity meters installed at each individual distribution panel or point to be metered, as noted in the electrical diagrams, necessary current transformers, potential taps, related wiring and accessories, and a central computer complete with modem or means of communication for Automatic Meter Reading (AMR).

C. Contractor shall furnish, install and verify as operational an electric, computerized metering system which shall be microprocessor controlled, consisting of all solid-state components. Electricity meters shall be manually readable using local Liquid Crystal Display (LCD) and push-button, and automatically readable utilizing one or more of the following methods: Frequency Hopping Spread Spectrum Power Line Carrier Communication, Telephone Modem Communication, RS-232 Serial Port Communication. The system shall be capable of using all of these methods of communication at the same property.

D. Manufacturers:

1. Subject to compliance with requirements, provide:

a. Quad Logic Controls Corporation, Mini Closet 5.
b. SATEC BFM 136.
c. Schneider Electric Power Logic BCPM
d. Or Approved Equal.

1.3 RELATED WORK

A. Related work specified in other Sections:

1. Hangers And Supports For Electrical Systems (Section 260529)
2. Raceway And Boxes For Electrical Systems (Section 260533)
3. Grounding And Bonding For Electrical Systems (260526)

1.4 STANDARDS

A. Listed by Underwriters Laboratories, Inc.
B. FCC Part 15, Subpart J, Class B
C. Modems Registered with the FCC under Part 68 Rules & Regulations
D. Approved by the New York City Advisory Board for code compliance

1.5 SUBMITTALS

A. Shop Drawings: Submit shop drawings and manufacturer's data for each component of the system, installation and user instructions, installation verification instructions and field test requirements.

B. Detail of panel installation with dimensions.

C. Compliance with city and state regulatory agencies.

PART 2 – PRODUCTS

2.1 SYSTEM REQUIREMENTS

A. The system shall be a fully automated, microprocessor based utilities measurement system. At its minimum configuration it will measure and record the usage of electricity in non-volatile memory (CMOS RAM), and communicate the reading to an on-site or remote computer (i.e. the billing computer).

B. Each meter shall interface to the electrical load being measured with a direct voltage tap, up to 600VAC, and with current transformers (solid or split core). The preferred current transformers shall have a 100mA secondary, but provision shall be available to interface with 5A secondary current transformers.

C. Each meter shall display its readings on a local LCD display. The consumption readings shall be up to nine (9) digits. In the default display, up to six (6) digits to the left of a decimal point shall be for kilowatt-hours, and three (3) digits to the right of a decimal point shall be for watt-hours. Read-out shall be to a single watt-hour for a 100A meter, and at the same ratio for all configurations not requiring and HCA (High Current Adapter). The consumption readings of all other measured parameters (e.g. kVARh, kVAh) shall be in the same format.

D. Each meter shall be equipped with a clock/calendar that automatically accommodates leap years and daylight savings time. The daylight savings time feature can be disabled when not required. The clock/calendar shall be backed up by battery and continue operating during power outages.

E. Each meter shall measure and record peak kW Demand along with the time and date at which it occurs. Peak demands shall be capable of being read and reset by the billing computer. The demand interval shall be factory programmed in each meter and shall be permanent.

F. Each meter shall maintain a forty (40) day log of daily Time-of-Use consumption and peak demand readings along with the time and date at which the daily peak demands occur. The consumption recorded shall be the reading at the end of the Time-of-Use period of the end of the day. The peak demand recorded in the log shall be the peak demand for the Time-of-Use period for that day. The log shall include reactive and apparent energy consumption and peak demands, with time and date stamp, if those options are enabled. The log shall contain a single "All Hours" Time-of-Use period even when the Time-of-Use feature is not explicitly used. See Section 2.2 below, for a description of the options.

G. Each meter shall perform Phase Diagnostics. Phase Diagnostic Registers shall include multipliers for amperage, voltage and watts, and line frequency. On a Per phase basis Phase Diagnostics shall include voltage, VAR phase shift, accumulated kWh and VARh, and instantaneous amps, watts, VAR's, VA's, phase angel (degrees displacement between current and voltage waveforms), and Power Factor.

H. Each meter shall perform Event Diagnostics. The Event Diagnostic Registers hall include Time and Date and the number of times the time has been changed, number of tampers and number of times the box was closed with the time and date of last occurrence number of power downs, power ups and start ups (POST) with time and date of last occurrence, and the number of times the accumulated peak demand has been reset, also with the time and date of the last occurrence. Meters that communicate by Power Line Carrier shall also include counts of properly received messages, rejected messages and the number of transmissions without reply.

2.2. THE SYSTEM SHALL BE CAPABLE OF THE OPTIONS NOTED BELOW:

A. Each meter shall be capable of measuring and recording reactive energy: kVARh consumption and kVAR demand. Demand shall be recorded along with the time and date at which it occurs. Peak de mands shall be capable of being read and reset by the billing computer. The demand interval shall be factory programmed in each meter and shall be permanent.

B. Each meter shall be capable of measuring and recording apparent energy: kVAh consumption and kVA demand. Demand shall be recorded along with the time and date at which it occurs. Peak demands shall be capable of being read and reset by the billing computer. The demand interval shall be factory programmed in each meter and shall be permanent.

C. Each meter shall be capable of reading up to three (3) dry contact, Form A pulse inputs to automate the reading of other utilities such as gas, water or BTU's. The pulse inputs shall be individually factory programmable as counter, as above, or as timers for such applications as run-time measurement.

D. Each meter shall be capable of providing a KYZ, (dry contact, Form C), pulse output to interface with energy management or building automation systems. The KYZ output can be factory programmed as

Kwh, kVARh, or kVAh. The value of an output pulse can also be factory programmed to meet customer requirements.

E. Each meter shall be capable of maintaining a one hundred twenty (120) day log of fifteen (15) minute demands with time and date stamp. The log is capable of being used as a 120 day log for a single energy parameter (e.g. kW), as two 60 day logs for two parameters (e.g. kW and kVAR or kVA), or as three 40 day logs for three parameters (e.g. kW, kVAR and kVA).

F. The system shall be able to communicate with the billing computer by one or more of the methods noted below.

1. Power Line Carrier. Each meter shall be capable of communication over the billing's electrical power wiring to a Scan Transponder via bidirectional, frequency hopping, spread spectrum power line carrier communications. These signals shall pass through transformers rated 600 kVA or less. The Scan Transponder and each meter shall select the best available f phase, frequency range and baud rate for communication at any given time.

2. The number of meters reporting to a single Scan Transponder is determined by the information to communicated and the amount of non-volatile memory in the Scan Transponder. The range is from 1 to 2,048 meters. All communication shall be direct between Scan Transponder and each meter, and under control of the Scan Transponder. Meters will not repeat messages from other meters nor will message routing be determined by meters.

3. One Scan Transponder shall be provided per electrical service entrance at the site. Each Scan Transponder shall be equipped with an RS-232 serial port. One Scan Transponder at the site shall be equipped with a Modem if the billing computer is remote.

   Multiple Scan Transponders shall be connected by Data Link. Meters may also be connected to the Scan Transponder by Data Link.

G. Modem. Individual meters shall be capable of being equipped with a modem for direct connection to a telephone line.

H. RS-232 Serial Port. All meters shall be capable of being equipped with a local serial port for Direct connection to a terminal or PC.

PART 3 - EXECUTION

3.1 EXECUTION REQUIREMENTS

A. Refer to DDC General Conditions for execution requirements.

3.2 CALIBRATION

A. Meters shall be factory calibrated. This calibration shall be valid for the life of the meter.

3.3 SYSTEM COMMISSIONING

A. Verification of proper installation and operation of each meter in the system shall be provided and made available from the factory or from local Authorized service centers.

3.4 SYSTEM MAINTENANCE

A. Maintenance of the system shall be performed by the installing Contractor, Authorized Service Center or factory personnel, as required, during the warranty period. 3 Year extended maintenance contracts shall be provided and made available from the Authorized Service Center or the factory.

3.5 DEMONSTRATION

A. Engage a factory-authorized service representative to train maintenance personnel on the system for period of minimum of two 3 hour sessions.

END OF SECTION 262414

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SECTION 262416
Panelboards

PART 1 - GENERAL

1.1. RELATED DOCUMENTS

A. The following documents apply to all required work for the Project: (1) the Contract Drawings, (2) the Specifications, (3) the General Conditions, (4) the Addendum and (5) the Contract (City of New York Standard Construction Contract).

B. LEED / Environmentally Preferable Purchase (EPP) General Requirements:

1. Refer to DDC General Conditions and the Addendum to the General Conditions.
2. LEED requirements apply to all Phase II work with the exception of the Existing Building scope. EPP requirements apply to the project's Existing Building scope only.

1.2. SUMMARY

A. Section Includes:

1. Distribution panelboards.
2. Lighting and appliance branch-circuit panelboards.

1.3. DEFINITIONS

A. SVR: Suppressed voltage rating.

1.4. PERFORMANCE REQUIREMENTS

A. Seismic Performance: Panelboards shall withstand the effects of earthquake motions determined according to SEI/ASCE 7.

1. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified.

1.5. SUBMITTALS

A. Refer to DDC General Conditions Section 01 33 00 "Submittal Procedures."

B. Product Data: For each type of panelboard, switching and overcurrent protective device, accessory, and component indicated. Include dimensions and manufacturers' technical data on features, performance, electrical characteristics, ratings, and finishes.

C. Shop Drawings: For each panelboard and related equipment.

1. Include dimensioned plans, elevations, sections, and details. Show tabulations of installed devices, equipment features, and ratings.
2. Detail enclosure types and details for types other than NEMA 250, Type 1.
3. Detail bus configuration, current, and voltage ratings.
4. Short-circuit current rating of panelboards and overcurrent protective devices.
5. Include evidence of NRTL listing for series rating of installed devices.
6. Detail features, characteristics, ratings, and factory settings of individual overcurrent protective devices and auxiliary components.
7. Include wiring diagrams for power, signal, and control wiring.
8. Include time-current coordination curves for each type and rating of overcurrent protective device included in panelboards. Submit on translucent log-log graft paper; include selectable ranges for each type of overcurrent protective device.

D. Qualification Data: For qualified testing agency.

E. Seismic Qualification Certificates: Submit certification that panelboards, overcurrent protective devices, accessories, and components will withstand seismic forces defined in Section 260548 "Vibration and Seismic Controls for Electrical Systems." Include the following:

1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

F. Field Quality-Control Reports:

1. Test procedures used.
2. Test results that comply with requirements.
3. Results of failed tests and corrective action taken to achieve test results that comply with requirements.

G. Panelboard Schedules: For installation in panelboards. Submit final versions after load balancing.

H. Operation and Maintenance Data: For panelboards and components to include in emergency, operation, and maintenance manuals. In addition to items specified in DDC General Conditions include the following:

1. Manufacturer's written instructions for testing and adjusting overcurrent protective devices.
2. Time-current curves, including selectable ranges for each type of overcurrent protective device that allows adjustments.

1.6. QUALITY ASSURANCE

A. Refer to DDC General Conditions Section 01 40 00 "Quality Requirements."

B. Testing Agency Qualifications: Member company of NETA or an NRTL.

C. Source Limitations: Obtain panelboards, overcurrent protective devices, components, and accessories from single source from single manufacturer.

D. Product Selection for Restricted Space: Drawings indicate maximum dimensions for panelboards including clearances between panelboards and adjacent surfaces and other items. Comply with indicated maximum dimensions.

E. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

F. Comply with NEMA PB 1.

G. Comply with NFPA 70.

1.7. DELIVERY, STORAGE, AND HANDLING

A. Remove loose packing and flammable materials from inside panelboards; install temporary electric heating (250 W per panelboard) to prevent condensation.

B. Handle and prepare panelboards for installation according to NECA 407 NEMA PB 1.

1.8. PROJECT CONDITIONS

A. Environmental Limitations:

1. Do not deliver or install panelboards until spaces are enclosed and weathertight, wet work in spaces is complete and dry, work above panelboards is complete, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.
2. Rate equipment for continuous operation under the following conditions unless otherwise indicated:

    a. Ambient Temperature: Not exceeding minus 22 deg F (minus 30 deg C) to plus 104 deg F (plus 40 deg C).
    b. Altitude: Not exceeding 6600 feet (2000 m).

B. Service Conditions: NEMA PB 1, usual service conditions, as follows:

1. Ambient temperatures within limits specified.
2. Altitude not exceeding 6600 feet (2000 m).

1.9. COORDINATION

A. Coordinate layout and installation of panelboards and components with other construction that penetrates walls or is supported by them, including electrical and other types of equipment, raceways, piping, encumbrances to workspace clearance requirements, and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.

B. Coordinate sizes and locations of concrete bases with actual equipment provided. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified in concrete specification sections.

1.10. WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to restore or replace transient voltage suppression devices that fail in materials or workmanship within specified warranty period.

1. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1. GENERAL REQUIREMENTS FOR PANELBOARDS

A. Fabricate and test panelboards according to IEEE 344 to withstand seismic forces defined in Section 260548 "Vibration and Seismic Controls for Electrical Systems."

B. Enclosures: Flush- and surface-mounted cabinets.

1. Rated for environmental conditions at installed location.

   a. Indoor Dry and Clean Locations: NEMA 250, Type 1.
   b. Outdoor Locations: NEMA 250, Type 3R.
   c. Indoor Locations Subject to Dust, Falling Dirt, and Dripping Noncorrosive Liquids: NEMA 250, Type 12.

2. Front: Secured to box with concealed trim clamps. For surface-mounted fronts, match box dimensions; for flush-mounted fronts, overlap box.
3. Hinged Front Cover: Entire front trim hinged to box and with standard door within hinged trim cover.
4. Skirt for Surface-Mounted Panelboards: Same gage and finish as panelboard front with flanges for attachment to panelboard, wall, and ceiling or floor.
5. Gutter Extension and Barrier: Same gage and finish as panelboard enclosure; integral with enclosure body. Arrange to isolate individual panel sections.
6. Finishes:

   a. Panels and Trim: galvanized steel, factory finished immediately after cleaning and pretreating with manufacturer's standard two-coat, baked-on finish consisting of prime coat and thermosetting topcoat.
   b. Back Boxes: Same finish as panels and trim.
   c. Fungus Proofing: Permanent fungicidal treatment for overcurrent protective devices and other components.

7. Directory Card: Inside panelboard door, mounted in metal frame with transparent protective cover.

C. Incoming Mains Location: Top and bottom.

D. Phase, Neutral, and Ground Buses:

1. Material: Hard-drawn copper, 98 percent conductivity.
2. Equipment Ground Bus: Adequate for feeder and branch-circuit equipment grounding conductors; bonded to box.
3. Extra-Capacity Neutral Bus: Neutral bus rated 200 percent of phase bus and UL listed as suitable for nonlinear loads.
4. Split Bus: Vertical buses divided into individual vertical sections.

E. Conductor Connectors: Suitable for use with conductor material and sizes.

1. Material: Hard-drawn copper, 98 percent conductivity.
2. Main and Neutral Lugs: Mechanical type.
3. Ground Lugs and Bus-Configured Terminators: Mechanical type.
4. Feed-Through Lugs: Mechanical type, suitable for use with conductor material. Locate at opposite end of bus from incoming lugs or main device.
5. Subfeed (Double) Lugs: Mechanical type suitable for use with conductor material. Locate at same end of bus as incoming lugs or main device.
6. Gutter-Tap Lugs: Mechanical type suitable for use with conductor material. Locate at same end of bus as incoming lugs or main device.

F. Service Equipment Label: NRTL labeled for use as service equipment for panelboards or load centers with one or more main service disconnecting and overcurrent protective devices.

G. Future Devices: Mounting brackets, bus connections, filler plates, and necessary appurtenances required for future installation of devices.

H. Panelboard Short-Circuit Current Rating: Fully rated to interrupt symmetrical short-circuit current available at terminals.

2.2. DISTRIBUTION PANELBOARDS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
2. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
3. Siemens Energy & Automation, Inc.
4. Square D; a brand of Schneider Electric.
5. Or approved equal.

B. Panelboards: NEMA PB 1, power and feeder distribution type.

C. Doors: Secured with vault-type latch with tumbler lock; keyed alike.

1. For doors more than 36 inches (914 mm) high, provide two latches, keyed alike.

D. Mains: Fused switch.

E. Branch Overcurrent Protective Devices for Circuit-Breaker Frame Sizes 125 A and Smaller: Bolt-on circuit breakers.

F. Branch Overcurrent Protective Devices for Circuit-Breaker Frame Sizes Larger Than 125 A: Bolt-on circuit breakers.

G. Branch Overcurrent Protective Devices: Fused switches.

2.3. LIGHTING AND APPLIANCE BRANCH-CIRCUIT PANELBOARDS

A. Manufacturers: Subject to compliance with requirements:

1. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
2. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
3. Siemens Energy & Automation, Inc.
4. Square D; a brand of Schneider Electric.
5. Or Approved Equal

B. Panelboards: NEMA PB 1, lighting and appliance branch-circuit type.

C. Mains: Circuit breaker or lugs only.

D. Branch Overcurrent Protective Devices: Bolt-on circuit breakers, replaceable without disturbing adjacent units.

E. Doors: Concealed hinges; secured with flush latch with tumbler lock; keyed alike.

F. Column-Type Panelboards: Narrow gutter extension, with cover, to overhead junction box equipped with ground and neutral terminal buses.

2.4. DISCONNECTING AND OVERCURRENT PROTECTIVE DEVICES

A. Manufacturers: Subject to compliance with requirements:

1. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
2. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
3. Siemens Energy & Automation, Inc.
4. Square D; a brand of Schneider Electric.
5. Or Approved Equal

B. Molded-Case Circuit Breaker (MCCB): Comply with UL 489, with interrupting capacity to meet available fault currents.

1. Thermal-Magnetic Circuit Breakers: Inverse time-current element for low-level overloads, and instantaneous magnetic trip element for short circuits. Adjustable magnetic trip setting for circuit-breaker frame sizes 250 A and larger.

2. Adjustable Instantaneous-Trip Circuit Breakers: Magnetic trip element with front-mounted, field-adjustable trip setting.
3. Electronic trip circuit breakers with rms sensing; field-replaceable rating plug or field-replicable electronic trip; and the following field-adjustable settings:

    a. Instantaneous trip.
    b. Long- and short-time pickup levels.
    c. Long- and short-time time adjustments.
    d. Ground-fault pickup level, time delay, and I^2t response.

4. Current-Limiting Circuit Breakers: Frame sizes 400 A and smaller; let-through ratings less than NEMA FU 1, RK-5.
5. GFCI Circuit Breakers: Single- and two-pole configurations with Class A ground-fault protection (6-mA trip).
6. Ground-Fault Equipment Protection (GFEP) Circuit Breakers: Class B ground-fault protection (30-mA trip).
7. Arc-Fault Circuit Interrupter (AFCI) Circuit Breakers: Comply with UL 1699; 120/240-V, single-pole configuration.
8. Molded-Case Circuit-Breaker (MCCB) Features and Accessories:

    a. Standard frame sizes, trip ratings, and number of poles.
    b. Lugs: Mechanical style, suitable for number, size, trip ratings, and conductor materials.
    c. Application Listing: Appropriate for application; Type SWD for switching fluorescent lighting loads; Type HID for feeding fluorescent and high-intensity discharge (HID) lighting circuits.
    d. Ground-Fault Protection: Integrally mounted relay and trip unit with adjustable pickup and time-delay settings, push-to-test feature, and ground-fault indicator.
    e. Communication Capability: Universal-mounted communication module with functions and features compatible with power monitoring and controls system.
    f. Shunt Trip: 120 -V trip coil energized from separate circuit, set to trip at 75 percent of rated voltage.
    g. Undervoltage Trip: Set to operate at 35 to 75 percent of rated voltage with field-adjustable 0.1- to 0.6-second time delay.
    h. Auxiliary Contacts: Two SPDT switches with "a" and "b" contacts; "a" contacts mimic circuit-breaker contacts and "b" contacts operate in reverse of circuit-breaker contacts.
    i. Alarm Switch: Single-pole, normally open contact that actuates only when circuit breaker trips.
    j. Key Interlock Kit: Externally mounted to prohibit circuit-breaker operation; key shall be removable only when circuit breaker is in off position.
    k. Zone-Selective Interlocking: Integral with electronic trip unit; for interlocking ground-fault protection function with other upstream or downstream devices.
    l. Multipole units enclosed in a single housing or factory assembled to operate as a single unit.
    m. Handle Padlocking Device: Fixed attachment, for locking circuit-breaker handle in on or off position.
    n. Handle Clamp: Loose attachment, for holding circuit-breaker handle in on position.

C. Fused Switch: NEMA KS 1, Type HD; clips to accommodate specified fuses; lockable handle.

1. Fuses, and Spare-Fuse Cabinet: Comply with requirements specified in Section 262813 "Fuses."

2. Fused Switch Features and Accessories: Standard ampere ratings and number of poles.
3. Auxiliary Contacts: Two normally open and normally closed contact(s) that operate with switch handle operation.

2.5. ACCESSORY COMPONENTS AND FEATURES

A. Accessory Set: Include tools and miscellaneous items required for overcurrent protective device test, inspection, maintenance, and operation.

B. Portable Test Set: For testing functions of solid-state trip devices without removing from panelboard. Include relay and meter test plugs suitable for testing panelboard meters and switchboard class relays.

PART 3 - EXECUTION

3.1. EXECUTION REQUIREMENTS

A. Refer to DDC General Conditions for execution requirements.

3.2. EXAMINATION

A. Receive, inspect, handle, and store panelboards according to NECA 407 NEMA PB 1.1.

B. Examine panelboards before installation. Reject panelboards that are damaged or rusted or have been subjected to water saturation.

C. Examine elements and surfaces to receive panelboards for compliance with installation tolerances and other conditions affecting performance of the Work.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.3. INSTALLATION

A. Install panelboards and accessories according to NECA 407, NEMA PB 1.1.

B. Equipment Mounting: Install panelboards on concrete bases, 4-inch (100-mm) nominal thickness. Comply with requirements for concrete base specified in Section 033000 "Cast-in-Place Concrete".

1. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch (450-mm) centers around full perimeter of base.
2. For panelboards, install epoxy-coated anchor bolts that extend through concrete base and anchor into structural concrete floor.
3. Place and secure anchorage devices. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
4. Install anchor bolts to elevations required for proper attachment to panelboards.
5. Attach panelboard to the vertical finished or structural surface behind the panelboard.

C. Temporary Lifting Provisions: Remove temporary lifting eyes, channels, and brackets and temporary blocking of moving parts from panelboards.

D. Comply with mounting and anchoring requirements specified in Section 260548 "Vibration and Seismic Controls for Electrical Systems."

E. Mount top of trim 90 inches (2286 mm) above finished floor unless otherwise indicated.

F. Mount panelboard cabinet plumb and rigid without distortion of box. Mount recessed panelboards with fronts uniformly flush with wall finish and mating with back box.

G. Install overcurrent protective devices and controllers not already factory installed.

1. Set field-adjustable, circuit-breaker trip ranges.

H. Install filler plates in unused spaces.

I. Stub four 1-inch (27-GRC) empty conduits from panelboard into accessible ceiling space or space designated to be ceiling space in the future. Stub four 1-inch (27-GRC) empty conduits into raised floor space or below slab not on grade.

J. Arrange conductors in gutters into groups and bundle and wrap with wire ties after completing load balancing.

K. Comply with NECA 1.

3.4. IDENTIFICATION

A. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs complying with Section 260553 "Identification for Electrical Systems."

B. Create a directory to indicate installed circuit loads after balancing panelboard loads; incorporate building's final room designations. Obtain approval before installing. Use a computer or typewriter to create directory; handwritten directories are not acceptable.

C. Panelboard Nameplates: Label each panelboard with a nameplate complying with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

D. Device Nameplates: Label each branch circuit device in distribution panelboards with a nameplate complying with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

3.5. FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

B. Acceptance Testing Preparation:

1. Test insulation resistance for each panelboard bus, component, connecting supply, feeder, and control circuit.
2. Test continuity of each circuit.

C. Tests and Inspections:

1. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.
3. Perform the following infrared scan tests and inspections and prepare reports:

   a. Initial Infrared Scanning: After Substantial Completion, but not more than 60 days after Final Acceptance, perform an infrared scan of each panelboard. Remove front panels so joints and connections are accessible to portable scanner.
   b. Follow-up Infrared Scanning: Perform an additional follow-up infrared scan of each panelboard 11 months after date of Substantial Completion.
   c. Instruments and Equipment:

      1) Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.

D. Panelboards will be considered defective if they do not pass tests and inspections.

E. Prepare test and inspection reports, including a certified report that identifies panelboards included and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

3.6. ADJUSTING

A. Adjust moving parts and operable component to function smoothly, and lubricate as recommended by manufacturer.

B. Set field-adjustable circuit-breaker trip ranges as indicated.

C. Circuit changes made during load balancing may negate color-coding of phases and circuits.

D. Load Balancing: After Substantial Completion, but not more than 60 days after Final Acceptance, measure load balancing and make circuit changes.

1. Measure as directed during period of normal system loading.
2. Perform load-balancing circuit changes outside normal occupancy/working schedule of the facility and at time directed. Avoid disrupting critical 24-hour services such as fax machines and on-line data processing, computing, transmitting, and receiving equipment.
3. After circuit changes, recheck loads during normal load period. Record all load readings before and after changes and submit test records.
4. Tolerance: Difference exceeding 20 percent between phase loads, within a panelboard, is not acceptable. Rebalance and recheck as necessary to meet this minimum requirement.

3.7. PROTECTION

A. Temporary Heating: Apply temporary heat to maintain temperature according to manufacturer's written instructions.

END OF SECTION 262416

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Section 262726
Wiring Devices

PART 1 - GENERAL

1.1. RELATED DOCUMENTS

A. The following documents apply to all required work for the Project: (1) the Contract Drawings, (2) the Specifications, (3) the General Conditions, (4) the Addendum and (5) the Contract (City of New York Standard Construction Contract).

B. LEED / Environmentally Preferable Purchase (EPP) General Requirements:

1. Refer to DDC General Conditions and the Addendum to the General Conditions.
2. LEED requirements apply to all Phase II work with the exception of the Existing Building scope. EPP requirements apply to the project's Existing Building scope only.

1.2. SUMMARY

A. This Section includes the following:

1. Receptacles, receptacles with integral GFCI, and associated device plates.
2. Twist-locking receptacles.
3. Receptacles with integral surge suppression units.
4. Wall-box motion sensors.
5. Wall-switch and exterior occupancy sensors.
6. Communications outlets.
7. Cord and plug sets.

B. Related Sections include the following:

1. Section 271500 "Communications Horizontal Cabling" for workstation outlets.

1.3. DEFINITIONS

A. EMI: Electromagnetic interference.

B. GFCI: Ground-fault circuit interrupter.

C. Pigtail: Short lead used to connect a device to a branch-circuit conductor.

D. RFI: Radio-frequency interference.

E. UTP: Unshielded twisted pair.

1.4. SUBMITTALS

A. Refer to DDC General Conditions Section 01 33 00 "Submittal Procedures."

B. Product Data: For each type of product indicated.

C. Shop Drawings: List of legends and description of materials and process used for premarking wall plates.

D. Samples: One for each type of device and wall plate specified, in each color specified.

E. Field quality-control test reports.

F. Operation and Maintenance Data: For wiring devices to include in all manufacturers' packing label warnings and instruction manuals that include labeling conditions.

1.5. QUALITY ASSURANCE

A. Refer to DDC General Conditions Section 01 40 00 "Quality Requirements."

B. Source Limitations: Obtain each type of wiring device and associated wall plate through one source from a single manufacturer. Insofar as they are available, obtain all wiring devices and associated wall plates from a single manufacturer and one source.

C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to the Commissioner, and marked for intended use.

D. Comply with NFPA 70.

1.6. COORDINATION

A. Receptacles for City of NY-Furnished Equipment: Match plug configurations.

1. Cord and Plug Sets: Match equipment requirements.

PART 2 - PRODUCTS

2.1. MANUFACTURERS

A. Manufacturers:

1. Wattstopper (Le Grand).
2. Cooper Wiring Devices; a division of Cooper Industries, Inc. (Cooper).
3. Hubbell Incorporated; Wiring Device-Kellems (Hubbell).
4. Leviton Mfg. Company Inc. (Leviton).
5. Pass & Seymour/Legrand; Wiring Devices & Accessories (Pass & Seymour).
6. Or Approved Equal.

2.2. STRAIGHT BLADE RECEPTACLES

A. Convenience Receptacles, 125 V, 20 A: Comply with NEMA WD 1, NEMA WD 6 configuration 5-20R, and UL 498.

1. Products: Subject to compliance with requirements, products that may be incorporated into the Work include the following:

a. Cooper; 5351 (single), 5352 (duplex).
b. Hubbell; HBL5351 (single), CR5352 (duplex).
c. Leviton; 5891 (single), 5352 (duplex).
d. Pass & Seymour; 5381 (single), 5352 (duplex).
e. Or Approved Equal.

2.3. GFCI RECEPTACLES

A. General Description: Straight blade, feed-through type. Comply with NEMA WD 1, NEMA WD 6, UL 498, and UL 943, Class A, and include indicator light that is lighted when device is tripped.

B. Duplex GFCI Convenience Receptacles, 125 V, 20 A:

8. Products: Subject to compliance with requirements, provide one of the following:

a. Cooper; GF20.
b. Pass & Seymour; 2084.
c. Leviton
d. Or Approved Equal

2.4. HAZARDOUS (CLASSIFIED) LOCATION RECEPTACLES

A. Available Wiring Devices for Hazardous (Classified) Locations: Comply with NEMA FB 11 and UL 1010.

1. Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include the following:

a. Cooper Crouse-Hinds.
b. EGS/Appleton Electric.
c. Killark; a division of Hubbell Inc.
d. Or Approved Equal

2.5. TWIST-LOCKING RECEPTACLES

A. Single Convenience Receptacles, 125 V, 20 A: Comply with NEMA WD 1, NEMA WD 6 configuration L5-20R, and UL 498.

1. Products: Subject to compliance with requirements, products that may be incorporated into the Work include the following:

   a. Cooper; L520R.
   b. Hubbell; HBL2310.
   c. Leviton; 2310.
   d. Pass & Seymour; L520-R.
   e. Or Approved Equal

2.6. CORD AND PLUG SETS

A. Description: Match voltage and current ratings and number of conductors to requirements of equipment being connected.

1. Cord: Rubber-insulated, stranded-copper conductors, with Type SOW-A jacket; with green-insulated grounding conductor and equipment-rating ampacity plus a minimum of 30 percent.
2. Plug: Nylon body and integral cable-clamping jaws. Match cord and receptacle type for connection.

2.7. SNAP SWITCHES

A. Comply with NEMA WD 1 and UL 20.

B. Switches, 120/277 V, 20 A:

1. Products: Subject to compliance with requirements, products that may be incorporated into the Work include the following:

   a. Cooper; 2221 (single pole), 2222 (two pole), 2223 (three way), 2224 (four way).
   b. Hubbell; CS1221 (single pole), CS1222 (two pole), CS1223 (three way), CS1224 (four way).
   c. Leviton; 1221-2 (single pole), 1222-2 (two pole), 1223-2 (three way), 1224-2 (four way).
   d. Pass & Seymour; 20AC1 (single pole), 20AC2 (two pole), 20AC3 (three way), 20AC4 (four way).
   e. Or Approved Equal

C. Pilot Light Switches, 20 A:

1. Products: Subject to compliance with requirements, products that may be incorporated into the Work include the following:

   a. Cooper; 2221PL for 120 V and 277 V.
   b. Hubbell; HPL1221PL for 120 V and 277 V.
   c. Leviton; 1221-PLR for 120 V, 1221-7PLR for 277 V.
   d. Pass & Seymour; PS20AC1-PLR for 120 V.
   e. Or Approved Equal

2. Description: Single pole, with neon-lighted handle, illuminated when switch is "ON."

D. Key-Operated Switches, 120/277 V, 20 A:

1. Products: Subject to compliance with requirements, provide one of the following:

   a. Cooper; 2221L.
   b. Hubbell; HBL1221L.
   c. Leviton; 1221-2L.
   d. Pass & Seymour; PS20AC1-L.
   e. Or Approved Equal

2. Description: Single pole, with factory-supplied key in lieu of switch handle.

E. Single-Pole, Double-Throw, Momentary Contact, Center-Off Switches, 120/277 V, 20 A; for use with mechanically held lighting contactors.

1. Products: Subject to compliance with requirements, products that may be incorporated into the Work include the following:

   a. Cooper; 1995.
   b. Hubbell; HBL1557.
   c. Leviton; 1257.
   d. Pass & Seymour; 1251.
   e. Or Approved Equal

2.8. OCCUPANCY SENSORS

A. Wall-Switch Sensors:

1. Products: Subject to compliance with requirements, products that may be incorporated into the Work include the following:

   a. Cooper; 6111 for 120 V, 6117 for 277 V.
   b. Hubbell; WS1277.
   c. Leviton; ODS 10-ID.
   d. Pass & Seymour; WS3000.
   e. Philips Lighting Controls.
   f. Or Approved Equal

2. Description: Passive-infrared type, 120/277 V, adjustable time delay up to 30 minutes, 180-degree field of view, with a minimum coverage area of 900 sq. ft. (84 sq. m).

B. Wall-Switch Sensors:

1. Products: Subject to compliance with requirements, products that may be incorporated into the Work include the following:

a. Hubbell; AT120 for 120 V, AT277 for 277 V.
b. Leviton; ODS 15-ID.
c. Philips Lighting Control LRS 2215
d. Or Approved Equal

2. Description: Adaptive-technology type, 120/277 V, adjustable time delay up to 20 minutes, 180-degree field of view, with a minimum coverage area of 900 sq. ft. (84 sq. m).

C. Long-Range Wall-Switch Sensors:

1. Products: Subject to compliance with requirements, provide one of the following:

a. Hubbell; ATP1600WRP.
b. Leviton; ODWWV-IRW.
c. Pass & Seymour; WA1001.
d. Watt Stopper (The); CX-100.
e. Philips Lighting Control LRM 500.
f. Or Approved Equal

2. Description: Passive-infrared type, 120/277 V, adjustable time delay up to 30 minutes, 110-degree field of view, with a minimum coverage area of 1200 sq. ft. (111 sq. m).

D. Long-Range Wall-Switch Sensors:

1. Products: Subject to compliance with requirements, provide one of the following:

a. Hubbell; ATD1600WRP.
b. Leviton; ODW12-MRW.
c. Watt Stopper (The); DT-200.
d. Philips Lighting Controls.
e. Or Approved Equal

2. Description: Dual technology, with both passive-infrared- and ultrasonic-type sensing, 120/277 V, adjustable time delay up to 30 minutes, 110-degree field of view, and a minimum coverage area of 1200 sq. ft. (111 sq. m).

E. Wide-Range Wall-Switch Sensors:

1. Products: Subject to compliance with requirements, products that may be incorporated into the Work include the following:

a. Hubbell; ATP120HBRP.
b. Leviton; ODWHB-IRW.
c. Pass & Seymour; HS1001.
d. Watt Stopper (The); CX-100-3.
e. Philips Lighting Controls.
f. Or Approved Equal

2. Description: Passive-infrared type, 120/277 V, adjustable time delay up to 30 minutes, 150-degree field of view, with a minimum coverage area of 1200 sq. ft. (111 sq. m).

2.9. COMMUNICATIONS OUTLETS

A. Telephone Outlet:

1. Products: Subject to compliance with requirements, products that may be incorporated into the Work include the following:

   a. Cooper; 3560-6.
   b. Leviton; 40649.
   c. Siemon.
   d. Or Approved Equal

4. Description: Single RJ-45 jack for terminating 100-ohm, balanced, four-pair UTP; TIA/EIA-568-B.1; complying with Category 5e. Comply with UL 1863.

B. Combination TV and Telephone Outlet:

1. Products: Subject to compliance with requirements, products that may be incorporated into the Work include the following:

   a. Cooper; 3562.
   b. Leviton; 40595.
   c. Siemon.
   d. Or Approved Equal

2. Description: Single RJ-45 jack for 100-ohm, balanced, four-pair UTP; TIA/EIA-568-B.1; complying with Category 5e; and one Type F coaxial cable connector.

2.10. WALL PLATES

A. Single and combination types to match corresponding wiring devices.

1. Plate-Securing Screws: Metal with head color to match plate finish.
2. Material for Finished Spaces: 0.035-inch- (1-mm-) thick, satin-finished stainless steel finish.
3. Material for Unfinished Spaces: Galvanized steel.
4. Material for Damp Locations: Cast aluminum with spring-loaded lift cover, and listed and labeled for use in "wet locations."

B. Wet-Location, Weatherproof Cover Plates: NEMA 250, complying with type 3R weather-resistant, die-cast aluminum with lockable cover.

2.11. FINISHES

A. Color: Wiring device catalog numbers in Section Text do not designate device color.

1. Wiring Devices Connected to Normal Power System: As selected by Commissioner, unless otherwise indicated or required by NFPA 70 or device listing.
2. Wiring Devices Connected to Emergency Power System: Red.

PART 3 - EXECUTION

3.1. EXECUTION REQUIREMENTS

A. Refer to DDC General Conditions for execution requirements.

3.2. INSTALLATION

A. Comply with NECA 1, including the mounting heights listed in that standard, unless otherwise noted.

B. Coordination with Other Trades:

1. Take steps to insure that devices and their boxes are protected. Do not place wall finish materials over device boxes and do not cut holes for boxes with routers that are guided by riding against outside of the boxes.
2. Keep outlet boxes free of plaster, drywall joint compound, mortar, cement, concrete, dust, paint, and other material that may contaminate the raceway system, conductors, and cables.
3. Install device boxes in brick or block walls so that the cover plate does not cross a joint unless the joint is troweled flush with the face of the wall.
4. Install wiring devices after all wall preparation, including painting, is complete.

C. Conductors:

1. Do not strip insulation from conductors until just before they are spliced or terminated on devices.
2. Strip insulation evenly around the conductor using tools designed for the purpose. Avoid scoring or nicking of solid wire or cutting strands from stranded wire.
3. The length of free conductors at outlets for devices shall meet provisions of NFPA 70, Article 300, without pigtails.

D. Device Installation:

1. Replace all devices that have been in temporary use during construction or that show signs that they were installed before building finishing operations were complete.
2. Keep each wiring device in its package or otherwise protected until it is time to connect conductors.
3. Do not remove surface protection, such as plastic film and smudge covers, until the last possible moment.
4. Connect devices to branch circuits using pigtails that are not less than 6 inches (152 mm) in length.
5. When there is a choice, use side wiring with binding-head screw terminals. Wrap solid conductor tightly clockwise, 2/3 to 3/4 of the way around terminal screw.

6. Use a torque screwdriver when a torque is recommended or required by the manufacturer.
7. When conductors larger than No. 12 AWG are installed on 15- or 20-A circuits, splice No. 12 AWG pigtails for device connections.
8. Tighten unused terminal screws on the device.
9. When mounting into metal boxes, remove the fiber or plastic washers used to hold device mounting screws in yokes, allowing metal-to-metal contact.

E. Receptacle Orientation:

1. Install ground pin of vertically mounted receptacles down, and on horizontally mounted receptacles to the right.

F. Device Plates: Do not use oversized or extra-deep plates. Restore wall finishes and remount outlet boxes when standard device plates do not fit flush or do not cover rough wall opening.

G. Arrangement of Devices: Unless otherwise indicated, mount flush, with long dimension vertical and with grounding terminal of receptacles on top. Group adjacent switches under single, multigang wall plates.

3.3. IDENTIFICATION

A. Comply with Section 260553 "Identification for Electrical Systems."

1. Receptacles: Identify panelboard and circuit number from which served. Use hot, stamped or engraved machine printing with black-filled lettering on face of plate, and durable wire markers or tags inside outlet boxes.

3.4. FIELD QUALITY CONTROL

A. Perform tests and inspections and prepare test reports.

1. Test Instruments: Use instruments that comply with UL 1436.
2. Test Instrument for Convenience Receptacles: Digital wiring analyzer with digital readout or illuminated LED indicators of measurement.

B. Tests for Convenience Receptacles:

1. Line Voltage: Acceptable range is 105 to 132 V.
2. Ground Impedance: Values of up to 2 ohms are acceptable.
3. GFCI Trip: Test for tripping values specified in UL 1436 and UL 943.
4. Using the test plug, verify that the device and its outlet box are securely mounted.
5. The tests shall be diagnostic, indicating damaged conductors, high resistance at the circuit breaker, poor connections, inadequate fault current path, defective devices, or similar problems. Correct circuit conditions, remove malfunctioning units and replace with new ones, and retest as specified above.

END OF SECTION 262726

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SECTION 262813
Fuses

PART 1 - GENERAL

1.1. RELATED DOCUMENTS

A. The following documents apply to all required work for the Project: (1) the Contract Drawings, (2) the Specifications, (3) the General Conditions, (4) the Addendum and (5) the Contract (City of New York Standard Construction Contract).

B. LEED / Environmentally Preferable Purchase (EPP) General Requirements:

1. Refer to DDC General Conditions and the Addendum to the General Conditions.
2. LEED requirements apply to all Phase II work with the exception of the Existing Building scope. EPP requirements apply to the project's Existing Building scope only.

1.2. SUMMARY

A. Section Includes:

1. Cartridge fuses rated 600-V ac and less for use in control circuits enclosed switches panelboards switchboards enclosed controllers and motor-control centers.
2. Plug fuses rated 125-V ac and less for use in plug-fuse-type enclosed switches fuseholders and panelboards.
3. Plug-fuse adapters for use in Edison-base, plug-fuse sockets.
4. Spare-fuse cabinets.

1.3. SUBMITTALS

A. Refer to DDC General Conditions Section 01 33 00 "Submittal Procedures."

B. Product Data: For each type of product indicated. Include construction details, material, dimensions, descriptions of individual components, and finishes for spare-fuse cabinets. Include the following for each fuse type indicated:

1. Ambient Temperature Adjustment Information: If ratings of fuses have been adjusted to accommodate ambient temperatures, provide list of fuses with adjusted ratings.
   a. For each fuse having adjusted ratings, include location of fuse, original fuse rating, local ambient temperature, and adjusted fuse rating.
   b. Provide manufacturer's technical data on which ambient temperature adjustment calculations are based.
2. Dimensions and manufacturer's technical data on features, performance, electrical characteristics, and ratings.
3. Current-limitation curves for fuses with current-limiting characteristics.

4. Time-current coordination curves (average melt) and current-limitation curves (instantaneous peak let-through current) for each type and rating of fuse.
5. Coordination charts and tables and related data.
6. Fuse sizes for elevator feeders and elevator disconnect switches.

C. Operation and Maintenance Data: For fuses to include in emergency, operation, and maintenance manuals. In addition to items specified in DDC General Conditions, include the following:

1. Ambient temperature adjustment information.
2. Current-limitation curves for fuses with current-limiting characteristics.
3. Time-current coordination curves (average melt) and current-limitation curves (instantaneous peak let-through current) for each type and rating of fuse.
4. Coordination charts and tables and related data.

1.4. QUALITY ASSURANCE

A. Refer to DDC General Conditions Section 01 33 00 "Submittal Procedures."

B. Source Limitations: Obtain fuses, for use within a specific product or circuit, from single source from single manufacturer.

C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

D. Comply with NEMA FU 1 for cartridge fuses.

E. Comply with NFPA 70.

F. Comply with UL 248-11 for plug fuses.

1.5. PROJECT CONDITIONS

A. For fuses installed outdoors or in unusual environmental conditions, revise this article to indicate minimum and maximum ambient temperatures and expected humidity range.

B. Where ambient temperature to which fuses are directly exposed is less than 40 deg F (5 deg C) or more than 100 deg F (38 deg C) , apply manufacturer's ambient temperature adjustment factors to fuse ratings.

1.6. COORDINATION

A. Coordinate fuse ratings with utilization equipment nameplate limitations of maximum fuse size and with system short-circuit current levels.

PART 2 - PRODUCTS

2.1. MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Cooper Bussmann, Inc.
2. Edison Fuse, Inc.
3. Ferraz Shawmut, Inc.
4. Littelfuse, Inc.
5. Or Approved Equal

2.2. CARTRIDGE FUSES

A. Characteristics: NEMA FU 1, nonrenewable cartridge fuses with voltage ratings consistent with circuit voltages.

2.3. PLUG FUSES

A. Characteristics: UL 248-11, nonrenewable plug fuses; 125-V ac.

2.4. PLUG-FUSE ADAPTERS

A. Characteristics: Adapters for using Type S, rejection-base plug fuses in Edison-base fuseholders or sockets; ampere ratings matching fuse ratings; irremovable once installed.

PART 3 - EXECUTION

3.1. EXECUTION REQUIREMENTS

A. Refer to DDC General Conditions for execution requirements.

3.2. EXAMINATION

A. Examine fuses before installation. Reject fuses that are moisture damaged or physically damaged.

B. Examine holders to receive fuses for compliance with installation tolerances and other conditions affecting performance, such as rejection features.

C. Examine utilization equipment nameplates and installation instructions. Install fuses of sizes and with characteristics appropriate for each piece of equipment.

D. Evaluate ambient temperatures to determine if fuse rating adjustment factors must be applied to fuse ratings.

E. Proceed with installation only after unsatisfactory conditions have been corrected.

3.3. FUSE APPLICATIONS

A. Cartridge Fuses:

1. Service Entrance: Class L, time delay Class RK1, time delay Class J, time delay.
2. Feeders: Class L, time delay, Class RK1, time delay Class RK5, time delay Class J, time delay.
3. Motor Branch Circuits: Class RK1 Class RK5, time delay.
4. Other Branch Circuits: Class RK1, time delay Class RK5, time delay Class J, time delay.
5. Control Circuits: Class CC, time delay.

B. Plug Fuses:

1. Motor Branch Circuits: Edison-base type, dual Type S, dual-element time delay.
2. Other Branch Circuits: Edison-base type, dual-element time delay Type S, dual-element time delay.

3.4. INSTALLATION

A. Install fuses in fusible devices. Arrange fuses so rating information is readable without removing fuse.

B. Install plug-fuse adapters in Edison-base fuseholders and sockets. Ensure that adapters are irremovable once installed.

C. Install spare-fuse cabinet(s).

3.5. IDENTIFICATION

A. Install labels complying with requirements for identification specified in Section 260553 "Identification for Electrical Systems" and indicating fuse replacement information on inside door of each fused switch and adjacent to each fuse block, socket, and holder.

END OF SECTION 262813

SECTION 262816
Enclosed Switches and Circuit Breakers

PART 1 - GENERAL

1.1. RELATED DOCUMENTS

A. The following documents apply to all required work for the Project: (1) the Contract Drawings, (2) the Specifications, (3) the General Conditions, (4) the Addendum and (5) the Contract (City of New York Standard Construction Contract).

B. LEED / Environmentally Preferable Purchase (EPP) General Requirements:

1. Refer to DDC General Conditions and the Addendum to the General Conditions.
2. LEED requirements apply to all Phase II work with the exception of the Existing Building scope. EPP requirements apply to the project's Existing Building scope only.

1.2. SUMMARY

A. Section Includes:

1. Fusible switches.
2. Nonfusible switches.
3. Receptacle switches.
4. Shunt trip switches.
5. Molded-case circuit breakers (MCCBs).
6. Molded-case switches.
7. Enclosures.

1.3. DEFINITIONS

A. NC: Normally closed.

B. NO: Normally open.

C. SPDT: Single pole, double throw.

1.4. PERFORMANCE REQUIREMENTS

A. Seismic Performance: Enclosed switches and circuit breakers shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.

1. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified and the unit will be fully operational after the seismic event."

1.5. SUBMITTALS

A. Refer to DDC General Conditions Section 01 33 00 "Submittal Procedures."

B. Product Data: For each type of enclosed switch, circuit breaker, accessory, and component indicated. Include dimensioned elevations, sections, weights, and manufacturers' technical data on features, performance, electrical characteristics, ratings, accessories, and finishes.

1. Enclosure types and details for types other than NEMA 250, Type 1.
2. Current and voltage ratings.
3. Short-circuit current ratings (interrupting and withstand, as appropriate).
4. Include evidence of NRTL listing for series rating of installed devices.
5. Detail features, characteristics, ratings, and factory settings of individual overcurrent protective devices, accessories, and auxiliary components.
6. Include time-current coordination curves (average melt) for each type and rating of overcurrent protective device; include selectable ranges for each type of overcurrent protective device.

C. Shop Drawings: For enclosed switches and circuit breakers. Include plans, elevations, sections, details, and attachments to other work.

1. Wiring Diagrams: For power, signal, and control wiring.

D. Qualification Data: For qualified testing agency.

E. Seismic Qualification Certificates: For enclosed switches and circuit breakers, accessories, and components, from manufacturer.

1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

F. Field quality-control reports.

1. Test procedures used.
2. Test results that comply with requirements.
3. Results of failed tests and corrective action taken to achieve test results that comply with requirements.

G. Manufacturer's field service report.

H. Operation and Maintenance Data: For enclosed switches and circuit breakers to include in emergency, operation, and maintenance manuals. In addition to items specified in DDC General Conditions, include the following:

1. Manufacturer's written instructions for testing and adjusting enclosed switches and circuit breakers.

2. Time-current coordination curves (average melt) for each type and rating of overcurrent protective device; include selectable ranges for each type of overcurrent protective device.

1.6. QUALITY ASSURANCE

A. Refer to DDC General Conditions Section 01 40 00 "Quality Requirements."

B. Testing Agency Qualifications: Member company of NETA or an NRTL.

C. Source Limitations: Obtain enclosed switches and circuit breakers, overcurrent protective devices, components, and accessories, within same product category, from single source from single manufacturer.

D. Product Selection for Restricted Space: Drawings indicate maximum dimensions for enclosed switches and circuit breakers, including clearances between enclosures, and adjacent surfaces and other items. Comply with indicated maximum dimensions.

E. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

F. Comply with NFPA 70.

1.7. PROJECT CONDITIONS

A. Environmental Limitations: Rate equipment for continuous operation under the following conditions unless otherwise indicated:

1. Ambient Temperature: Not less than minus 22 deg F (minus 30 deg C) and not exceeding 104 deg F (40 deg C).
2. Altitude: Not exceeding 6600 feet (2010 m).

B. Interruption of Existing Electric Service: Do not interrupt electric service to facilities occupied by the City of New York unless permitted under the following conditions and then only after arranging to provide temporary electric service according to requirements indicated:

1. Notify Commissioner no fewer than seven days in advance of proposed interruption of electric service.
2. Indicate method of providing temporary electric service.
3. Do not proceed with interruption of electric service without Commissioner's written permission.
4. Comply with NFPA 70E.

1.8. COORDINATION

A. Coordinate layout and installation of switches, circuit breakers, and components with equipment served and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.

PART 2 - PRODUCTS

2.1. FUSIBLE SWITCHES

A. Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include the following:

1. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
2. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
3. Siemens Energy & Automation, Inc.
4. Square D; a brand of Schneider Electric.
5. Or Approved Equal

B. Type GD, General Duty, Single Throw, 240-V ac, 800 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, with cartridge fuse interiors to accommodate indicated fuses, lockable handle with capability to accept two padlocks, and interlocked with cover in closed position.

C. Type HD, Heavy Duty, Single Throw, 240 V ac, 1200 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, with clips or bolt pads to accommodate indicated fuses, lockable handle with capability to accept three padlocks, and interlocked with cover in closed position.

D. Type HD, Heavy Duty, Six Pole, Single Throw, 240 -V ac, 200 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, with clips or bolt pads to accommodate indicated fuses, lockable handle with capability to accept three padlocks, and interlocked with cover in closed position.

E. Type HD, Heavy Duty, Double Throw, 240-V ac, 1200 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, with clips or bolt pads to accommodate indicated fuses, lockable handle with capability to accept three padlocks, and interlocked with cover in closed position.

F. Accessories:

1. Equipment Ground Kit: Internally mounted and labeled for copper and aluminum ground conductors.
2. Neutral Kit: Internally mounted; insulated, capable of being grounded and bonded; labeled for copper and aluminum neutral conductors.
3. Isolated Ground Kit: Internally mounted; insulated, capable of being grounded and bonded; labeled for copper and aluminum neutral conductors.
4. Class R Fuse Kit: Provides rejection of other fuse types when Class R fuses are specified.
5. Auxiliary Contact Kit: Two NO/NC (Form "C") auxiliary contact(s), arranged to activate before switch blades open.
6. Hookstick Handle: Allows use of a hookstick to operate the handle.
7. Lugs: Mechanical type, suitable for number, size, and conductor material.
8. Service-Rated Switches: Labeled for use as service equipment.
9. Accessory Control Power Voltage: Remote mounted and powered; 24-V ac.

2.2. NONFUSIBLE SWITCHES (FOLLOW DDC PRODUCT REQUIREMENTS)

A. Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include the following:

1. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
2. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
3. Siemens Energy & Automation, Inc.
4. Square D; a brand of Schneider Electric.
5. Or Approved Equal.

B. Type GD, General Duty, Single Throw, 600 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, lockable handle with capability to accept two padlocks, and interlocked with cover in closed position.

C. Type HD, Heavy Duty, Single Throw, 240-V ac, 1200 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, lockable handle with capability to accept three padlocks, and interlocked with cover in closed position.

D. Type HD, Heavy Duty, Six Pole, Single Throw, 240-V ac, 200 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, lockable handle with capability to accept three padlocks, and interlocked with cover in closed position.

E. Type HD, Heavy Duty, Double Throw, 240-V ac, 1200 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, lockable handle with capability to accept three padlocks, and interlocked with cover in closed position.

F. Accessories:

1. Equipment Ground Kit: Internally mounted and labeled for copper and aluminum ground conductors.
2. Neutral Kit: Internally mounted; insulated, capable of being grounded and bonded; labeled for copper and aluminum neutral conductors.
3. Isolated Ground Kit: Internally mounted; insulated, capable of being grounded and bonded; labeled for copper and aluminum neutral conductors.
4. Auxiliary Contact Kit: Two NO/NC (Form "C") auxiliary contact(s), arranged to activate before switch blades open.
5. Hookstick Handle: Allows use of a hookstick to operate the handle.
6. Lugs: Mechanical type, suitable for number, size, and conductor material.
7. Accessory Control Power Voltage: Remote mounted and powered; 24-V ac.

2.3. MOLDED-CASE CIRCUIT BREAKERS

A. Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include the following:

1. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
2. General Electric Company; GE Consumer & Industrial - Electrical Distribution.

3. Siemens Energy & Automation, Inc.
4. Square D; a brand of Schneider Electric.
5. Or Approved Equal

B. General Requirements: Comply with UL 489, NEMA AB 1, and NEMA AB 3, with interrupting capacity to comply with available fault currents.

C. Thermal-Magnetic Circuit Breakers: Inverse time-current element for low-level overloads and instantaneous magnetic trip element for short circuits. Adjustable magnetic trip setting for circuit-breaker frame sizes 250 A and larger.

D. Adjustable, Instantaneous-Trip Circuit Breakers: Magnetic trip element with front-mounted, field-adjustable trip setting.

E. Electronic Trip Circuit Breakers: Field-replaceable rating plug, rms sensing, with the following field-adjustable settings:

1. Instantaneous trip.
2. Long- and short-time pickup levels.
3. Long- and short-time time adjustments.
4. Ground-fault pickup level, time delay, and I^2t response.

F. Current-Limiting Circuit Breakers: Frame sizes 400 A and smaller, and let-through ratings less than NEMA FU 1, RK-5.

G. Integrally Fused Circuit Breakers: Thermal-magnetic trip element with integral limiter-style fuse listed for use with circuit breaker and trip activation on fuse opening or on opening of fuse compartment door.

H. Ground-Fault, Circuit-Interrupter (GFCI) Circuit Breakers: Single- and two-pole configurations with Class A ground-fault protection (6-mA trip).

I. Ground-Fault, Equipment-Protection (GFEP) Circuit Breakers: With Class B ground-fault protection (30-mA trip).

J. Features and Accessories:

1. Standard frame sizes, trip ratings, and number of poles.
2. Lugs: Mechanical type, suitable for number, size, trip ratings, and conductor material.
3. Application Listing: Appropriate for application; Type SWD for switching fluorescent lighting loads; Type HID for feeding fluorescent and high-intensity discharge lighting circuits.
4. Ground-Fault Protection: Comply with UL 1053; integrally mounted, self-powered type with mechanical ground-fault indicator; relay with adjustable pickup and time-delay settings, push-to-test feature, internal memory, and shunt trip unit; and three-phase, zero-sequence current transformer/sensor.
5. Communication Capability: Circuit-breaker-mounted communication module with functions and features compatible with power monitoring and control system, specified in electrical specification sections.
6. Shunt Trip: Trip coil energized from separate circuit, with coil-clearing contact.

7. Undervoltage Trip: Set to operate at 35 to 75 percent of rated voltage without intentional time delay.
8. Auxiliary Contacts: Two SPDT switches with "a" and "b" contacts; "a" contacts mimic circuit-breaker contacts, "b" contacts operate in reverse of circuit-breaker contacts.
9. Alarm Switch: One NO contact that operates only when circuit breaker has tripped.
10. Key Interlock Kit: Externally mounted to prohibit circuit-breaker operation; key shall be removable only when circuit breaker is in off position.
11. Zone-Selective Interlocking: Integral with electronic trip unit; for interlocking ground-fault protection function.
12. Electrical Operator: Provide remote control for on, off, and reset operations.
13. Accessory Control Power Voltage: Integrally mounted, self-powered.

2.4. ENCLOSURES

A. Enclosed Switches and Circuit Breakers: NEMA AB 1, NEMA KS 1, NEMA 250, and UL 50, to comply with environmental conditions at installed location.

1. Indoor, Dry and Clean Locations: NEMA 250, Type 1
2. Outdoor Locations: NEMA 250, Type 3R.
3. Kitchen, Wash-Down Areas: NEMA 250, Type 4X.
4. Other Wet or Damp, Indoor Locations: NEMA 250, Type 4.
5. Indoor Locations Subject to Dust, Falling Dirt, and Dripping Noncorrosive Liquids: NEMA 250, Type 12.
6. Hazardous Areas Indicated on Drawings: NEMA 250, Type 7.

PART 3 - EXECUTION

3.1. EXECUTION REQUIREMENTS

A. Refer to DDC General Conditions for execution requirements.

3.2. EXAMINATION

A. Examine elements and surfaces to receive enclosed switches and circuit breakers for compliance with installation tolerances and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.3. INSTALLATION

A. Install individual wall-mounted switches and circuit breakers with tops at uniform height unless otherwise indicated.

B. Comply with mounting and anchoring requirements specified in Section 260548 "Vibration and Seismic Controls for Electrical Systems."

C. Temporary Lifting Provisions: Remove temporary lifting eyes, channels, and brackets and temporary blocking of moving parts from enclosures and components.

D. Install fuses in fusible devices.

E. Comply with NECA 1.

3.4. IDENTIFICATION

A. Comply with requirements in Section 260553 "Identification for Electrical Systems."

1. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs.
2. Label each enclosure with engraved metal or laminated-plastic nameplate.

3.5. FIELD QUALITY CONTROL

A. Perform tests and inspections.

1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.

B. Acceptance Testing Preparation:

1. Test insulation resistance for each enclosed switch and circuit breaker, component, connecting supply, feeder, and control circuit.
2. Test continuity of each circuit.

C. Tests and Inspections:

1. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.
3. Perform the following infrared scan tests and inspections and prepare reports:

    a. Initial Infrared Scanning: After Substantial Completion, but not more than 60 days after Final Acceptance, perform an infrared scan of each enclosed switch and circuit breaker. Remove front panels so joints and connections are accessible to portable scanner.
    b. Follow-up Infrared Scanning: Perform an additional follow-up infrared scan of each enclosed switch and circuit breaker 11 months after date of Substantial Completion.
    c. Instruments and Equipment: Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.

4. Test and adjust controls, remote monitoring, and safeties. Replace damaged and malfunctioning controls and equipment.

D. Enclosed switches and circuit breakers will be considered defective if they do not pass tests and inspections.

E. Prepare test and inspection reports, including a certified report that identifies enclosed switches and circuit breakers and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

3.6. ADJUSTING

A. Adjust moving parts and operable components to function smoothly, and lubricate as recommended by manufacturer.

B. Set field-adjustable circuit-breaker trip ranges as specified in Section 260573 "Overcurrent Protective Device Coordination Study."

END OF SECTION 262816

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SECTION 262913
Enclosed Controllers

PART 1 - GENERAL

1.1. RELATED DOCUMENTS

A. The following documents apply to all required work for the Project: (1) the Contract Drawings, (2) the Specifications, (3) the General Conditions, (4) the Addendum and (5) the Contract (City of New York Standard Construction Contract).

B. LEED / Environmentally Preferable Purchase (EPP) General Requirements:

1. Refer to DDC General Conditions and the Addendum to the General Conditions.
2. LEED requirements apply to all Phase II work with the exception of the Existing Building scope. EPP requirements apply to the project's Existing Building scope only.

1.2. SUMMARY

A. Section includes the following enclosed controllers rated 600 V and less:

1. Full-voltage manual.
2. Full-voltage magnetic.
3. Reduced-voltage magnetic.
4. Reduced-voltage solid state.
5. Multispeed.

B. Related Section:

1. Section 262923 "Variable-Frequency Motor Controllers" for general-purpose, ac, adjustable-frequency, pulse-width-modulated controllers for use on variable torque loads in ranges up to 200 hp.

1.3. DEFINITIONS

A. CPT: Control power transformer.

B. MCCB: Molded-case circuit breaker.

C. MCP: Motor circuit protector.

D. N.C.: Normally closed.

E. N.O.: Normally open.

F. OCPD: Overcurrent protective device.

G. SCR: Silicon-controlled rectifier.

1.4. PERFORMANCE REQUIREMENTS

A. Seismic Performance: Enclosed controllers shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.

1. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified."

1.5. SUBMITTALS

A. Refer to DDC General Conditions Section 01 33 00 "Submittal Procedures."

B. Product Data: For each type of enclosed controller. Include manufacturer's technical data on features, performance, electrical characteristics, ratings, and enclosure types and finishes.

C. Shop Drawings: For each enclosed controller. Include dimensioned plans, elevations, sections, details, and required clearances and service spaces around controller enclosures.

1. Show tabulations of the following:

a. Each installed unit's type and details.
b. Factory-installed devices.
c. Nameplate legends.
d. Short-circuit current rating of integrated unit.
e. Listed and labeled for integrated short-circuit current (withstand) rating of OCPDs in combination controllers by an NRTL acceptable to the Commissioner.
f. Features, characteristics, ratings, and factory settings of individual OCPDs in combination controllers.

2. Wiring Diagrams: For power, signal, and control wiring.

D. Qualification Data: For qualified testing agency.

E. Seismic Qualification Certificates: For enclosed controllers, accessories, and components, from manufacturer.

1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

F. Field quality-control reports.

G. Operation and Maintenance Data: For enclosed controllers to include in emergency, operation, and maintenance manuals. In addition to items specified in DDC General Conditions, include the following:

1. Routine maintenance requirements for enclosed controllers and installed components.
2. Manufacturer's written instructions for testing and adjusting circuit breaker and MCP trip settings.
3. Manufacturer's written instructions for setting field-adjustable overload relays.
4. Manufacturer's written instructions for testing, adjusting, and reprogramming reduced-voltage solid-state controllers.

H. Load-Current and Overload-Relay Heater List: Compile after motors have been installed, and arrange to demonstrate that selection of heaters suits actual motor nameplate full-load currents.

I. Load-Current and List of Settings of Adjustable Overload Relays: Compile after motors have been installed, and arrange to demonstrate that switch settings for motor running overload protection suit actual motors to be protected.

1.6. QUALITY ASSURANCE

A. Refer to DDC General Conditions Section 01 40 00 "Quality Requirements."

B. Testing Agency Qualifications: Member company of NETA or an NRTL.

1. Testing Agency's Field Supervisor: Currently certified by NETA to supervise on-site testing.

C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

D. Comply with NFPA 70.

E. IEEE Compliance: Fabricate and test enclosed controllers according to IEEE 344 to withstand seismic forces defined in Section 260548 "Vibration and Seismic Controls for Electrical Systems."

1.7. DELIVERY, STORAGE, AND HANDLING

A. Store enclosed controllers indoors in clean, dry space with uniform temperature to prevent condensation. Protect enclosed controllers from exposure to dirt, fumes, water, corrosive substances, and physical damage.

B. If stored in areas subject to weather, cover enclosed controllers to protect them from weather, dirt, dust, corrosive substances, and physical damage. Remove loose packing and flammable materials from inside controllers; install temporary electric heating, with at least 250 W per controller.

1.8. PROJECT CONDITIONS

A. Environmental Limitations: Rate equipment for continuous operation under the following conditions unless otherwise indicated:

1. Ambient Temperature: Not less than minus 22 deg F (minus 30 deg C) and not exceeding 104 deg F (40 deg C).
2. Altitude: Not exceeding 6600 feet (2010 m).

1.9. COORDINATION

A. Coordinate layout and installation of enclosed controllers with other construction including conduit, piping, equipment, and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.

B. Coordinate sizes and locations of concrete bases with actual equipment provided. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified in concrete specification sections.

C. Coordinate installation of roof curbs, equipment supports, and roof penetrations.

PART 2 - PRODUCTS

2.1. FULL-VOLTAGE CONTROLLERS

A. General Requirements for Full-Voltage Controllers: Comply with NEMA ICS 2, general purpose, Class A.

B. Motor-Starting Switches: "Quick-make, quick-break" toggle or push-button action; marked to show whether unit is off or on.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
    b. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
    c. Rockwell Automation, Inc.; Allen-Bradley brand.
    d. Siemens Energy & Automation, Inc.
    e. Square D; a brand of Schneider Electric.
    f. Or Approved Equal.

2. Configuration: Two speed.
3. Surface mounting.
4. Red pilot light.
5. Additional Nameplates: HIGH and LOW for two-speed switches.

C. Magnetic Controllers: Full voltage, across the line, electrically held.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
    b. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
    c. Rockwell Automation, Inc.; Allen-Bradley brand.
    d. Siemens Energy & Automation, Inc.
    e. Square D; a brand of Schneider Electric.
    f. Or Approved Equal.

2. Configuration: Reversing.
3. Contactor Coils: Pressure-encapsulated type.

   a. Operating Voltage: Depending on contactor NEMA size and line-voltage rating, manufacturer's standard matching control power or line voltage.

4. Power Contacts: Totally enclosed, double-break, silver-cadmium oxide; assembled to allow inspection and replacement without disturbing line or load wiring.
5. Control Circuits: 120 -V ac.

6. Bimetallic Overload Relays:

   a. Inverse-time-current characteristic.
   b. Class 30 tripping characteristic.
   c. Heaters in each phase matched to nameplate full-load current of actual protected motor and with appropriate adjustment for duty cycle.
   d. Ambient compensated.
   e. Automatic resetting.

7. N.C./ N.O., isolated overload alarm contact.
8. External overload reset push button.

D. Combination Magnetic Controller: Factory-assembled combination of magnetic controller, OCPD, and disconnecting means.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
   b. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
   c. Rockwell Automation, Inc.; Allen-Bradley brand.
   d. Siemens Energy & Automation, Inc.
   e. Square D; a brand of Schneider Electric.
   f. Or Approved Equal.

2. Fusible Disconnecting Means:

   a. NEMA KS 1, heavy-duty, horsepower-rated, fusible switch with clips or bolt pads to accommodate Class J Class R fuses.
   b. Lockable Handle: Accepts three padlocks and interlocks with cover in closed position.

3. Auxiliary Contacts: N.O./N.C., arranged to activate before switch blades open.

4. Nonfusible Disconnecting Means:

   a. NEMA KS 1, heavy-duty, horsepower-rated, nonfusible switch.
   b. Lockable Handle: Accepts three padlocks and interlocks with cover in closed position.
   c. Auxiliary Contacts: N.O./N.C., arranged to activate before switch blades open.

5. MCP Disconnecting Means:

   a. UL 489, NEMA AB 1, and NEMA AB 3, with interrupting capacity to comply with available fault currents, instantaneous-only circuit breaker with front-mounted, field-adjustable, short-circuit trip coordinated with motor locked-rotor amperes.
   b. Lockable Handle: Accepts three padlocks and interlocks with cover in closed position.
   c. Auxiliary contacts "a" and "b" arranged to activate with MCP handle.
   d. N.C. /N.O. alarm contact that operates only when MCP has tripped.
   e. Current-limiting module to increase controller short-circuit current (withstand) rating to 100 kA.

6. MCCB Disconnecting Means:

   a. UL 489, NEMA AB 1, and NEMA AB 3, with interrupting capacity to comply with available fault currents; thermal-magnetic MCCB, with inverse time-current element for low-level overloads and instantaneous magnetic trip element for short circuits.
   b. Front-mounted, adjustable magnetic trip setting for circuit-breaker frame sizes 250 A and larger.
   c. Lockable Handle: Accepts three padlocks and interlocks with cover in closed position.
   d. Auxiliary contacts "a" and "b" arranged to activate with MCCB handle.
   e. N.C./ N.O. alarm contact that operates only when MCCB has tripped.

2.2. MULTISPEED MAGNETIC CONTROLLERS

A. General Requirements for Multispeed Magnetic Controllers: Comply with NEMA ICS 2, general purpose, Class A.

B. Multispeed Magnetic Controllers: Two speed, full voltage, across the line, electrically held.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
   b. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
   c. Rockwell Automation, Inc.; Allen-Bradley brand.
   d. Siemens Energy & Automation, Inc.
   e. Square D; a brand of Schneider Electric.
   f. Or Approved Equal

2. Configuration: Nonreversing.
3. Contactor Coils: Pressure-encapsulated type.

   a. Operating Voltage: Depending on contactor NEMA size and line-voltage rating, manufacturer's standard matching control power or line voltage.

4. Power Contacts: Totally enclosed, double break, silver-cadmium oxide; assembled to allow inspection and replacement without disturbing line or load wiring.
5. Control Circuits: 120 -V ac.

a. CPT Spare Capacity: 200 VA.

6. Compelling relays shall ensure that motor will start only at low speed.
7. Accelerating timer relays shall ensure properly timed acceleration through speeds lower than that selected.
8. Decelerating timer relays shall ensure automatically timed deceleration through each speed.
9. Antiplugging timer relays shall ensure a time delay when transferring from FORWARD to REVERSE and back.

10. Bimetallic Overload Relays:

a. Inverse-time-current characteristic.
b. Class 30 tripping characteristic.
c. Heaters in each phase matched to nameplate full-load current of actual protected motor and with appropriate adjustment for duty cycle.
d. Ambient compensated.
e. Automatic resetting.

11. N.C./ N.O., isolated overload alarm contact.
12. External overload reset push button.

C. Combination Multispeed Magnetic Controller: Factory-assembled combination of reduced-voltage magnetic controller, OCPD, and disconnecting means.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
b. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
c. Rockwell Automation, Inc.; Allen-Bradley brand.
d. Siemens Energy & Automation, Inc.
e. Square D; a brand of Schneider Electric.
f. Or Approved Equal

2. Fusible Disconnecting Means:

a. NEMA KS 1, heavy-duty, horsepower-rated, fusible switch with clips or bolt pads to accommodate Class J Class R fuses.
b. Lockable Handle: Accepts three padlocks and interlocks with cover in closed position.
c. Auxiliary Contacts: N.O./N.C., arranged to activate before switch blades open.

3. Nonfusible Disconnecting Means:

a. NEMA KS 1, heavy-duty, horsepower-rated, nonfusible switch.
b. Lockable Handle: Accepts three padlocks and interlocks with cover in closed position.
c. Auxiliary Contacts: N.O./N.C., arranged to activate before switch blades open.

4. MCP Disconnecting Means:

a. UL 489, NEMA AB 1, and NEMA AB 3, with interrupting capacity to comply with available fault currents, instantaneous-only circuit breaker with front-mounted, field-adjustable, short-circuit trip coordinated with motor locked-rotor amperes.
b. Lockable Handle: Accepts three padlocks and interlocks with cover in closed position.
c. Auxiliary contacts "a" and "b" arranged to activate with MCP handle.
d. N.C. / N.O. alarm contact that operates only when MCP has tripped.
e. Current-limiting module to increase controller short-circuit current (withstand) rating to 100 kA.

5. MCCB Disconnecting Means:

a. UL 489, NEMA AB 1, and NEMA AB 3, with interrupting capacity to comply with available fault currents; thermal-magnetic MCCB, with inverse time-current element for low-level overloads and instantaneous magnetic trip element for short circuits.
b. Front-mounted, adjustable magnetic trip setting for circuit-breaker frame sizes 250 A and larger.
c. Lockable Handle: Accepts three padlocks and interlocks with cover in closed position.
d. Auxiliary contacts "a" and "b" arranged to activate with MCCB handle.
e. N.C./ N.O. alarm contact that operates only when MCCB has tripped.

2.3. ENCLOSURES

A. Enclosed Controllers: NEMA ICS 6, to comply with environmental conditions at installed location.

1. Dry and Clean Indoor Locations: Type 1.
2. Outdoor Locations: Type 3R .
3. Kitchen Wash-Down Areas: Type 4X , stainless steel.
4. Other Wet or Damp Indoor Locations: Type 4 .
5. Indoor Locations Subject to Dust, Falling Dirt, and Dripping Noncorrosive Liquids: Type 12.
6. Hazardous Areas Indicated on Drawings: Type 9.

2.4. ACCESSORIES

A. General Requirements for Control Circuit and Pilot Devices: NEMA ICS 5; factory installed in controller enclosure cover unless otherwise indicated.

1. Push Buttons, Pilot Lights, and Selector Switches: Heavy-duty type.

a. Push Buttons: Covered types; maintained as indicated.
b. Pilot Lights: LED types; colors as indicated: push to test.
c. Selector Switches: Rotary type.

2. Elapsed Time Meters: Heavy duty with digital readout in hours; resettable.
3. Meters: Panel type, 2-1/2-inch (64-mm) minimum size with 90- or 120-degree scale and plus or minus two percent accuracy. Where indicated, provide selector switches with an off position.

B. N.C./ N.O. auxiliary contact(s).

C. Control Relays: Auxiliary and adjustable solid-state time-delay relays.

D. Phase-Failure, Phase-Reversal, and Undervoltage and Overvoltage Relays: Solid-state sensing circuit with isolated output contacts for hard-wired connections. Provide adjustable undervoltage, overvoltage, and time-delay settings.

E. Breather and drain assemblies, to maintain interior pressure and release condensation in Type 4 enclosures installed outdoors or in unconditioned interior spaces subject to humidity and temperature swings.

F. Space heaters, with N.C. auxiliary contacts, to mitigate condensation in Type 12 enclosures installed outdoors or in unconditioned interior spaces subject to humidity and temperature swings.

G. Sun shields installed on fronts, sides, and tops of enclosures installed outdoors and subject to direct and extended sun exposure.

H. Cover gaskets for Type 1 enclosures.

PART 3 - EXECUTION

3.1. EXECUTION REQUIREMENTS

A. Refer to DDC General Conditions for execution requirements.

3.2. EXAMINATION

A. Examine areas and surfaces to receive enclosed controllers, with Installer present, for compliance with requirements and other conditions affecting performance of the Work.

B. Examine enclosed controllers before installation. Reject enclosed controllers that are wet, moisture damaged, or mold damaged.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.3. INSTALLATION

A. Wall-Mounted Controllers: Install enclosed controllers on walls with tops at uniform height unless otherwise indicated, and by bolting units to wall or mounting on lightweight structural-steel channels bolted to wall. For controllers not at walls, provide freestanding racks complying with Section 260529 "Hangers and Supports for Electrical Systems."

B. Floor-Mounted Controllers: Install enclosed controllers on 4-inch (100-mm) nominal-thickness concrete base. Comply with requirements for concrete base specified in Section 033000 "Cast-in-Place Concrete."

1. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch (450-mm) centers around the full perimeter of concrete base.
2. For supported equipment, install epoxy-coated anchor bolts that extend through concrete base and anchor into structural concrete floor.

3. Place and secure anchorage devices. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
4. Install anchor bolts to elevations required for proper attachment to supported equipment.

C. Seismic Bracing: Comply with requirements specified in Section 260548 "Vibration and Seismic Controls for Electrical Systems."

D. Temporary Lifting Provisions: Remove temporary lifting eyes, channels, and brackets and temporary blocking of moving parts from enclosures and components.

E. Install fuses in each fusible-switch enclosed controller.

F. Install fuses in control circuits if not factory installed. Comply with requirements in Section 262813 "Fuses."

G. Install heaters in thermal overload relays. Select heaters based on actual nameplate full-load amperes after motors have been installed.

H. Install, connect, and fuse thermal-protector monitoring relays furnished with motor-driven equipment.

3.4. IDENTIFICATION

A. Identify enclosed controllers, components, and control wiring. Comply with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

1. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs.
2. Label each enclosure with engraved nameplate.
3. Label each enclosure-mounted control and pilot device.

3.5. CONTROL WIRING INSTALLATION

A. Install wiring between enclosed controllers and remote devices . Comply with requirements in electrical specification sections.

B. Bundle, train, and support wiring in enclosures.

C. Connect selector switches and other automatic-control selection devices where applicable.

1. Connect selector switches to bypass only those manual- and automatic-control devices that have no safety functions when switch is in manual-control position.
2. Connect selector switches with enclosed-controller circuit in both manual and automatic positions for safety-type control devices such as low- and high-pressure cutouts, high-temperature cutouts, and motor overload protectors.

3.6. FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections.

B. Acceptance Testing Preparation:

1. Test insulation resistance for each enclosed controller, component, connecting supply, feeder, and control circuit.
2. Test continuity of each circuit.

C. Tests and Inspections:

1. Inspect controllers, wiring, components, connections, and equipment installation.
2. Test insulation resistance for each enclosed-controller element, component, connecting motor supply, feeder, and control circuits.
3. Test continuity of each circuit.
4. Verify that voltages at controller locations are within plus or minus 10 percent of motor nameplate rated voltages. If outside this range for any motor, notify Commissioner before starting the motor(s).
5. Test each motor for proper phase rotation.
6. Perform each electrical test and visual and mechanical inspection stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
7. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.
8. Perform the following infrared (thermographic) scan tests and inspections and prepare reports:

   a. Initial Infrared Scanning: After Substantial Completion, but not more than 60 days after Final Acceptance, perform an infrared scan of each multi-pole enclosed controller. Remove front panels so joints and connections are accessible to portable scanner.
   b. Follow-up Infrared Scanning: Perform an additional follow-up infrared scan of each multi-pole enclosed controller 11 months after date of Substantial Completion.
   c. Instruments and Equipment: Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.

9. Test and adjust controls, remote monitoring, and safeties. Replace damaged and malfunctioning controls and equipment.

D. Enclosed controllers will be considered defective if they do not pass tests and inspections.

E. Prepare test and inspection reports including a certified report that identifies enclosed controllers and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

3.7. ADJUSTING

A. Set field-adjustable switches, auxiliary relays, time-delay relays, timers, and overload-relay pickup and trip ranges.

B. Adjust overload-relay heaters or settings if power factor correction capacitors are connected to the load side of the overload relays.

C. Adjust the trip settings of MCPs and thermal-magnetic circuit breakers with adjustable instantaneous trip elements. Initially adjust to six times the motor nameplate full-load ampere ratings and attempt to start motors several times, allowing for motor cooldown between starts. If tripping occurs on motor inrush, adjust settings in increments until motors start without tripping. Do not exceed eight times the motor full-load amperes (or 11 times for NEMA Premium Efficient motors if required). Where these maximum settings do not allow starting of a motor, notify Commissioner before increasing settings.

D. Set the taps on reduced-voltage autotransformer controllers at 80 percent.

E. Set field-adjustable switches and program microprocessors for required start and stop sequences in reduced-voltage solid-state controllers.

F. Set field-adjustable circuit-breaker trip ranges.

3.8. PROTECTION

A. Temporary Heating: Apply temporary heat to maintain temperature according to manufacturer's written instructions until enclosed controllers are ready to be energized and placed into service.

B. Replace controllers whose interiors have been exposed to water or other liquids prior to Substantial Completion.

3.9. INSTRUCTION

A. Instruct building's operating personnel to adjust, operate, and maintain enclosed controllers, and to use and reprogram microprocessor-based, reduced-voltage solid-state controllers.

END OF SECTION 262913

SECTION 262923
Variable Frequency Motor Controllers

PART 1 - GENERAL

1.1. RELATED DOCUMENTS

A. The following documents apply to all required work for the Project: (1) the Contract Drawings, (2) the Specifications, (3) the General Conditions, (4) the Addendum and (5) the Contract (City of New York Standard Construction Contract).

B. LEED / Environmentally Preferable Purchase (EPP) General Requirements:

1. Refer to DDC General Conditions and the Addendum to the General Conditions.
2. LEED requirements apply to all Phase II work with the exception of the Existing Building scope. EPP requirements apply to the project's Existing Building scope only.

1.2. SUMMARY

A. This Section includes solid-state, PWM, VFCs for speed control of three-phase, squirrel-cage induction motors.

1.3. DEFINITIONS

A. BMS: Building management system.

B. IGBT: Integrated gate bipolar transistor.

C. LAN: Local area network.

D. PID: Control action, proportional plus integral plus derivative.

E. PWM: Pulse-width modulated.

F. VFC: Variable frequency controller.

1.4. SUBMITTALS

A. Refer to DDC General Conditions Section 01 33 00 "Submittal Procedures."

B. Product Data: For each type of VFC. Include dimensions, mounting arrangements, location for conduit entries, shipping and operating weights, and manufacturer's technical data on features, performance, electrical ratings, characteristics, and finishes.

C. Shop Drawings: For each VFC.

1. Include dimensioned plans, elevations, sections, and details, including required clearances and service space around equipment. Show tabulations of installed devices, equipment features, and ratings. Include the following:

   a. Each installed unit's type and details.
   b. Nameplate legends.
   c. Short-circuit current rating of integrated unit.
   d. Listed and labeled for series rating of overcurrent protective devices in combination controllers by an NRTL acceptable to the Commissioner.
   e. Features, characteristics, ratings, and factory settings of each motor-control center unit.

2. Wiring Diagrams: Power, signal, and control wiring for VFCs. Provide schematic wiring diagram for each type of VFC.

D. Coordination Drawings: Floor plans, drawn to scale, showing dimensioned layout, required working clearances, and required area above and around VFCs where pipe and ducts are prohibited. Show VFC layout and relationships between electrical components and adjacent structural and mechanical elements. Show support locations, type of support, and weight on each support. Indicate field measurements.

E. Manufacturer Seismic Qualification Certification: Submit certification that VFCs, accessories, and components will withstand seismic forces defined in Section 260548 "Vibration and Seismic Controls for Electrical Systems." Include the following:

1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
   a. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified and the unit will be fully operational after the seismic event."

2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

F. Qualification Data: For manufacturer.

G. Field quality-control test reports.

H. Operation and Maintenance Data: For VFCs, all installed devices, and components to include in emergency, operation, and maintenance manuals. In addition to items specified in DDC General Conditions include the following:

1. Routine maintenance requirements for VFCs and all installed components.
2. Manufacturer's written instructions for testing and adjusting overcurrent protective devices.

I. Load-Current and Overload-Relay Heater List: Compile after motors have been installed and arrange to demonstrate that selection of heaters suits actual motor nameplate full-load currents.

J. Load-Current and List of Settings of Adjustable Overload Relays: Compile after motors have been installed and arrange to demonstrate that dip switch settings for motor running overload protection suit actual motor to be protected.

1.5. QUALITY ASSURANCE

A. Refer to DDC General Conditions Section 01 40 00 "Quality Requirements."

B. Manufacturer Qualifications: A qualified manufacturer. Maintain a service center capable of providing instruction, parts, and emergency maintenance and restores.

C. Testing Agency Qualifications: An independent agency, with the experience and capability to conduct the testing indicated, that is a member company of the InterNational Electrical Testing Association or is a nationally recognized testing laboratory (NRTL) as defined by OSHA in 29 CFR 1910.7, and that is acceptable to the Commissioner.

D. Source Limitations: Obtain VFCs of a single type through one source from a single manufacturer.

E. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to Commissioner, and marked for intended use.

F. Comply with NFPA 70.

G. Product Selection for Restricted Space: Drawings indicate maximum dimensions for VFCs, minimum clearances between VFCs, and adjacent surfaces and other items. Comply with indicated maximum dimensions and clearances.

1.6. DELIVERY, STORAGE, AND HANDLING

A. Deliver VFCs in shipping splits of lengths that can be moved past obstructions in delivery path as indicated.

B. Store VFCs indoors in clean, dry space with uniform temperature to prevent condensation. Protect VFCs from exposure to dirt, fumes, water, corrosive substances, and physical damage.

C. If stored in areas subject to weather, cover VFCs to protect them from weather, dirt, dust, corrosive substances, and physical damage. Remove loose packing and flammable materials from inside controllers; install electric heating of sufficient wattage to prevent condensation.

1.7. PROJECT CONDITIONS

A. Environmental Limitations: Rate equipment for continuous operation, capable of driving full load without derating, under the following conditions, unless otherwise indicated:

1. Ambient Temperature: 0 to 40 deg C.
2. Humidity: Less than 90 percent (noncondensing).

3. Altitude: Not exceeding 3300 feet (1005 m).

B. Interruption of Existing Electrical Service: Do not interrupt electrical service to facilities occupied by the City of New York unless permitted under the following conditions and then only after arranging to provide temporary electrical service according to requirements indicated:

1. Notify the Commissioner no fewer than two days in advance of proposed interruption of electrical service.
2. Indicate method of providing temporary electrical service.
3. Do not proceed with interruption of electrical service without The Commissioner written permission.

C. Product Selection for Restricted Space: Drawings indicate maximum dimensions for VFCs, including clearances between VFCs, and adjacent surfaces and other items. Comply with indicated maximum dimensions.

1.8. COORDINATION

A. Coordinate layout and installation of VFCs with other construction including conduit, piping, equipment, and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.

B. Coordinate size and location of concrete bases. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified in Section 033000 "Cast-in-Place Concrete."

C. Coordinate installation of roof curbs, equipment supports, and roof penetrations. These items are specified in Section 077100 "Roof Specialties and Accessories."

D. Coordinate features of VFCs, installed units, and accessory devices with pilot devices and control circuits to which they connect.

E. Coordinate features, accessories, and functions of each VFC and each installed unit with ratings and characteristics of supply circuit, motor, required control sequence, and duty cycle of motor and load.

PART 2 - PRODUCTS

2.1. MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. ABB Power Distribution, Inc.; ABB Control, Inc. Subsidiary.
2. Baldor Electric Company (Graham).
3. Danfoss Inc.; Danfoss Electronic Drives Div.
4. Eaton Corporation; Cutler-Hammer Products.
5. General Electric Company; GE Industrial Systems.
6. Rockwell Automation; Allen-Bradley Co.; Industrial Control Group.
7. Siemens Energy and Automation; Industrial Products Division.
8. Square D.

9. Toshiba International Corporation.
10. Or Approved Equal.

2.2. VARIABLE FREQUENCY CONTROLLERS

A. Description: NEMA ICS 2, IGBT, PWM, VFC; listed and labeled as a complete unit and arranged to provide variable speed of an NEMA MG 1, Design B, 3-phase induction motor by adjusting output voltage and frequency.

1. Provide unit suitable for operation of premium-efficiency motor as defined by NEMA MG 1.

B. Design and Rating: Match load type such as fans, blowers, and pumps; and type of connection used between motor and load such as direct or through a power-transmission connection.

C. Output Rating: 3-phase; 6 to 60 Hz, with voltage proportional to frequency throughout voltage range.

D. Unit Operating Requirements:

1. Input ac voltage tolerance of 208 V, plus or minus 5.
2. Input frequency tolerance of 50/60 Hz, plus or minus 6 percent.
3. Minimum Efficiency: 96 percent at 60 Hz, full load.
4. Minimum Displacement Primary-Side Power Factor: 96 percent.
5. Overload Capability: 1.1 times the base load current for 60 seconds; 2.0 times the base load current for 3 seconds.
6. Starting Torque: 100 percent of rated torque or as indicated.
7. Speed Regulation: Plus or minus 1 percent.

E. Isolated control interface to allow controller to follow control signal over an 11:1 speed range.

1. Electrical Signal: 4 to 20 mA at 24 V.
2. Pneumatic Signal: 3 to 15 psig (20 to 104 kPa).

F. Internal Adjustability Capabilities:

1. Minimum Speed: 5 to 25 percent of maximum rpm.
2. Maximum Speed: 80 to 100 percent of maximum rpm.
3. Acceleration: 2 to a minimum of 22 seconds.
4. Deceleration: 2 to a minimum of 22 seconds.
5. Current Limit: 50 to a minimum of 110 percent of maximum rating.

G. Self-Protection and Reliability Features:

1. Input transient protection by means of surge suppressors.
2. Under- and overvoltage trips; inverter overtemperature, overload, and overcurrent trips.
3. Motor Overload Relay: Adjustable and capable of NEMA ICS 2, Class 10 performance.
4. Notch filter to prevent operation of the controller-motor-load combination at a natural frequency of the combination.
5. Instantaneous line-to-line and line-to-ground overcurrent trips.

6. Loss-of-phase protection.
7. Reverse-phase protection.
8. Short-circuit protection.
9. Motor overtemperature fault.

H. Multiple-Motor Capability: Controller suitable for service to multiple motors and having a separate overload relay and protection for each controlled motor. Overload relay shall shut off controller and motors served by it when overload relay is tripped.

I. Automatic Reset/Restart: Attempts three restarts after controller fault or on return of power after an interruption and before shutting down for manual reset or fault correction. Bidirectional autospeed search shall be capable of starting into rotating loads spinning in either direction and returning motor to set speed in proper direction, without damage to controller, motor, or load.

J. Power-Interruption Protection: To prevent motor from re-energizing after a power interruption until motor has stopped.

K. Torque Boost: Automatically varies starting and continuous torque to at least 1.5 times the minimum torque to ensure high-starting torque and increased torque at slow speeds.

L. Motor Temperature Compensation at Slow Speeds: Adjustable current fall-back based on output frequency for temperature protection of self-cooled, fan-ventilated motors at slow speeds.

M. Status Lights: Door-mounted LED indicators shall indicate the following conditions:

1. Power on.
2. Run.
3. Overvoltage.
4. Line fault.
5. Overcurrent.
6. External fault.

N. Panel-Mounted Operator Station: Start-stop and auto-manual selector switches with manual speed control potentiometer and elapsed time meter.

O. Indicating Devices: Meters or digital readout devices and selector switch, mounted flush in controller door and connected to indicate the following controller parameters:

1. Output frequency (Hz).
2. Motor speed (rpm).
3. Motor status (running, stop, fault).
4. Motor current (amperes).
5. Motor torque (percent).
6. Fault or alarming status (code).
7. PID feedback signal (percent).
8. DC-link voltage (VDC).
9. Set-point frequency (Hz).
10. Motor output voltage (V).

P. Control Signal Interface:

1. Electric Input Signal Interface: A minimum of 2 analog inputs (0 to 10 V or 0/4-20 mA) and 6 programmable digital inputs.
2. Pneumatic Input Signal Interface: 3 to 15 psig (20 to 104 kPa).
3. Remote Signal Inputs: Capability to accept any of the following speed-setting input signals from the BMS or other control systems:

    a. 0 to 10-V dc.
    b. 0-20 or 4-20 mA.
    c. Potentiometer using up/down digital inputs.
    d. Fixed frequencies using digital inputs.
    e. RS485.
    f. Keypad display for local hand operation.

4. Output Signal Interface:

    a. A minimum of 1 analog output signal (0/4-20 mA), which can be programmed to any of the following:

        1) Output frequency (Hz).
        2) Output current (load).
        3) DC-link voltage (VDC).
        4) Motor torque (percent).
        5) Motor speed (rpm).
        6) Set-point frequency (Hz).

5. Remote Indication Interface: A minimum of 2 dry circuit relay outputs (120-V ac, 1 A) for remote indication of the following:

    a. Motor running.
    b. Set-point speed reached.
    c. Fault and warning indication (overtemperature or overcurrent).
    d. PID high- or low-speed limits reached.

Q. Communications: Provide an RS485 interface allowing VFC to be used with an external system within a multidrop LAN configuration. Interface shall allow all parameter settings of VFC to be programmed via BMS control. Provide capability for VFC to retain these settings within the nonvolatile memory.

R. Manual Bypass: Magnetic contactor arranged to safely transfer motor between controller output and bypass controller circuit when motor is at zero speed. Controller-off-bypass selector switch sets mode, and indicator lights give indication of mode selected. Unit shall be capable of stable operation (starting, stopping, and running), with motor completely disconnected from controller (no load).

S. Bypass Controller: NEMA ICS 2, full-voltage, nonreversing enclosed controller with across-the-line starting capability in manual-bypass mode. Provide motor overload protection under both modes of operation with control logic that allows common start-stop capability in either mode.

T. Integral Disconnecting Means: NEMA AB 1, instantaneous-trip circuit breaker.

U. Isolating Switch: Non-load-break switch arranged to isolate VFC and permit safe troubleshooting and testing, both energized and de-energized, while motor is operating in bypass mode.

V. Remote Indicating Circuit Terminals: Mode selection, controller status, and controller fault.

2.3. ENCLOSURES

A. NEMA I indoors, NEMA 3R Outdoors.

2.4. ACCESSORIES

A. Devices shall be factory installed in controller enclosure, unless otherwise indicated.

B. Push-Button Stations, Pilot Lights, and Selector Switches: NEMA ICS 2, heavy-duty type.

C. Stop and Lockout Push-Button Station: Momentary-break, push-button station with a factory-applied hasp arranged so padlock can be used to lock push button in depressed position with control circuit open.

D. Control Relays: Auxiliary and adjustable time-delay relays.

E. Standard Displays:

1. Output frequency (Hz).
2. Set-point frequency (Hz).
3. Motor current (amperes).
4. DC-link voltage (VDC).
5. Motor torque (percent).
6. Motor speed (rpm).
7. Motor output voltage (V).

F. Historical Logging Information and Displays:

1. Real-time clock with current time and date.
2. Running log of total power versus time.
3. Total run time.
4. Fault log, maintaining last four faults with time and date stamp for each.

G. Current-Sensing, Phase-Failure Relays for Bypass Controller: Solid-state sensing circuit with isolated output contacts for hard-wired connection; arranged to operate on phase failure, phase reversal, current un balance of from 30 to 40 percent, or loss of supply voltage; with adjustable response delay.

2.5. FACTORY FINISHES

A. Finish: Manufacturer's standard paint applied to factory-assembled and -tested VFCs before shipping.

PART 3 - EXECUTION

3.1. EXECUTION REQUIREMENTS

A. Refer to DDC General Conditions for execution requirements.

3.2. EXAMINATION

A. Examine areas, surfaces, and substrates to receive VFCs for compliance with requirements, installation tolerances, and other conditions affecting performance.

B. Examine roughing-in for conduit systems to verify actual locations of conduit connections before VFC installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.3. APPLICATIONS

A. Select features of each VFC to coordinate with ratings and characteristics of supply circuit and motor; required control sequence; and duty cycle of motor, controller, and load.

B. Select horsepower rating of controllers to suit motor controlled.

3.4. INSTALLATION

A. Anchor each VFC assembly to steel-channel sills arranged and sized according to manufacturer's written instructions. Attach by bolting. Level and grout sills flush with mounting surface.

B. Install VFCs on concrete bases.

C. Comply with mounting and anchoring requirements specified in Section 260529 "Hangers and Supports for Electrical Systems."

D. Controller Fuses: Install fuses in each fusible switch. Comply with requirements in Section 262813 "Fuses."

3.5. CONCRETE BASES

A. Coordinate size and location of concrete bases. Verify structural requirements with Commissioner.

B. Concrete base is specified in Section 260500 "Common Work Results for Electrical," and concrete materials and installation requirements are specified in concrete specification sections.

3.6. IDENTIFICATION

A. Identify VFCs, components, and control wiring according to Section 260553 "Identification for Electrical Systems."

B. Operating Instructions: Frame printed operating instructions for VFCs, including control sequences and emergency procedures. Fabricate frame of finished metal, and cover instructions with clear acrylic plastic. Mount on front of VFC units.

3.7. CONTROL WIRING INSTALLATION

A. Install wiring between VFCs and remote devices according to Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

B. Bundle, train, and support wiring in enclosures.

C. Connect hand-off-automatic switch and other automatic-control devices where applicable.

1. Connect selector switches to bypass only manual- and automatic-control devices that have no safety functions when switch is in hand position.
2. Connect selector switches with control circuit in both hand and automatic positions for safety-type control devices such as low- and high-pressure cutouts, high-temperature cutouts, and motor overload protectors.

3.8. CONNECTIONS

A. Conduit installation requirements are specified in other electrical specification sections. Drawings indicate general arrangement of conduit, fittings, and specialties.

B. Ground equipment according to Section 260526 "Grounding and Bonding for Electrical Systems."

3.9. FIELD QUALITY CONTROL

A. Prepare for acceptance tests as follows:

1. Test insulation resistance for each enclosed controller element, bus, component, connecting supply, feeder, and control circuit.
2. Test continuity of each circuit.

B. Manufacturer's Field Service: Engage a factory-authorized service representative to perform the following:

1. Inspect controllers, wiring, components, connections, and equipment installation. Test and adjust controllers, components, and equipment.
2. Assist in field testing of equipment including pretesting and adjusting of solid-state controllers.
3. Report results in writing.

C. Testing Agency will engage a qualified testing and inspecting agency to perform field tests and inspections and prepare test reports.

D. Perform the following field tests and inspections and prepare test reports:

1. Perform each electrical test and visual and mechanical inspection, except optional tests, stated in NETA ATS. Certify compliance with test parameters.
2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.

3.10. ADJUSTING

A. Set field-adjustable switches and circuit-breaker trip ranges.

3.11. INSTRUCTION

A. Engage a factory-authorized service representative to instruct building's operating personnel to adjust, operate, and maintain variable frequency controllers.

END OF SECTION 262923

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SECTION 263213
Engine-Generators

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The following documents apply to all required work for the Project: (1) the Contract Drawing, (2) the Specification, (3) the General Conditions, (4) the Addendum and (5) the Contract (City of New York Standard Construction Contract).

B. LEED / Environmentally Preferable Purchase (EPP) General Requirements:

1. Refer to DDC General Conditions and the Addendum to the General Conditions.
2. LEED requirements apply to all Phase II work with the exception of the Existing Building scope. EPP requirements apply to the project's Existing Building scope only.

1.2 SCOPE OF WORK

Provide a natural gas-powered engine-generator set of the latest commercial type and design.

1.3 MATERIALS

A. The Supplier shall furnish:

1. A 500 KW Standby rated natural gas engine-generator set along with accessories, per this Specification.
2. A NEMA 1 Automatic Transfer Switch per Specification included.
3. Labor to test the generator with resistive load banks upon completion of installation.
4. Owner instruction services.

1.4 MANUFACTURER

The generator set shall be a factory package of one manufacturer who has been regularly engaged in the design and production of generator sets for a minimum of 10 years. To qualify as a manufacturer, the supplier must manufacture the engine, the generator, or both items.

1.6 SUPPLIER

The completed engine-generator set shall be supplied by the Manufacturer's authorized distributor only.

1.7 POWER RATING

Power rating of the engine-generator set shall be based on operation at rated rpm when equipped with all necessary operating accessories, such as air cleaners, oil pump, jacket water pump, governor, alternating current generator, and exciter regulator. Radiator fan shall be included as necessary operating accessory.

A prototype test to the demands of NFPA 110, Level 1 and an endurance test of at least 1,000 hours at 100% of the Standby rating shall have been conducted for the engine-generator set being bid.

Package will be EPA certified for emergency power applications with air/fuel ratio controls built into the control panel.

1.8 SUBMITTAL DATA

A. Refer to DDC General Conditions for submittal requirements.

B. Make and model of engine-generator.

C. Makes and models of major auxiliary equipment, including automatic transfer switch, vibration isolators, and radiator.

D. Manufacturer-produced dimension drawings of the complete engine-generator set clearly showing entrance points for each of the interconnections required.

E. Combustion air requirements.

F. Location and descriptions of the supplier's parts and service facilities within a 50 mile radius of the job site, including parts inventory and number of qualified engine-generator set service personnel.

G. Actual electrical diagrams, including schematic diagrams and interconnection wiring diagrams for all equipment to be supplied.

H. Manufacturer warranty statements.

I. Engine altitude deration information.

J. Service agreements for the routine maintenance or total maintenance and repair of the engine-generator set shall be offered for a period of no less than 2 years.

K. Source quality-control test reports.

1. Certified summary of prototype-unit test report.
2. Certified Test Reports: For components and accessories that are equivalent, but not identical, to those tested on prototype unit.
3. Certified Summary of Performance Tests: Certify compliance with specified requirement to meet performance criteria for sensitive loads.
4. Report of factory test on units to be shipped for this Project, showing evidence of compliance with specified requirements.
5. Report of sound generation.
6. Report of exhaust emissions showing compliance.
7. Certified Torsional Vibration Compatibility: Comply with NFPA 110.

L. Operation and Maintenance Data: For packaged engine generators to include in emergency,

operation, and maintenance manuals. In addition to items specified in DDC General Conditions, include the following:

1. List of tools and replacement items recommended to be stored at Project for ready access. Include part and drawing numbers, current prices and source of supply.

PART 2 - PRODUCTS

2.1 GENERAL

A. References and Standards

The generator set covered by these specifications shall be designed, tested, rated, assembled and installed in strict accordance with all applicable standards below:

1. ISO8528-5
2. BS5514
3. SAE J1349
4. ISO3046-1
5. DIN6271
6. UL2200

Designed to allow for installed compliance to NFPA 70, NFPA99 and NFPA 110

2.2 ENGINE

A. The engine shall be spark ignited, a minimum 10-cylinder, water-cooled, Vee type, four-stroke cycle. The engine shall not use turbocharging.

The engine shall be equipped with fuel, lube oil, intake air filters, lube oil cooler, service meter, gear-driven water pump, instruments, water temperature gauge, and lubricating oil pressure gauge.

The engine speed will be optimized to maintain a BMEP (brake mean effective pressure) less than 122.3 psi, so as to minimize engine wear.

The engine will run at 1,800 rpm during periodic exercising; an internal exerciser will provide an option to test at reduced speed (rpm) so as to minimize unnecessary noise.

B. Governor: Engine governor shall be Electronic type which shall control the frequency within 3% of rated frequency from no load to full load for droop operation or isochronous frequency regulation when supplying electronic or other non-linear loads. The frequency of any constant load shall remain within a stead-state band width of ±0.25% of rated frequency.

C. Mounting: The engine-generator set shall be mounted on a structural base supplied by the manufacturer.

D. Protective Devices: Safety shutoffs for high water temperature, low oil pressure, electrical over-speed, and engine over-crank shall be provided.

F. Engine shall be provided with vibration isolation.

2.3 GENERATOR

A. Rating: The generator shall be rated for standby electrical service as follows: 500 kW/625 kVA, at 0.8 pf, 120/208 volts, 3-phase, 60 Hz, 1,800 rpm.

B. The generator shall accept 100% rated load in a single step within 10 seconds.

C. Type: The generator shall be three-phase, single-bearing, synchronous type, wet wound, tropicalized, and built to NEMA standards. The process for winding, insertion and varnish is machine precision wound and machine finished.
The exciter field will be brushless type. Class H insulation shall be used on the stator and rotor, and both shall be further protected with an asphalt modified epoxy on all end coils. The rating will be at a generator temperature rise not to exceed 125° C at 40° C ambient so as to provide an extended life. The generator shall also include a resettable thermal protector and fuse for exciter/regulator protection against extended low power factor loads and faults. The generator rotor shall be dynamically balanced within 0.0005" peak-to-peak amplitude displacements at both ends of shaft and shall sustain 25% over-speed.

D. Alternator shall be 12 lead reconnectable windings.

E. Regulator: A digital automatic volts-per-Hz type, solid-state exciter/regulator, manufactured by the generator manufacturer, shall be included and shock mounted inside the generator control panel enclosure. Voltage regulation shall be ±0.25% from no load to full-rated load. Readily accessible voltage droop, voltage level, and voltage gain controls shall be included in the module. Voltage level adjustment shall be a minimum of ±10%.

The module shall include the following protective features:

1. Current limit circuits shall restrain the exciter field current while allowing full forcing voltage to be applied to obtain rapid response during transient conditions or service overloading on the generator.

2. A time-delay circuit shall sense the current limit operation and cut off all field current to the generator after 10 seconds.

2.4 COOLING SYSTEM

A. Radiator: An engine-mounted radiator with Puller-type fan shall be provided to maintain safe operation at 110°F ambient temperature. Total airflow restriction to and from the radiator shall not exceed 0.5" H_2O (0.12 KPA). The radiator shall have two core sections to service the engine jacket

water and aftercooler circuits. Both cores are to be enclosed in a single housing. The aftercooler core shall be designed for 130°F maximum water temperature.

B. Cooling System Treatment: The engine cooling system shall be pre-treated by the engine supplier for the inhibition of internal corrosion. A solution of 50% ethylene glycol shall be added.

2.5 FUEL SYSTEM

The engine/generator shall be capable of operation on low pressure natural gas. A normally closed 12 VDC gas valve and secondary pressure regulator will be factory installed. A braided flexible fuel connector will be furnished for installation between the gas valve and the gas piping.

2.6 EXHAUST SILENCER

Critical grade silencer or greater if required to achieve acoustic rating in section 2.2 E must be enclosed within the unit in a separate discharge box with thermal grade wrapping.

2.7 STARTING MOTOR

The engine shall be equipped with an electric starting system with positive engagement drive and of sufficient capacity to crank the engine at a speed which will start the engine under operating conditions. The starting pinion will disengage automatically when the engine starts.

2.8 AUTOMATIC CONTROLS

Fully automatic generator set start-stop controls in the generator control panel shall be provided. Controls shall provide shutdown for low oil pressure, high water temperature, low coolant level, over-speed, over-crank, over-voltage and one auxiliary contact for activating accessory items. Controls shall include cranking cycle without lockout and manual reset feature.

The same panel will provide voltage regulation.

2.9 JACKET WATER HEATER

An engine-mounted thermal circulation water heater incorporating an adjustable thermostatic switch shall be furnished to maintain engine jacket water to 90°F (32.2°C).

2.10 BATTERY AND BATTERY CHARGER

A. A lead/acid storage battery set of the heavy-duty diesel starting type shall be provided. Battery voltage shall be compatible with the starting system. A battery rack constructed in conformance with the NEC requirements and necessary cables and clamps shall be provided.

B. A current-limiting, float-equalize charger shall be installed inside the generator enclosure to automatically recharge batteries. The charger shall float at 2.17 volts per cell and equalize at 2.33 volts per cell. It should include overload protection, silicon diode full wave rectifiers, voltage surge

suppressors, DC ammeter, and fused AC output, and battery malfunctions alarm relay. AC input voltage shall be 120 volts, single phase. Amperage output shall be no less than 10 amperes.

2.11 MAIN LINE CIRCUIT BREAKER

A. A main line circuit breaker carrying the UL mark shall be factory installed. The circuit breaker shall meet standards established by UL, NEMA, and the NEC. The breaker shall be rated per the manufacturer's recommendations.

B. The trip unit for each pole shall have elements providing inverse time delay during overload conditions and instantaneous magnetic tripping for short circuit protection.

C. Generator/exciter field circuit breakers do not meet the above electrical standards and are unacceptable for line protection.

2.12 GENERATOR CONTROL PANEL

A. Control panel shall be obtained from same manufacturer as generator set and shall include factory warranty and manufacturer's parts and service support.
Control panel will operate in -40 to +70 degrees C.

B. Generator-mounted Control Panel: Designed and built by the system manufacturer and incorporating 100% solid-state circuitry, sealed dust-tight, watertight modular components and instrumentation. The panel shall be shock mounted to the generator.
It shall comply with IEC, IEC 144, IP22, NEMA 1 for external environmental resistance and IP44/NEMA 12 resistance for internal sealed modules. The panel shall include the following equipment:

1. General AC Output Metering Devices:
AC voltmeter 3-1/2" 2%
AC ammeter 3-1/2" 2%
Dial Frequency Meter 3-1/2" 2%
Voltmeter-Ammeter Phase selector switch, 4 Position

2. Engine Monitoring Devices:
Water temperature gauge
Running time meter
Oil pressure gauge

3. Start/Stop Controls:
1 start-stop switch, cycle cranking with cooldown timer, auto start-stop, manual start, off, and reset positions.
1 voltage adjust rheostat
1 alarm horn with silence switch. Horn must be 100 dB.
1 panel light and on/off switch for same
1 alarm module with five red flashing lights to annunciate shutdowns for over-speed, low oil pressure, high water temperature, and over-crank
Two communication ports, Modbus supported

All input signals from sensors will use 4-20 mA input signal.
Load imbalance thermal protection shall be provided.

C. Voltage regulator shall be internal to control panel in order to protect from environmental damage.

D. Convenience receptacles will be provided for the easy connection of auxiliary heaters.

2.13 AUTOMATIC LOAD TRANSFER SWITCH

A. See Section 263600.

PART 3 – EXECUTION

3.1. EXECUTION REQUIREMENTS

A. Refer to DDC General Conditions for execution requirements.

3.2. EXAMINATION

A. Examine areas, equipment bases, and conditions, with Installer present, for compliance with requirements for installation and other conditions affecting packaged engine-generator performance.

B. Examine roughing-in of piping systems and electrical connections. Verify actual locations of connections before packaged engine-generator installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.3. INSTALLATION

A. Comply with packaged engine-generator manufacturers' written installation and alignment instructions and with NFPA 110.

B. Install packaged engine generator to provide access, without removing connections or accessories, for periodic maintenance.

C. Install packaged engine generator with restrained spring isolators having a minimum deflection of 1 inch (25 mm) on 4-inch- (100-mm-) high concrete base. Secure sets to anchor bolts installed in concrete bases. Concrete base construction is specified in Section 260548"Vibration and Seismic Controls for Electrical Systems."

D. Electrical Wiring: Install electrical devices furnished by equipment manufacturers but not specified to be factory mounted.

3.4. CONNECTIONS

A. Piping installation requirements are specified in HVAC specification sections. Drawings indicate general arrangement of piping and specialties.

B. Ground equipment according to Section 260526 "Grounding and Bonding for Electrical Systems."

C. Connect wiring according to Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

3.5. IDENTIFICATION

A. Identify system components according to Section 230553 "Identification for HVAC Piping and Equipment" and Section 260553 "Identification for Electrical Systems."

3.6. FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections and prepare test reports.

B. Tests and Inspections:

1. Perform tests recommended by manufacturer and each electrical test and visual and mechanical inspection (except those indicated to be optional) for "AC Generators and for Emergency Systems" specified in NETA Acceptance Testing Specification. Certify compliance with test parameters.
2. NFPA 110 Acceptance Tests: Perform tests required by NFPA 110 that are additional to those specified here including, but not limited to, single-step full-load pickup test.
3. Battery Tests: Equalize charging of battery cells according to manufacturer's written instructions. Record individual cell voltages.
    a. Measure charging voltage and voltages between available battery terminals for full-charging and float-charging conditions. Check electrolyte level and specific gravity under both conditions.
    b. Test for contact integrity of all connectors. Perform an integrity load test and a capacity load test for the battery.
    c. Verify acceptance of charge for each element of the battery after discharge.
    d. Verify that measurements are within manufacturer's specifications.
4. Battery-Charger Tests: Verify specified rates of charge for both equalizing and float-charging conditions.
5. System Integrity Tests: Methodically verify proper installation, connection, and integrity of each element of engine-generator system before and during system operation. Check for air, exhaust, and fluid leaks.
6. Exhaust-System Back-Pressure Test: Use a manometer with a scale exceeding 40-inch wg (120 kPa). Connect to exhaust line close to engine exhaust manifold. Verify that back pressure at full-rated load is within manufacturer's written allowable limits for the engine.
7. Exhaust Emissions Test.
8. Voltage and Frequency Transient Stability Tests: Use recording oscilloscope to measure voltage and frequency transients for 50 and 100 percent step-load increases and decreases and verify that performance is as specified.
9. Harmonic-Content Tests: Measure harmonic content of output voltage under 25 percent and at 100 percent of rated linear load. Verify that harmonic content is within specified limits.
10. Noise Level Tests: Measure A-weighted level of noise emanating from generator-set installation, including engine exhaust and cooling-air intake and discharge, at four locations and compare measured levels with required values.

C. Coordinate tests with tests for transfer switches and run them concurrently.

D. Test instruments shall have been calibrated within the last 12 months, traceable to standards of NIST, and adequate for making positive observation of test results. Make calibration records available for examination on request.

E. Leak Test: After installation, charge system and test for leaks. Restore leaks and retest until no leaks exist.

F. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.

G. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

H. Remove and replace malfunctioning units and retest as specified above.

I. Retest: Correct deficiencies identified by tests and observations and retest until specified requirements are met.

J. Report results of tests and inspections in writing. Record adjustable relay settings and measured insulation resistances, time delays, and other values and observations. Attach a label or tag to each tested component indicating satisfactory completion of tests.

K. Infrared Scanning: After Substantial Completion, but not more than 60 days after Final Acceptance, perform an infrared scan of each power wiring termination and each bus connection. Remove all access panels so terminations and connections are accessible to portable scanner.

1. Follow-up Infrared Scanning: Perform an additional follow-up infrared scan 11 months after date of Substantial Completion.
2. Instrument: Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.
3. Record of Infrared Scanning: Prepare a certified report that identifies terminations and connections checked and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

3.7. INSTRUCTION

A. Engage a factory-authorized service representative to instruct building's operating personnel to adjust, operate, and maintain packaged engine generators.

END OF SECTION 263213

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SECTION 263600
Transfer Switches

PART 1 - GENERAL

1.1. RELATED DOCUMENTS

A. The following documents apply to all required work for the Project: (1) the Contract Drawings, (2) the Specifications, (3) the General Conditions, (4) the Addendum and (5) the Contract (City of New York Standard Construction Contract).

B. LEED / Environmentally Preferable Purchase (EPP) General Requirements:

1. Refer to DDC General Conditions and the Addendum to the General Conditions.
2. LEED requirements apply to all Phase II work with the exception of the Existing Building scope. EPP requirements apply to the project's Existing Building scope only.

1.2. SUMMARY

A. This Section includes transfer switches rated 600 V and less, including the following:

1. Automatic transfer switches.
2. Remote annunciation systems.

B. Related Sections include the following:

1. Section 213113 "Electric-Drive, Centrifugal Fire Pumps" for automatic transfer switches for fire pumps.

1.3. SUBMITTALS

A. Refer to DDC General Conditions Section 01 33 00 "Submittal Procedures."

B. Product Data: For each type of product indicated. Include rated capacities, weights, operating characteristics, furnished specialties, and accessories.

C. Shop Drawings: Dimensioned plans, elevations, sections, and details showing minimum clearances, conductor entry provisions, gutter space, installed features and devices, and material lists for each switch specified.

D. Manufacturer Seismic Qualification Certification: Submit certification that transfer switches accessories, and components will withstand seismic forces defined in Section 260548 "Vibration and Seismic Controls for Electrical Systems." Include the following:

1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.

a. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified."

2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

E. Qualification Data: For manufacturer.

F. Field quality-control test reports.

G. Operation and Maintenance Data: For each type of product to include in emergency, operation, and maintenance manuals. In addition to items specified in DDC General Conditions include the following:

1. Features and operating sequences, both automatic and manual.
2. List of all factory settings of relays; provide relay-setting and calibration instructions, including software, where applicable.

1.4. QUALITY ASSURANCE

A. Refer to DDC General Conditions Section 01 40 00 "Quality Requirements."

B. Manufacturer Qualifications: Maintain a service center capable of providing instruction, parts, and emergency maintenance restores within a response period of less than eight hours from time of notification.

C. Testing Agency Qualifications: An independent agency, with the experience and capability to conduct the testing indicated and that is acceptable to the Commissioner.

D. Source Limitations: Obtain automatic transfer switches and bypass/isolation switches through one source from a single manufacturer.

E. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to the Commissioner, and marked for intended use.

F. Comply with NEMA ICS 1.

G. Comply with NFPA 70.

H. Comply with NFPA 99.

I. Comply with NFPA 110.

J. Comply with UL 1008 unless requirements of these Specifications are stricter.

1.5. PROJECT CONDITIONS

A. Interruption of Existing Electrical Service: Do not interrupt electrical service to facilities occupied by the City of New York unless permitted under the following conditions and then only after arranging to provide temporary electrical service:

1. Notify the Commissioner no fewer than two days in advance of proposed interruption of electrical service.
2. Do not proceed with interruption of electrical service without Commissioner's written permission.

1.6. COORDINATION

A. Coordinate size and location of concrete bases. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified in concrete specification sections.

PART 2 - PRODUCTS

2.1. MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Contactor Transfer Switches:
   a. Caterpillar; Engine Div.
   b. Emerson; ASCO Power Technologies, LP.
   c. Generac Power Systems, Inc.
   d. GE Zenith Controls.
   e. Kohler Power Systems; Generator Division.
   f. Onan/Cummins Power Generation; Industrial Business Group.
   g. Russelectric, Inc.
   h. Or Approved Equal.

2.2. GENERAL TRANSFER-SWITCH PRODUCT REQUIREMENTS

A. Indicated Current Ratings: Apply as defined in UL 1008 for continuous loading and total system transfer, including tungsten filament lamp loads not exceeding 30 percent of switch ampere rating, unless otherwise indicated.

B. Indicate required ratings on Drawings.

1. Where transfer switch includes internal fault-current protection, rating of switch and trip unit combination shall exceed indicated fault-current value at installation location.

C. Solid-State Controls: Repetitive accuracy of all settings shall be plus or minus 2 percent or better over an operating temperature range of minus 20 to plus 70 deg C.

D. Resistance to Damage by Voltage Transients: Components shall meet or exceed voltage-surge withstand capability requirements when tested according to IEEE C62.41. Components shall meet or exceed voltage-impulse withstand test of NEMA ICS 1.

E. Electrical Operation: Accomplish by a nonfused, momentarily energized solenoid or electric-motor-operated mechanism, mechanically and electrically interlocked in both directions.

F. Switch Characteristics: Designed for continuous-duty repetitive transfer of full-rated current between active power sources.

1. Limitation: Switches using molded-case switches or circuit breakers or insulated-case circuit-breaker components are not acceptable.
2. Switch Action: Double throw; mechanically held in both directions.
3. Contacts: Silver composition or silver alloy for load-current switching. Conventional automatic transfer-switch units, rated 225 A and higher, shall have separate arcing contacts.

G. Neutral Switching. Where four-pole switches are indicated, provide neutral pole switched simultaneously with phase poles.

H. Neutral Terminal: Solid and fully rated, unless otherwise indicated.

I. Oversize Neutral: Ampacity and switch rating of neutral path through units indicated for oversize neutral shall be double the nominal rating of circuit in which switch is installed.

J. Heater: Equip switches exposed to outdoor temperatures and humidity, and other units indicated, with an internal heater. Provide thermostat within enclosure to control heater.

K. Battery Charger: For generator starting batteries.

1. Float type rated 2 A.
2. Ammeter to display charging current.
3. Fused ac inputs and dc outputs.

L. Annunciation, Control, and Programming Interface Components: Devices at transfer switches for communicating with remote programming devices, annunciators, or annunciator and control panels shall have communication capability matched with remote device.

M. Factory Wiring: Train and bundle factory wiring and label, consistent with Shop Drawings, either by color-code or by numbered or lettered wire and cable tape markers at terminations. Color-coding and wire and cable tape markers are specified in Section 260553 "Identification for Electrical Systems."

1. Designated Terminals: Pressure type, suitable for types and sizes of field wiring indicated.
2. Power-Terminal Arrangement and Field-Wiring Space: Suitable for top, side, or bottom entrance of feeder conductors as indicated.
3. Control Wiring: Equipped with lugs suitable for connection to terminal strips.

N. Enclosures: General-purpose NEMA 250, Type 1, complying with NEMA ICS 6 and UL 508, unless otherwise indicated.

2.3. AUTOMATIC TRANSFER SWITCHES

A. Comply with Level 1 equipment according to NFPA 110.

B. Switching Arrangement: Double-throw type, incapable of pauses or intermediate position stops during normal functioning, unless otherwise indicated.

C. Manual Switch Operation: Under load, with door closed and with either or both sources energized. Transfer time is same as for electrical operation. Control circuit automatically disconnects from electrical operator during manual operation.

D. Manual Switch Operation: Unloaded. Control circuit automatically disconnects from electrical operator during manual operation.

E. Signal-Before-Transfer Contacts: A set of normally open/normally closed dry contacts operates in advance of retransfer to normal source. Interval is adjustable from 1 to 30 seconds.

F. Digital Communication Interface: Matched to capability of remote annunciator or annunciator and control panel.

G. In-Phase Monitor: Factory-wired, internal relay controls transfer so it occurs only when the two sources are synchronized in phase. Relay compares phase relationship and frequency difference between normal and emergency sources and initiates transfer when both sources are within 15 electrical degrees, and only if transfer can be completed within 60 electrical degrees. Transfer is initiated only if both sources are within 2 Hz of nominal frequency and 70 percent or more of nominal voltage.

H. Motor Disconnect and Timing Relay: Controls designate starters so they disconnect motors before transfer and reconnect them selectively at an adjustable time interval after transfer. Control connection to motor starters is through wiring external to automatic transfer switch. Time delay for reconnecting individual motor loads is adjustable between 1 and 60 seconds, and settings are as indicated. Relay contacts handling motor-control circuit inrush and seal currents are rated for actual currents to be encountered.

I. Programmed Neutral Switch Position: Switch operator has a programmed neutral position arranged to provide a midpoint between the two working switch positions, with an intentional, time-controlled pause at midpoint during transfer. Pause is adjustable from 0.5 to 30 seconds minimum and factory set for 0.5 second, unless otherwise indicated. Time delay occurs for both transfer directions. Pause is disabled unless both sources are live.

J. Automatic Transfer-Switch Features:

1. Undervoltage Sensing for Each Phase of Normal Source: Sense low phase-to-ground voltage on each phase. Pickup voltage shall be adjustable from 85 to 100 percent of nominal, and dropout voltage is adjustable from 75 to 98 percent of pickup value. Factory set for pickup at 90 percent and dropout at 85 percent.
2. Adjustable Time Delay: For override of normal-source voltage sensing to delay transfer and engine start signals. Adjustable from zero to six seconds, and factory set for one second.

3. Voltage/Frequency Lockout Relay: Prevent premature transfer to generator. Pickup voltage shall be adjustable from 85 to 100 percent of nominal. Factory set for pickup at 90 percent. Pickup frequency shall be adjustable from 90 to 100 percent of nominal. Factory set for pickup at 95 percent.
4. Time Delay for Retransfer to Normal Source: Adjustable from 0 to 30 minutes, and factory set for 10 minutes to automatically defeat delay on loss of voltage or sustained undervoltage of emergency source, provided normal supply has been restored.
5. Test Switch: Simulate normal-source failure.
6. Switch-Position Pilot Lights: Indicate source to which load is connected.
7. Source-Available Indicating Lights: Supervise sources via transfer-switch normal- and emergency-source sensing circuits.

    a. Normal Power Supervision: Green light with nameplate engraved "Normal Source Available."
    b. Emergency Power Supervision: Red light with nameplate engraved "Emergency Source Available."

8. Unassigned Auxiliary Contacts: Two normally open, single-pole, double-throw contacts for each switch position, rated 10 A at 240-V ac.
9. Transfer Override Switch: Overrides automatic retransfer control so automatic transfer switch will remain connected to emergency power source regardless of condition of normal source. Pilot light indicates override status.
10. Engine Starting Contacts: One isolated and normally closed, and one isolated and normally open; rated 10 A at 32-V dc minimum.
11. Engine Shutdown Contacts: Instantaneous; shall initiate shutdown sequence at remote engine-generator controls after retransfer of load to normal source.
12. Engine Shutdown Contacts: Time delay adjustable from zero to five minutes, and factory set for five minutes. Contacts shall initiate shutdown at remote engine-generator controls after retransfer of load to normal source.
13. Engine-Generator Exerciser: Solid-state, programmable-time switch starts engine generator and transfers load to it from normal source for a preset time, then retransfers and shuts down engine after a preset cool-down period. Initiates exercise cycle at preset intervals adjustable from 7 to 30 days. Running periods are adjustable from 10 to 30 minutes. Factory settings are for 7-day exercise cycle, 20-minute running period, and 5-minute cool-down period. Exerciser features include the following:

    a. Exerciser Transfer Selector Switch: Permits selection of exercise with and without load transfer.
    b. Push-button programming control with digital display of settings.
    c. Integral battery operation of time switch when normal control power is not available.

2.4. REMOTE ANNUNCIATOR SYSTEM

A. Functional Description: Remote annunciator panel shall annunciate conditions for indicated transfer switches. Annunciation shall include the following:

1. Sources available, as defined by actual pickup and dropout settings of transfer-switch controls.
2. Switch position.
3. Switch in test mode.
4. Failure of communication link.

B. Annunciator Panel: LED-lamp type with audible signal and silencing switch.

1. Indicating Lights: Grouped for each transfer switch monitored.
2. Label each group, indicating transfer switch it monitors, location of switch, and identity of load it serves.
3. Mounting: Flush, modular, steel cabinet, unless otherwise indicated.
4. Lamp Test: Push-to-test or lamp-test switch on front panel.

2.5. SOURCE QUALITY CONTROL

A. Factory test and inspect components, assembled switches, and associated equipment. Ensure proper operation. Check transfer time and voltage, frequency, and time-delay settings for compliance with specified requirements. Perform dielectric strength test complying with NEMA ICS 1.

PART 3 - EXECUTION

3.1. EXECUTION REQUIREMENTS

A. Refer to DDC General Conditions for execution requirements.

3.2. INSTALLATION

A. Design each fastener and support to carry load indicated by seismic requirements and according to seismic-restraint details. See Section 260548 "Vibration and Seismic Controls for Electrical Systems."

B. Floor-Mounting Switch: Anchor to floor by bolting.

1. Concrete Bases: 4 inches (100 mm) high, reinforced, with chamfered edges. Extend base no more than 4 inches (100 mm) in all directions beyond the maximum dimensions of switch, unless otherwise indicated or unless required for seismic support. Construct concrete bases according to Section 260529 "Hangers and Supports for Electrical Systems."

C. Annunciator Panel Mounting: Flush in wall, unless otherwise indicated.

D. Identify components according to Section 260553 "Identification for Electrical Systems."

E. Set field-adjustable intervals and delays, relays, and engine exerciser clock.

3.3. CONNECTIONS

A. Wiring to Remote Components: Match type and number of cables and conductors to control and communication requirements of transfer switches as recommended by manufacturer. Increase raceway sizes at no additional cost to the City of New York if necessary to accommodate required wiring.

B. Ground equipment according to Section 260526 "Grounding and Bonding for Electrical Systems."

C. Connect wiring according to Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

3.4. FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections. Report results in writing.

B. Perform tests and inspections and prepare test reports.

1. After installing equipment and after electrical circuitry has been energized, test for compliance with requirements.
2. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
3. Measure insulation resistance phase-to-phase and phase-to-ground with insulation-resistance tester. Include external annunciation and control circuits. Use test voltages and procedure recommended by manufacturer. Comply with manufacturer's specified minimum resistance.

    a. Check for electrical continuity of circuits and for short circuits.
    b. Inspect for physical damage, proper installation and connection, and integrity of barriers, covers, and safety features.
    c. Verify that manual transfer warnings are properly placed.
    d. Perform manual transfer operation.

4. After energizing circuits, demonstrate interlocking sequence and operational function for each switch at least three times.

    a. Simulate power failures of normal source to automatic transfer switches and of emergency source with normal source available.
    b. Simulate loss of phase-to-ground voltage for each phase of normal source.
    c. Verify time-delay settings.
    d. Verify pickup and dropout voltages by data readout or inspection of control settings.
    e. Test bypass/isolation unit functional modes and related automatic transfer-switch operations.
    f. Perform contact-resistance test across main contacts and correct values exceeding 500 microhms and values for 1 pole deviating by more than 50 percent from other poles.
    g. Verify proper sequence and correct timing of automatic engine starting, transfer time delay, retransfer time delay on restoration of normal power, and engine cool-down and shutdown.

5. Ground-Fault Tests: Coordinate with testing of ground-fault protective devices for power delivery from both sources.

    a. Verify grounding connections and locations and ratings of sensors.

C. Testing Agency's Tests and Inspections:

1. After installing equipment and after electrical circuitry has been energized, test for compliance with requirements.
2. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.

3. Measure insulation resistance phase-to-phase and phase-to-ground with insulation-resistance tester. Include external annunciation and control circuits. Use test voltages and procedure recommended by manufacturer. Comply with manufacturer's specified minimum resistance.

   a. Check for electrical continuity of circuits and for short circuits.
   b. Inspect for physical damage, proper installation and connection, and integrity of barriers, covers, and safety features.
   c. Verify that manual transfer warnings are properly placed.
   d. Perform manual transfer operation.

4. After energizing circuits, demonstrate interlocking sequence and operational function for each switch at least three times.

   a. Simulate power failures of normal source to automatic transfer switches and of emergency source with normal source available.
   b. Simulate loss of phase-to-ground voltage for each phase of normal source.
   c. Verify time-delay settings.
   d. Verify pickup and dropout voltages by data readout or inspection of control settings.
   e. Test bypass/isolation unit functional modes and related automatic transfer-switch operations.
   f. Perform contact-resistance test across main contacts and correct values exceeding 500 microhms and values for 1 pole deviating by more than 50 percent from other poles.
   g. Verify proper sequence and correct timing of automatic engine starting, transfer time delay, retransfer time delay on restoration of normal power, and engine cool-down and shutdown.

5. Ground-Fault Tests: Coordinate with testing of ground-fault protective devices for power delivery from both sources.

   a. Verify grounding connections and locations and ratings of sensors.

D. Coordinate tests with tests of generator and run them concurrently.

E. Report results of tests and inspections in writing. Record adjustable relay settings and measured insulation and contact resistances and time delays. Attach a label or tag to each tested component indicating satisfactory completion of tests.

F. Remove and replace malfunctioning units and retest as specified above.

G. Infrared Scanning: After Substantial Completion, but not more than 60 days after Final Acceptance, perform an infrared scan of each switch. Remove all access panels so joints and connections are accessible to portable scanner.

1. Follow-up Infrared Scanning: Perform an additional follow-up infrared scan of each switch 11 months after date of Substantial Completion.
2. Instrument: Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.
3. Record of Infrared Scanning: Prepare a certified report that identifies switches checked and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

3.5. INSTRUCTION

A. Engage a factory-authorized service representative to instruct building's operating personnel to adjust, operate, and maintain transfer switches and related equipment as specified below.

B. Coordinate this training with that for generator equipment.

END OF SECTION 263600

SECTION 264113
Lightning Protection for Structures

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The following documents apply to all required work for the Project: (1) the Contract Drawings, (2) the Specifications, (3) the General Conditions, (4) the Addendum and (5) the Contract (City of New York Standard Construction Contract).

B. LEED General Requirements:

1. Refer to DDC General Conditions.

a. Section 01 33 00 "Submittal Procedures."

b. Section 01 81 13.04 "Sustainable Design Requirements for LEED v4 Buildings."

1.2 SUMMARY

A. Section includes lightning protection for structures and building site components.

1.3 SUBMITTALS

A. Refer to DDC General Conditions Section 01 33 00 "Submittal Procedures."

B. Shop Drawings: For air terminals and mounting accessories.

1. Layout of the lightning protection system, along with details of the components to be used in the installation.
2. Include indications for use of raceway, data on how concealment requirements will be met, and calculations required by NFPA 780 for bonding of grounded and isolated metal bodies.

C. Qualification Data: For qualified Installer and manufacturer. Include data on listing or certification by UL.

D. Certification, signed by Contractor, that roof adhesive is approved by manufacturer of roofing material.

E. Field quality-control reports.

F. Comply with recommendations in NFPA 780, Annex D, "Inspection and Maintenance of Lightning Protection Systems," for maintenance of the lightning protection system.

G. Other Informational Submittals: Plans showing dimensioned as-built locations of grounding features, including the following:

1. Ground rods.
2. Ground loop conductor.

1.4 QUALITY ASSURANCE

A. Refer to DDC General Conditions Section 01 40 00 "Quality Requirements."

B. Installer Qualifications: Certified by UL, trained and approved for installation of units required for this Project.

C. System Certificate:

1. UL Master Label.

D. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 780, "Definitions" Article.

1.5 COORDINATION

A. Coordinate installation of lightning protection with installation of other building systems and components, including electrical wiring, supporting structures and building materials, metal bodies requiring bonding to lightning protection components, and building finishes.

B. Coordinate installation of air terminals attached to roof systems with roofing manufacturer and Installer.

C. Flashings of through-roof assemblies shall comply with roofing manufacturers' specifications.

PART 2 - PRODUCTS

2.1 LIGHTNING PROTECTION SYSTEM COMPONENTS

A. Comply with UL 96.

B. Roof-Mounted Air Terminals: NFPA 780, Class I copper unless otherwise indicated.
1. Manufacturers: Subject to compliance with requirements, provide:
   a. Heary Bros. Lightning Protection Co. Inc.
   b. East Coast Lightning Equipment Inc.
   c. Preferred Lightning Protection.
   d. Robbins Lightning, Inc.
   e. Thompson Lightning Protection, Inc.
   f. Approval Equal.

2. Air Terminals More than 24 Inches (600 mm) Long: With brace attached to the terminal at not less than half the height of the terminal.

3. Single-Membrane, Roof-Mounted Air Terminals: Designed specifically for single-membrane roof system materials. Comply with requirements in Division 07 roofing Sections.

C. Main and Bonding Conductors: Copper.

D. Ground Loop Conductor: The same size and type as the main conductor except tinned.

E. Ground Rods: Copper-clad. 3/4 inch (19 mm) in diameter by 10 feet (3 m) long.

F. Heavy-Duty, Stack-Mounted, Lightning Protection Components: Stainless steel.

PART 3 - EXECUTION

3.1 EXECUTION REQUIREMENTS

A. Refer to DDC General Conditions for execution requirements.

3.2 INSTALLATION

A. Install lightning protection components and systems according to UL 96A.

B. Install conductors with direct paths from air terminals to ground connections. Avoid sharp bends.

C. Conceal the following conductors:

1. System conductors.
2. Down conductors.
3. Interior conductors.
4. Conductors within normal view of exterior locations at grade within 200 feet (60 m) of building.

D. Cable Connections: Use crimped or bolted connections for all conductor splices and connections between conductors and other components. Use exothermic-welded connections in underground portions of the system.

E. Air Terminals on Single-Ply Membrane Roofing: Comply with roofing membrane and adhesive manufacturer's written instructions.

F. Bond extremities of vertical metal bodies exceeding 60 feet (18 m) in length to lightning protection components.

G. Ground Loop: Install ground-level, potential equalization conductor and extend around the perimeter of structure.

1. Bury ground ring not less than 24 inches (600 mm) from building foundation.
2. Bond ground terminals to the ground loop.
3. Bond grounded building systems to the ground loop conductor within 12 feet (3.6 m) of grade level.

H. Bond lightning protection components with intermediate-level interconnection loop conductors to grounded metal bodies of building at 60-foot (18-m) intervals.

3.3 CORROSION PROTECTION

A. Do not combine materials that can form an electrolytic couple that will accelerate corrosion in the presence of moisture unless moisture is permanently excluded from junction of such materials.

B. Use conductors with protective coatings where conditions cause deterioration or corrosion of conductors.

3.4 FIELD QUALITY CONTROL

A. Notify Commissioner at least 48 hours in advance of inspection before concealing lightning protection components.

B. UL Inspection: Meet requirements to obtain a UL Master Label for system.

END OF SECTION 264113

SECTION 265100
Interior Lighting

PART 1 - GENERAL

1.1. RELATED DOCUMENTS

A. The following documents apply to all required work for the Project: (1) the Contract Drawings, (2) the Specifications, (3) the General Conditions, (4) the Addendum and (5) the Contract (City of New York Standard Construction Contract).

B. LEED / Environmentally Preferable Purchase (EPP) General Requirements:

1. Refer to DDC General Conditions and the Addendum to the General Conditions.
2. LEED requirements apply to all Phase II work with the exception of the Existing Building scope. EPP requirements apply to the project's Existing Building scope only.

1.2. SUMMARY

A. This Section includes the following:

1. Interior lighting fixtures, lamps, and ballasts.
2. Exit signs.
3. Lighting fixture supports.

1.3. DEFINITIONS

A. BF: Ballast factor.

B. CRI: Color-rendering index.

C. CU: Coefficient of utilization.

D. HID: High-intensity discharge.

E. LER: Luminaire efficacy rating.

F. Luminaire: Complete lighting fixture, including ballast housing if provided.

G. RCR: Room cavity ratio.

1.4. SUBMITTALS

A. Refer to DDC General Conditions Section 013300 "Submittal Procedures" for submittal requirements.

B. Product Data: For each type of lighting fixture, arranged in order of fixture designation. Include data on features, accessories, finishes, and the following:

1. Physical description of lighting fixture including dimensions.
2. Emergency lighting units including battery and charger.
3. Ballast.
4. Energy-efficiency data.
5. Life, output, and energy-efficiency data for lamps.
6. Photometric data, in IESNA format, based on laboratory tests of each lighting fixture type, outfitted with lamps, ballasts, and accessories identical to those indicated for the lighting fixture as applied in this Project.

    a. For indicated fixtures, photometric data shall be certified by a qualified independent testing agency. Photometric data for remaining fixtures shall be certified by the manufacturer.
    b. Photometric data shall be certified by a manufacturer's laboratory with a current accreditation under the National Voluntary Laboratory Accreditation Program (NVLAP) for Energy Efficient Lighting Products.

C. Shop Drawings: Show details of nonstandard or custom lighting fixtures. Indicate dimensions, weights, methods of field assembly, components, features, and accessories.

1. Wiring Diagrams: Power wiring.

D. Coordination Drawings: Reflected ceiling plan(s) and other details, drawn to scale, on which the following items are shown and coordinated with each other, based on input from installers of the items involved:

1. Lighting fixtures.
2. Suspended ceiling components.
3. Structural members to which suspension systems for lighting fixtures will be attached.
4. Other items in finished ceiling including the following:

    a. Air outlets and inlets.
    b. Speakers.
    c. Sprinklers.
    d. Smoke and fire detectors.
    e. Occupancy sensors.
    f. Access panels.

5. Perimeter moldings.

E. Samples for Verification: Interior lighting fixtures designated for sample submission in Interior Lighting Fixture Schedule. Each sample shall include the following:

1. Lamps: Specified units installed.
2. Accessories: Cords and plugs.

F. Product Certificates: For each type of ballast for bi-level and dimmer-controlled fixtures, signed by product manufacturer.

G. Qualification Data: For agencies providing photometric data for lighting fixtures.

H. Field quality-control test reports.

I. Operation and Maintenance Data: For lighting equipment and fixtures to include in emergency, operation, and maintenance manuals.

J. Warranties: Special warranties specified in this Section.

1.5. QUALITY ASSURANCE

A. Refer to DDC General Conditions section 01400 "Quality Requirements" for quality assurance requirements.

B. Luminaire Photometric Data Testing Laboratory Qualifications: Provided by manufacturers' laboratories that are accredited under the National Volunteer Laboratory Accreditation Program for Energy Efficient Lighting Products.

C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to the Commissioner, and marked for intended use.

D. Comply with NFPA 70.

E. FMG Compliance: Lighting fixtures for hazardous locations shall be listed and labeled for indicated class and division of hazard by FMG.

F. Mockups: Provide interior lighting fixtures for room or module mockups, complete with power and control connections.

1. Obtain Commissioner's approval of fixtures for mockups before starting installations.
2. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
3. Approved fixtures in mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.6. COORDINATION

A. Coordinate layout and installation of lighting fixtures and suspension system with other construction that penetrates ceilings or is supported by them, including HVAC equipment, fire-suppression system, and partition assemblies.

1.7. WARRANTY

A. Special Warranty for Ballasts: Manufacturer's standard form in which ballast manufacturer agrees to restore or replace ballasts that fail in materials or workmanship within specified warranty period.

1. Warranty Period for Electronic Ballasts: Five years from date of Substantial Completion.
2. Warranty Period for Electromagnetic Ballasts: Three years from date of Substantial Completion.

B. Special Warranty for T5 and T8 Fluorescent Lamps: Manufacturer's standard form, made out to the City of New York and signed by lamp manufacturer agreeing to replace lamps that fail in materials or workmanship, f.o.b. the nearest shipping point to Project site, within specified warranty period indicated below.

1. Warranty Period: Two year(s) from date of Substantial Completion

C. Special Warranty for LED Lamps:

Special Warranty for T5 and T8 Fluorescent Lamps: Manufacturer's standard form, made out to the City of New York and signed by lamp manufacturer agreeing to replace lamps that fail in materials or workmanship, f.o.b. the nearest shipping point to Project site, within specified warranty period indicated below.

1. Warranty Period: Five year(s) to include LED driver and all LED components.

PART 2 - PRODUCTS

2.1. MANUFACTURERS

A. Refer to Electrical Drawings (sheets E1-010, 11, 12) for light fixture schedule.

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Holophane
2. Focal Point
3. Cree
4. Vode
5. Ecosense
6. Bega
7. Lumenpulse
8. BK Lighting
9. Hevi Lite
10. USAI
11. Beacon
12. Hubbell
13. Ligman,
14. or approved equal.

2.2. LIGHTING FIXTURES AND COMPONENTS, GENERAL REQUIREMENTS

A. Recessed Fixtures: Comply with NEMA LE 4 for ceiling compatibility for recessed fixtures.

B. Incandescent Fixtures: Comply with UL 1598. Where LER is specified, test according to NEMA LE 5A.

C. Fluorescent Fixtures: Comply with UL 1598. Where LER is specified, test according to NEMA LE 5 and NEMA LE 5A as applicable.

D. HID Fixtures: Comply with UL 1598. Where LER is specified, test according to NEMA LE 5B.

E. LED Fixtures: Comply with UL 1598. Where LER is specified, test according to NEMA LE 5A.

F. Metal Parts: Free of burrs and sharp corners and edges.

G. Sheet Metal Components: Steel, unless otherwise indicated. Form and support to prevent warping and sagging.

H. Doors, Frames, and Other Internal Access: Smooth operating, free of light leakage under operating conditions, and designed to permit relamping without use of tools. Designed to prevent doors, frames, lenses, diffusers, and other components from falling accidentally during relamping and when secured in operating position.

I. Reflecting surfaces shall have minimum reflectance as follows, unless otherwise indicated:

1. White Surfaces: 85 percent.
2. Specular Surfaces: 83 percent.
3. Diffusing Specular Surfaces: 75 percent.
4. Laminated Silver Metallized Film: 90 percent.

J. Plastic Diffusers, Covers, and Globes:

1. Acrylic Lighting Diffusers: 100 percent virgin acrylic plastic. High resistance to yellowing and other changes due to aging, exposure to heat, and UV radiation.

   a. Lens Thickness: At least 0.125 inch (3.175 mm) minimum unless different thickness is indicated.
   b. UV stabilized.

2. Glass: Annealed crystal glass, unless otherwise indicated.

K. Electromagnetic-Interference Filters: Factory installed to suppress conducted electromagnetic-interference as required by MIL-STD-461E. Fabricate lighting fixtures with one filter on each ballast indicated to require a filter.

2.3. BALLASTS FOR LINEAR FLUORESCENT LAMPS

A. Electronic Ballasts: Comply with ANSI C82.11; instant -start type, unless otherwise indicated, and designed for type and quantity of lamps served. Ballasts shall be designed for full light output unless dimmer or bi-level control is indicated.

1. Sound Rating: A .
2. Total Harmonic Distortion Rating: Less than 10 percent.
3. Transient Voltage Protection: IEEE C62.41, Category A or better.
4. Operating Frequency: 42 kHz or higher.
5. Lamp Current Crest Factor: 1.7 or less.
6. BF: 0.85 or higher.
7. Power Factor: 0.98 or higher.
8. Parallel Lamp Circuits: Multiple lamp ballasts shall comply with ANSI C 82.11 and shall be connected to maintain full light output on surviving lamps if one or more lamps fail.

B. Electronic Programmed-Start Ballasts for T5 and T5HO Lamps: Comply with ANSI C82.11 and the following:

1. Lamp end-of-life detection and shutdown circuit for T5 diameter lamps.
2. Automatic lamp starting after lamp replacement.
3. Sound Rating: A.
4. Total Harmonic Distortion Rating: Less than 20 percent.
5. Transient Voltage Protection: IEEE C62.41, Category A or better.
6. Operating Frequency: 20 kHz or higher.
7. Lamp Current Crest Factor: 1.7 or less.
8. BF: 0.95 or higher, unless otherwise indicated.
9. Power Factor: 0.98 or higher.

C. Electromagnetic Ballasts: Comply with ANSI C82.1; energy saving, high-power factor, Class P, and having automatic-reset thermal protection.

1. Ballast Manufacturer Certification: Indicated by label.

D. Single Ballasts for Multiple Lighting Fixtures: Factory-wired with ballast arrangements and bundled extension wiring to suit final installation conditions without modification or rewiring in the field.

E. Ballasts for Low-Temperature Environments:

1. Temperatures 0 Deg F (Minus 17 Deg C) and Higher: Electronic or electromagnetic type rated for 0 deg F (minus 17 deg C) starting and operating temperature with indicated lamp types.
2. Temperatures Minus 20 Deg F (Minus 29 Deg C) and Higher: Electromagnetic type designed for use with indicated lamp types.

F. Ballasts for Low Electromagnetic-Interference Environments: Comply with 47 CFR, Chapter 1, Part 18, Subpart C, for limitations on electromagnetic and radio-frequency interference for consumer equipment.

G. Ballasts for Dimmer-Controlled Lighting Fixtures: Electronic type.

1. Dimming Range: 100 to 5 percent of rated lamp lumens.
2. Ballast Input Watts: Can be reduced to 20 percent of normal.
3. Compatibility: Certified by manufacturer for use with specific dimming control system and lamp type indicated.

H. Ballasts for Bi-Level Controlled Lighting Fixtures: Electronic type.

1. Operating Modes: Ballast circuit and leads provide for remote control of the light output of the associated lamp between high- and low-level and off.

   a. High-Level Operation: 100 percent of rated lamp lumens.
   b. Low-Level Operation: 50 percent of rated lamp lumens.

2. Ballast shall provide equal current to each lamp in each operating mode.
3. Compatibility: Certified by manufacturer for use with specific bi-level control system and lamp type indicated.

2.4. BALLASTS FOR COMPACT FLUORESCENT LAMPS

A. Description: Electronic programmed rapid-start type, complying with ANSI C 82.11, designed for type and quantity of lamps indicated. Ballast shall be designed for full light output unless dimmer or bi-level control is indicated:

1. Lamp end-of-life detection and shutdown circuit.
2. Automatic lamp starting after lamp replacement.
3. Sound Rating: A.
4. Total Harmonic Distortion Rating: Less than 20 percent.
5. Transient Voltage Protection: IEEE C62.41, Category A or better.
6. Operating Frequency: 20 kHz or higher.
7. Lamp Current Crest Factor: 1.7 or less.
8. BF: 0.95 or higher, unless otherwise indicated.
9. Power Factor: 0.98 or higher.
10. Interference: Comply with 47 CFR, Chapter 1, Part 18, Subpart C, for limitations on electromagnetic and radio-frequency interference for nonconsumer equipment.
11. Ballast Case Temperature: 75 deg C, maximum.

B. Ballasts for Dimmer-Controlled Lighting Fixtures: Electronic type.

1. Dimming Range: 100 to 5 percent of rated lamp lumens.
2. Ballast Input Watts: Can be reduced to 20 percent of normal.
3. Compatibility: Certified by manufacturer for use with specific dimming control system and lamp type indicated.

2.5. BALLASTS FOR HID LAMPS

A. Electromagnetic Ballast for Metal-Halide Lamps: Comply with ANSI C82.4 and UL 1029. Include the following features, unless otherwise indicated:

1. Ballast Circuit: Constant-wattage autotransformer or regulating high-power-factor type.
2. Minimum Starting Temperature: Minus 22 deg F (Minus 30 deg C) for single-lamp ballasts.
3. Normal Ambient Operating Temperature: 104 deg F (40 deg C).
4. Open-circuit operation that will not reduce average life.
5. Low-Noise Ballasts: Manufacturers' standard epoxy-encapsulated models designed to minimize audible fixture noise.

B. Electronic Ballast for Metal-Halide Lamps: Include the following features unless otherwise indicated:

1. Lamp end-of-life detection and shutdown circuit.
2. Sound Rating: A.
3. Total Harmonic Distortion Rating: Less than 15 percent.
4. Transient Voltage Protection: IEEE C62.41, Category A or better.
5. Lamp Current Crest Factor: 1.5 or less.
6. Power Factor: .90 or higher.
7. Interference: Comply with 47 CFR, Chapter 1, Part 18, Subpart C, for limitations on electromagnetic and radio-frequency interference for nonconsumer equipment.

8. Protection: Class P thermal cutout.
9. Bi-Level Dimming Ballast: Ballast circuit and leads provide for remote control of the light output of the associated fixture between high- and low-level and off.

    a. High-Level Operation: 100 percent of rated lamp lumens.
    b. Low-Level Operation: 50 percent of rated lamp lumens.
    c. Compatibility: Certified by ballast manufacturer for use with specific bi-level control system and lamp type indicated. Certified by lamp manufacturer that ballast operating modes are free from negative effect on lamp life and color-rendering capability.

10. Continuous Dimming Ballast: Dimming range shall be from 100 to 35 percent of rated lamp lumens without flicker.

    a. Ballast Input Watts: Reduced to a maximum of 50 percent of normal at lowest dimming setting.
    b. Compatibility: Certified by manufacturer for use with specific dimming control system and lamp type indicated. Certified by lamp manufacturer that ballast operating modes are free from negative effect on lamp life and color-rendering capability.

C. Auxiliary Instant-On Quartz System: Factory-installed feature automatically switches quartz lamp on when fixture is initially energized and when power outages occur. System automatically turns quartz lamp off when HID lamp reaches approximately 60 percent light output.

2.6. EXIT SIGNS

A. Description: Comply with UL 924; for sign colors, visibility, luminance, and lettering size, comply with NYC Building Code.

B. Internally Lighted Signs:

1. Lamps for AC Operation: Fluorescent, 2 for each fixture, 20,000 hours of rated lamp life.
2. Lamps for AC Operation: LEDs, 70,000 hours minimum rated lamp life.

2.7. FLUORESCENT LAMPS

A. Low-Mercury Lamps: Comply with EPA's toxicity characteristic leaching procedure test; shall yield less than 0.2 mg of mercury per liter when tested according to NEMA LL 1.

B. T8 rapid-start low-mercury lamps, rated 32 W maximum, nominal length of 48 inches (1220 mm), 2800 initial lumens (minimum), CRI 75 (minimum), color temperature 3500 K, and average rated life 20,000 hours, unless otherwise indicated.

C. T8 rapid-start low-mercury lamps, rated 17 W maximum, nominal length of 24 inches (610 mm), 1300 initial lumens (minimum), CRI 75 (minimum), color temperature 3500 K, and average rated life of 20,000 hours, unless otherwise indicated.

D. T5 rapid-start low-mercury lamps, rated 28 W maximum, nominal length of 45.2 inches (1150 mm), 2900 initial lumens (minimum), CRI 85 (minimum), color temperature 3000 K, and average rated life of 20,000 hours, unless otherwise indicated.

E. T5HO rapid-start, high-output low-mercury lamps, rated 54 W maximum, nominal length of 45.2 inches (1150 mm), 5000 initial lumens (minimum), CRI 85 (minimum), color temperature 4100 K, and average rated life of 20,000 hours, unless otherwise indicated.

F. Compact Fluorescent Lamps: 4-Pin, low mercury, CRI 80 (minimum), color temperature 3500 K, average rated life of 10,000 hours at 3 hours operation per start, and suitable for use with dimming ballasts, unless otherwise indicated.

1. 13 W: T4, double or triple tube, rated 900 initial lumens (minimum).
2. 18 W: T4, double or triple tube, rated 1200 initial lumens (minimum).
3. 26 W: T4, double or triple tube, rated 1800 initial lumens (minimum).
4. 32 W: T4, triple tube, rated 2400 initial lumens (minimum).
5. 42 W: T4, triple tube, rated 3200 initial lumens (minimum).
6. 55 W: T4, triple tube, rated 4300 initial lumens (minimum).

2.8. HID LAMPS

A. Metal-Halide Lamps: ANSI C78.1372, with a minimum CRI 65 and color temperature 4000 K.

B. Pulse-Start, Metal-Halide Lamps: Minimum CRI 65, and color temperature 4000 K.

C. Ceramic, Pulse-Start, Metal-Halide Lamps: Minimum CRI 80 and color temperature 4000 K.

2.9. LIGHTING FIXTURE SUPPORT COMPONENTS

A. Comply with Section 260529 "Hangers and Supports for Electrical Systems" for channel- and angle-iron supports and nonmetallic channel and angle supports.

B. Single-Stem Hangers: 1/2-inch (13-mm) steel tubing with swivel ball fittings and ceiling canopy. Finish same as fixture.

C. Twin-Stem Hangers: Two, 1/2-inch (13-mm) steel tubes with single canopy designed to mount a single fixture. Finish same as fixture.

D. Wires: ASTM A 641/A 641M, Class 3, soft temper, zinc-coated steel, 12 gage (2.68 mm).

E. Wires for Humid Spaces: ASTM A 580/A 580M, Composition 302 or 304, annealed stainless steel, 12 gage (2.68 mm).

F. Rod Hangers: 3/16-inch (5-mm) minimum diameter, cadmium-plated, threaded steel rod.

G. Hook Hangers: Integrated assembly matched to fixture and line voltage and equipped with threaded attachment, cord, and locking-type plug.

2.10. REQUIREMENTS FOR INDIVIDUAL LIGHTING FIXTURES

A. Fixture Type :

1. Voltage: 120-V ac.
2. Mounting: Recessed ceiling Pendant Surface ceiling Surface wall Suspended shall be as per contract documents.
3. Nominal Dimensions: See light fixture schedule.
4. Lamps: See lighting fixture schedules.
5. Ballast Type: Electronic instant start Electromagnetic Low temperature.
6. BF: Insert value.
7. Quantity of Ballasts per Fixture: See light fixture schedule.
8. Ballast Type: Electronic Electromagnetic, compatible with lamp type indicated.
9. Ballast Fuse: Factory installed, slow-blow type rated between 2.65 and 3.0 times the line current.
10. Lens: Describe types, materials, and features not indicated elsewhere.
11. External Finish: As per lighting fixtures schedules.
12. Trim and Hardware: As per lighting fixture schedules.
13. Special Environmental Conditions: As per lighting fixture schedules.
14. Other Features: As per lighting fixture schedules.
15. Minimum CU for typical RCR shall be as follows (typical cavity reflectance are ceiling, 80 percent; wall, 50 percent; and floor, 20 percent): RCR 7 CU.
16. Provide lighting fixtures as needed for mockups.

2.11. LED LUMINAIRES

A. Led Luminaires shall meet the following technical requirements:

1. Minimum Light Output.
2. Zonal Lumen Requirements.
3. Minimum Luminaire Efficacy.
4. Minimum CRI.
5. L70 Lumen Maintenance.
6. Minimum Luminaire Warranty of 5 years (not pro-rated) to include LED driver and all LED Components.

B. Additional Requirements:

1. Color Temperature of 3,000 K – 4,100 K for interior Lighting Schedule on the plans.
2. Luminaire shall be mercury-free, lead free, and RoHS compliant.
3. Luminaire shall comply with FCC 47 CFR part 15 non-consumer RFI/EMI standards.
4. Light output of the LED system shall be measured using the absolute photometry method following IES LM-79 and IES LM-80 requirements and guidelines.
5. Luminaire shall maintain 70% lumen output (L70) for a minimum of 50,000 hours.
6. Driver shall have a rated life of 50,000 hours, minimum.
7. Lumen output shall not depreciate more than 20% after 10,000 hours of use.
8. Driver and LEDs shall be furnished from a single manufacturer to ensure compatibility.

9. Luminaire Color Rendering Index (CRI) shall be a minimum of 80 for interior.

10. LED luminaire shall be thermally designed as to not exceed the maximum junction temperature of the LED for the ambient temperature of the location the luminaire is to be installed. Rated case temperature shall be suitable for operation in the ambient temperatures typically found for the intended installation.

11. LED driver shall have a minimum power factor (pf) of 0.9 and a maximum crest factor (cf) of 1.5 at full input power and across specified voltage range.

12. Luminaire shall operate normally for input voltage fluctuation of plus or minus 10 percent.

13. Luminaire shall have a maximum Total Harmonic Distortion (THD) of 20%at full input power and across specified voltage range.

14. Wiring connections to LED drivers shall utilize polarized quick-disconnects for field maintenance. All connections to luminaires shall be reverse polarity protected and provide high voltage protection in the event connections are reversed or shorted during the installation process.

15. Fuse Protections: All luminaires shall have built-in fuse protection. All power supply outputs shall be either fuse protected or be Polymeric Positive Temperature Coefficient (PTC) protected as per Class 2 UL listing.

16. All luminaires shall be provided with knockouts for conduit connections

17. Provide all of the following data on submittals:
    a. Delivered lumens.
    b. Input watts.
    c. Efficacy.
    d. Color rendering index.

19. LED luminaires used for Emergency Egress Lighting:
    a. The failure of one LED shall not affect the operation of the remaining LEDs.

20. Emergency LED Luminaire Compatibility with Inverters:
    a. Emergency Inverters shall be sine-wave type, or have written confirmation from the luminaire manufacturer that the luminaire will function with a square wave inverter.

21. Dimming:
    a. LED Driver shall be compatible with dimming controls where dimming is indicated on the plans. Dimmable drivers shall use Dimming Constant Current (DCC) or Pulse Width Modulation (PWM) operation.
    b. LED luminaires shall dim to (20%, 15%, 10%, 5% and 0.1%) as specified in the Lighting Schedule on the plans without visible flicker or "popcorn effect". "Popcorn effect" is defined as the luminaire being on a pre-set dimmed level (less than 100%), and going to 100% prior to returning to the pre-set level when power is returned to the luminaire.

PART 3 - EXECUTION

3.1. EXECUTION REQUIREMENTS

A. Refer to DDC General Conditions for execution requirements.

3.2. INSTALLATION

A. Lighting fixtures: Set level, plumb, and square with ceilings and walls. Install lamps in each fixture.

B. Support for Lighting Fixtures in or on Grid-Type Suspended Ceilings: Use grid as a support element.

1. Install a minimum of four ceiling support system rods or wires for each fixture. Locate not more than 6 inches (150 mm) from lighting fixture corners.
2. Support Clips: Fasten to lighting fixtures and to ceiling grid members at or near each fixture corner with clips that are UL listed for the application.
3. Fixtures of Sizes Less Than Ceiling Grid: Install as indicated on reflected ceiling plans or center in acoustical panel, and support fixtures independently with at least two 3/4-inch (20-mm) metal channels spanning and secured to ceiling tees.
4. Install at least one independent support rod or wire from structure to a tab on lighting fixture. Wire or rod shall have breaking strength of the weight of fixture at a safety factor of 3.

C. Suspended Lighting Fixture Support:

1. Pendants and Rods: Where longer than 48 inches (1200 mm), brace to limit swinging.
2. Stem-Mounted, Single-Unit Fixtures: Suspend with twin-stem hangers.
3. Continuous Rows: Use tubing or stem for wiring at one point and tubing or rod for suspension for each unit length of fixture chassis, including one at each end.

D. Adjust aimable lighting fixtures to provide required light intensities.

E. Connect wiring according to Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

3.3. FIELD QUALITY CONTROL

A. Test for Emergency Lighting: Interrupt power supply to demonstrate proper operation. Verify transfer from normal power to battery and retransfer to normal.

B. Prepare a written report of tests, inspections, observations, and verifications indicating and interpreting results. If adjustments are made to lighting system, retest to demonstrate compliance with standards.

END OF SECTION 265100

SECTION 26 51 13
Architectural Luminaires, Lamps, and Ballasts

PART I – GENERAL

1.1 RELATED DOCUMENTS:

A. The following documents apply to all required work for the Project: (1) the Contract Drawings, (2) the Specifications, (3) the General Conditions, (4) the Addendum and (5) the Contract (City of New York Standard Construction Contract).

B. LEED / Environmentally Preferable Purchase (EPP) General Requirements:

a. Refer to DDC General Conditions and the Addendum to the General Conditions

b. LEED requirements apply to all Phase II work with the exception of the Existing Building scope. EPP requirements apply to the project's Existing Building scope only.

1.2 SUMMARY:

A. Included in the Work of this Section are materials, and appurtenances required to complete the Work of this Section, as specified herein, as required by job conditions, or as indicated on drawings. The scope of this section includes general requirements for luminaires and their components, coordination, definitions, quality assurances, shop drawings, mockups, samples for a complete job.

1.3 DEFINITIONS:

A. The term "luminaires" refers to lighting fixtures with their lamps and all other components.

1.4 GENERAL REQUIREMENTS:

A. Materials and equipment to be provided for the installation of indoor and outdoor luminaires, lighting equipment, control wiring, and lamps as shown on the drawings and specified herein shall be controlled and securely attached to supports.

B. Refer to drawings for dimension, details, and approximate fixture locations.

1.5 COORDINATION:

A. Luminaire locations as indicated on the electrical drawings are generalized and approximate. Verify locations with Contract Drawings, reflected ceiling plans and other reference data. Adequacy of headroom and non-interference with other equipment, such as ducts, pipes or openings to be provided during installation of fixtures. The location of equipment included in the Work of this Section may be shown on the Contract Drawings in a certain place, actual construction may disclose that the location for the Work does not make its position easily and quickly accessible.

B. Installation of fixtures should be arranged in proper relation to other Work and with finishes so that it shall harmonize in service and appearance and so that there shall be no interference in location or level.

C. Where a catalog number or pictorial description are provided, the written description shall take precedence.

D. Fixtures are is to be flush or concealed, install fixtures to assure that the fixture does not project visually or physically beyond the finished lines of floors, ceilings or walls.

E. Verify ceiling conditions and furnish appropriate mounting details for each luminaire. Mounting details shall be approved by Commissioner.

F. Verify compatibility of supply voltage indicated on electrical drawings with voltage specified for each luminaire prior to release.

1.6 QUALITY ASSURANCE:

A. Refer to DDC General Conditions Section 01 40 00 "Quality Requirements"

B. Manufacturers: Fixture Manufacturers are listed in Part 2.1 shall be assumed capable of supplying the listed fixtures.

C. Equipment Compatibility:

1. Provide similar luminaires, drivers and other components fabricated by one manufacturer, to simplify maintenance and replacement of equipment.
2. Fixture details shown may be modified by the manufacturer provided all the following conditions have been met:
   a. Fixture performance is equal or improved.
   b. Structural, mechanical, electrical, safety, and maintenance characteristics are equal or improved.

D. Regulatory Agencies:

1. Provide luminaires constructed, wired and installed in compliance with the New York City Building Codes. Luminaires should conform or exceed Underwriters Laboratories (UL) standards.
2. For any category of luminaire tested by any of the following agencies, provide luminaires listed and labeled by an independent Nationally Recognized Testing Laboratory (NRTL) such as UL, ETL, CSA, MET

1.7 SUBMITTAL PROCEDURES:

A. Refer to DDC General Conditions Section 01 33 00 "Submittal Procedures"

1.8 SHOP DRAWINGS:

A. General:

1. For standard catalog items with no modifications, submit catalog cut sheets prepared by the manufacturer which clearly show all elements to be supplied and all corresponding product data (including lamping; driver manufacturer and model number; voltage; accessories or options and any miscellaneous items detailed in the written description of the specification.) If cut sheet shows more than one (1) fixture type, all non-applicable information shall be crossed out.
2. For custom fixtures, modified fixtures or LED fixtures mounted in continuous rows, submit a layout drawing prepared by the manufacturer showing all details of construction, lengths of runs, lamping layout, suspension installation hardware or components, power locations, power supplies, remote drivers, remote transformers, finishes and list of materials. Drawings must be to scale. If scallop shields, wallwash reflectors or baffles are required, drawings shall indicate relative position to wall or adjacent vertical surface.
3. When components are indicated as contractor supplied or specified (i.e. remote transformers, drivers, housings, NEMA enclosures, etc.,) contractor is to provide submittals for such components in conjunction with the fixture submittal.
4. Manufacturer shall provide submittals with fixture installation instruction sheets.

5. Operable luminaire samples and mockups as indicated in Part 2.1.
6. Request for Final Layout: At the same time that shop drawings are submitted, the Commissioner shall request verification of final layouts and control zones for all luminaires. the Commissioner shall also submit templates for labeling of all controls. Labeling templates shall be returned by the Commissioner. If control template information is not available from the Commissioner, the contractor shall furnish blank control station faceplates. The Commissioner shall coordinate the faceplate labeling information. Custom engraved (or labeled) faceplates shall be requested from the manufacturer so that they arrive prior to the final release of the space to the Commissioner and subsequent beginning of the warranty period. Blank faceplates shall be replaced with custom labeled faceplates at no additional cost to the City of New York.
7. Shop drawings shall show all luminaire components, including but not limited to reflectors, louvers, lenses, fuses, junction boxes, and drivers. Shop drawings shall show materials, finishes, metal gauges, overall and detailed dimensions, sizes, electrical and mechanical connections, fasteners, welds, joints, any exposed hardware, and conditions, or provisions for the work of others, and similar information. Indicate complete details of the luminaire, including manufacturer's name and catalogue numbers for, drivers, light shields, switches and type of wiring, and targeting and locking devices for adjustable luminaires. Indicate type and extent of approved inert insulating materials to prevent electrolytic corrosion at junctions of dissimilar metals. Include pertinent mounting details including hung ceiling construction. Standard catalogue cuts shall be supplemented by additional drawings if information or descriptions listed above are not included in the cuts. Photometric documentation and finish samples shall be provided upon request. Samples shall be provided if indicated in Part 2.1. No luminaires will be approved without the previous described submission of data.
8. Submit layouts for continuous luminaires or coves, indicating overall field measurements and proposed lengths, and condition of joints, corners, and ends.

B. Data: Submit independent laboratory photometric data in the directed number of copies and in format as directed by Commissioner. Photometric data shall be submitted for standard, "off-the-shelf" units at the time the manufacturer's cuts are submitted. Photometric testing and reporting shall conform to IESNA procedures.

C. Manufacturer's Catalogue Sheets shall indicate input watts and electrical characteristics, ambient temperature rating, noise level rating, mounting methods and UL or ETL listing for use with required lamp and ballast (if any).

1.9 SAMPLES:

A. After shop drawings, data and any other required submissions have been approved, submit to Commissioner samples of each of the following components:

1. Samples demonstrating the finishes of any custom metal, paint color or finish. Sample size to be a minimum of 4in (100mm) square. Place labels on the back side of finish samples only.
2. Material samples of any transmitting media, such as plastic, glass, perforated metal and the like. Sample size to be a minimum of 12in (305mm) square, to allow adequate space for label.
3. Each LED downlight reflector cone that differs in size or finish, if requested during shop drawing review.
4. Any other luminaires or components requested in the luminaire descriptions or schedule.

B. Submit two (2) samples unless otherwise indicated. If luminaire samples are requested, supply a completely operable luminaire with the specified lamp and a 10ft (3m) cord and plug for standard 120 volt service. For 277 volt luminaires, also supply a completely wired or plug-wired step-up transformer

to convert from 120 to 277 volts, with a 120 volt cord and plug. Provide component parts as specifically requested.

C. Where a sample is submitted or requested, do not fabricate that luminaire type until the sample is approved. Submit and resubmit a sample as required, until samples are approved.

D. The purpose of the sample is to review manufacturing techniques, detailing, lamping, and scale. Minor modifications, if any, shall be considered part of these Specifications.

E. Submit complete and operable sample luminaires for any proposed substitution.

1.10 PRODUCT DELIVERY, STORAGE, AND HANDLING:

A. Luminaires and their component elements shall be delivered to the job site factory-assembled and wired to the greatest extent practical, in accordance with the approved shop drawings, samples, certificates and catalogue cuts, and shall be handled in a careful manner to avoid damage.

B. Exposed finishes shall be protected during manufacture, transport, storage and handling. Delivered materials shall be identical to the approved samples. Materials which become damaged shall be repaired and/or replaced as directed.

C. Luminaires shall be stored under cover, above the ground, in clean, dry areas, and shall be tagged and/or marked as to type and location.

D. Delivered luminaires shall include wiring, drivers, shielding, channels, lenses and other parts and appurtenances necessary for luminaire installation of each luminaire type.

E. Protect luminaires that are to be integrated into, or finally located after completion of exhibit construction work.

1.11 MOCK-UP:

A. As a part of the Work of this Section, when specifically called for in the Luminaire Schedule, temporarily install, connect and adjust a reasonable number of luminaires, unless otherwise stated. Install completely operable luminaires with all lamps, drivers, etc., of each type listed in the Luminaire Schedule where a mock-up is specified, to verify specified requirements. Place the mock-up luminaires where and when directed by Commissioner. Remove and store mock-up luminaires, when approved, as necessary to complete the work.

1. The mock-up installation shall closely conform to the conditions of the actual installation as to: height, distance from ceiling, number and type of lamps, material, color, etc. A written description shall submitted of each proposed mock-up with drawings in order to obtain the Commissioner's approval prior to commencement of each mock-up.

1.12 WARRANTY:

A. System shall carry a full warranty for a minimum of five (5) years..

PART II - PRODUCTS

2.1. MANUFACTURERS

A. Reference Electrical Drawings (sheets E1-010, 11, 12) for fixture schedule.

B. Subject to compliance with requirements, provide products by one of the following:

1. Holophane
2. Focal Point
3. Cree
4. Vode
5. Ecosense
6. Bega
7. Lumenpulse
8. BK Lighting
9. Hevi Lite
10. USAI
11. Beacon
12. Hubbell
13. Ligman,
14. or approved equal.

2.2. GENERAL

A. Provide recessed luminaires that are constructed to be suitable for and compatible with the ceiling, wall, pavement or other materials and construction in which they will be installed.

2.3. MATERIALS AND FABRICATION

A. Provide luminaires completely factory-assembled and wired and equipped with necessary drivers, wiring, shielding, reflectors, channels, lenses, and other parts and appurtenances necessary. Deliver to project site ready for installation and to complete the luminaire installation.

B. Use only completely concealed hardware, unless otherwise noted. Latching of luminaire door frames shall be unobtrusive. Make luminaire free from light leaks by the inherent design of the luminaire body and frame. Bond gaskets, when used, to the luminaire metal.

C. Construct luminaires with the minimum number of joints. Make unexposed joints by approved method such as welding, brazing, screwing or bolting. Soldered joints are not acceptable.

D. Provide metallic cast or extruded parts of luminaires that are close grained, sound, and free from imperfections or discoloration. Provide cast or extruded parts that are rigid, true to pattern, and of ample weight and thickness. Provide cast or extruded parts that are properly fitted, filed, ground, and buffed to provide finished surfaces and joints free of imperfections. Make thickness on cast parts not less than 1/8in (3mm).

E. Provide housings that make electrical components easily accessible and replaceable, without removing the luminaire body from its mounting. Provide luminaires indicated as "continuous" on drawings or specifications with finished end-to-end or wall-to-wall appearance. Maximize lighted length to nearest whole foot (304mm), with equally spaced unlighted portions at each end, not to exceed 6in (152mm) each. Provide continuous louvers and/or lenses into unlighted ends and at corners if specified

F. Wiring:

1. Provide luminaire wiring and associated operating and starting equipment in compliance with UL 1570 and NEC.

2. Make connections of wires to terminals in in a neat and workman-like manner and which are electrically and mechanically secure, with no loose strands protruding.
3. Provide wiring channels and wireways free from projections and rough or sharp edges throughout. At points or edges over which conductors shall pass and may be subject to injury or wear, grind to make a smooth contact surface with the conductors. Install insulated bushings at points of entrances and exit of flexible wiring.

G. All interior fixtures shall be "Damp Location" rated at a minimum, with greater protection as called for in the luminaire schedule. All exterior fixtures shall be "Marine Grade" wet location, equivalent to IP66. All hardware, including bolts imbedded in lighting pole foundations, shall be stainless steel or equivalent marine grade resistant.

2.5 FINISHES:

A. Apply luminaire finishes after fabrication in a manner that assures a durable wear-resistant surfacing. Prior to finishing, hot clean the surfaces by accepted chemical means, and treat them with corrosion inhibiting (phosphating) treatment to assure positive paint-adhesion. Give exposed metal surfaces (brass, bronze, aluminum and others) and finished castings except chromium-plated or stainless-steel parts an even coat of high grade methacrylate lacquer, or transparent epoxy. Anodize exposed aluminum surfaces for corrosion resistance. Make sheet steel luminaire housing, and iron and steel parts which have not received phosphating treatment, or which are to be utilized in exterior applications corrosion resistant by zinc or cadmium plating or hot-dip zinc galvanizing after completion of all forming, welding, or drilling operations.

B. Electroplate parts operated under temperatures injurious to hot-dipped galvanizing.

C. Cadmium plate screws, bolts, nuts and other fastening or latching hardware.

D. Except where otherwise indicated provide luminaires with a final synthetic, high-temperature baked enamel coating of color and finish as specified or directed. Unless otherwise specified, provide white baked enamel "reflective" surfaces, with a minimum reflectance of 86 percent. Unless otherwise specified, provide potentially visible non-reflective surfaces with a matte-black baked enamel finish. Prior to painting give all parts proper etched surface preparation to assure paint adherence and durability.

2.6 TRANSFORMERS FOR LOW-VOLTAGE LUMINAIRES:

A. General:

1. Each transformer controlled by a dimmer shall have a suitable choke to eliminate noise during dimming.
2. Secondary wiring shall be sized so that the total average voltage drop on the transformer secondary side does not exceed 3 percent.

B. Where a remote transformer is required for interior installations, provide a UL listed remote low voltage power supply which meets or exceeds the following requirements, in addition to those of Paragraph A above.

1. Power supply shall contain a toroidal transformer, primary circuit breaker, and thermal protection.
2. Power supply shall be UL listed, suitable for surface or recessed mounting in both walls and ceilings and require zero clearance to combustible materials.

2.7 LAMPS:

A. Solid State Lighting / Light Emitting Diode (LED) Lamps and Luminaires:

1. General:
   a. Unless otherwise specified, all LED luminaires and power/data supplies shall be provided by a single manufacturer to ensure compatibility.
   b. All control components, peripheral devices and control software are to be provided by and shall be the responsibility of a single entity. All components shall perform successfully as a complete system and shall operate as described in Section 26 09 33, Distributed Lighting Control System.
   c. Include all components necessary for a complete installation. Provide all power supplies, synchronizers, data cables, and data terminators for a complete working system.
   d. All LED sources used in the LED luminaire shall be of proven quality from established and reputable LED manufacturers. Acceptable LED lamp manufacturers unless otherwise noted are:
      (i) Cree, Inc.
      (ii) Philips Lighting
      (iii) Nichia Corporation
      (iv) Norlux
      (v) Opto Technology, Inc.
      (vi) Osram Optronic Semiconductors
      (vii) Xacato
      (viii) Bridgelux
      (ix) Citizen Electronics
      (x) Or approved equal
2. Products and Components – Performance
   a. LED luminaires and components shall be UL listed or UL classified.
   b. All LED luminaires shall be subjected to the following JEDEC Reliability Tests for Lead-free Semiconductors: HTOL, RTOL, LTOL, PTMCL, TMSK, Mechanical Shock, Variable Vibration Frequency, SHR, Autoclave.
   c. To ensure luminaire quality, luminaire shall have been tested under accelerated life test conditions including an operating temperature span of 360 degrees F, and cyclic loading up to 60G.
   d. All products included in system shall use Mil-Std 810F, Random Vibration 7.698g as a minimum standard. In installations subject to vibration, luminaire shall be installed with vibration isolation hardware to sufficiently dampen vibrations.
   e. All LED components shall be mercury and lead-free.
   f. LEDs shall comply with ANSI/NEMA/ANSLG C78.377-2008 – Specifications for the Chromaticity of Solid State Lighting Products. Color shall remain stable throughout the life of the lamp. Color shall match approved sample.
   g. LEDs shall comply with IESNA LM-80 – Standards for Lumen Maintenance of LED Lighting Products
   h. White LEDs shall have a rated source life of 50,000 hours under normal operating conditions. LED "rated source life" is defined as the time when a minimum of 70 percent of initial lumen output remains.
   i. Luminaire assembly shall include a method of dissipating heat so as to not degrade life of source, electronic equipment, or lenses. LED luminaire housing shall be designed to transfer heat from the LED board to the outside environment. Luminaire housing shall have no negative impact on life of components.
   j. Manufacturer shall supply in writing a range of permissible operating temperatures in which system will perform optimally.

k. High power LED luminaires shall be thermally protected using one or more of the following thermal management techniques: metal core board, gap pad, and/or internal monitoring firmware
l. LEDs shall be adequately protected from moisture or dust in interior applications.
m. For wet and damp use, the LED-based luminaire itself shall be sealed, rated, and tested for appropriate environmental conditions, not accomplished by using an additional housing or enclosure. Such protection shall have no negative impact on rated life of source or components, or if so, such reductions shall be explicitly brought to the attention of the designer.
n. All hardwired connections to LED luminaires shall be reverse polarity protected and provide high voltage protection in the event connections are reversed or shorted during the installation process.
o. The LED luminaire shall be operated at constant and carefully regulated current levels. LEDs shall not be overdriven beyond their specified nominal voltage and current.
p. Manufacturer shall be able to provide supporting documentation of the product meeting third party regulatory compliance.
q. Manufacturer shall ensure that products undergo and successfully meet appropriate design and manufacturability testing including Design FMEA, Process FMEA, Environmental Engineering Considerations and Laboratory Tests, IEC standards and UL/CE testing.
r. All LED luminaires (100 percent of each lot) shall undergo a minimum twenty-four (24) hour burn-in during manufacturing, prior to shipping.
s. Manufacturer shall provide Luminaire Efficacy (lm/W), total luminous flux (lumens), luminous intensity (candelas) chromaticity coordinates, CCT and CRI. optical performance, polar diagrams, and relevant luminance and illuminance photometric data. Provide data in IES file format in accordance with IES LM-79-2008, based on test results from an independent testing laboratory.
t. Power / data supply shall have the following:
   (i) Supply outputs shall have current limiting protection.
   (ii) Supply shall provide miswiring protection.
   (iii) Supply shall have power factor correction.
   (iv) Supply shall provide connections that are conduit-ready or clamp-style connections in the case of low-voltage wiring.
   (v) Supply shall come with a housing that meets a minimum IP20 rating for dry location installation unless located in a damp or wet location.
   (vi) Supply shall be UL listed for Class 1 or Class 2 wiring

3. LED Control and Communication – Performance
   a. LED luminaires shall be network controllable via digital control.
   b. The LED system shall use integral and differential non-linear control.
   c. Constant data transmission rates shall be employed, resulting in the output being independent of distance of cable between power supply and light source within the specified length.
   d. LED system shall have a selectable means of external control via a data network.
   e. Each LED luminaire and/or node shall have the capability to be set to a unique and individual address. Address shall be selectable through on board switches or by an external hardware or software method.
   f. The LED system shall be scalable, with every LED luminaire/address in the system capable of being controlled by a single, centralized controller.

2.8 REFLECTORS:

A. Aluminum Reflectors:

1. Provide reflectors and reflecting cones or baffles fabricated from aluminum reflector sheet no less than minimum thickness listed below for each application, or in accordance with the current UL standard 1570 for ballast covers, whichever is thicker. Reflector shall be absolutely free of tooling marks including spinning lines, and free of marks or indentation caused by riveting or other assembly techniques. No rivets, springs, or other hardware shall be visible after installation.
   a. Cones 0.0500in (1.27mm)
   b. Wall wash kicker panels 0.0400in (1.01mm)
   c. Reflectors (non-structural) 0.0235in (0.59mm)
   d. Louvers/Baffles 0.0200in (0.50mm)

2. Provide reflectors and baffles of first-quality polished, buffed and anodized finish, "Alzak" process or approved equal, and with specular or semi-specular finish color to be clear, unless specified otherwise. Provide reflector and baffles which produce no apparent brightness nor a lamp image, nor may any part of the lamp be visible from 50° above nadir to 90° above nadir (vertical). That is the reflector shall have a maximum 50° cutoff angle and a minimum 40° shielding angle.
3. Provide other aluminum reflectors where required, and formed and finished as noted on drawings and elsewhere in the specifications. Provide only reflectors free from blemishes, scratches, or indentations which would distort their reflective function and finished by means of the "Alzak" process, or approved equal, unless otherwise noted. No rivets, springs, or other hardware shall be visible after installation.
4. Anodized aluminum reflectors shall have the following characteristics:

Type	Min. Weight of Coating [a] (mg/in^2)	(mg/cm^2)	Min. Total Hemispherical Reflectance [b]	Min. Specular Component [b]	Min Visual Clarity [c]	Min. Diffuseness at 15° [c]
Specular	2	0.31	86	70	90	0.03
Specular (low-iridescent)	5	0.77	85	46	80	0.05
Semi-specular (low-iridescent)	5	0.77	82	10	35	0.40

(a) Anodizing process. Coating of aluminum oxide: Reference ASTM Test Method B-137.
(b) Reference ASTM Test Method E-903-82 (testing utilizing a TR1 or TR2 Total Reflectometer is also acceptable pending issuance of ASTM standard).
(c) Reference ASTM Test Method E-430-78 (1983).

B. Painted Reflectors:

1. Reflectors shall be completely formed before application of primer and enamel color coat or coats.
2. When requested by Commissioner, submit a sufficient quantity of flat steel panels having the identical primer and color coat or coats applied in the same manner as proposed for the specified fixtures.
3. Tests will be required only in case of dispute about reflector characteristics. Tests may be required at any time before or during Contractor's warranty period.
4. Tests:
   a. Painted reflectors shall have an initial reflection factor not less than 86 percent in the visible range of 400-700 nanometers as per ASTM Method E-424-71 as determined by independent laboratory test of fading, tested in the following manner: One half of sample shall be covered

and remaining half shall be exposed to a 150 watt sunlamp placed 1/2in (12.7mm) above reflective surface for 72 hours. Comparison of exposed and unexposed sides shall show no visible fading or deterioration in appearance or reflectance.

b. The percentage of Specular Gloss shall be a minimum of 80 percent as determined by ASTM Method D-532-T, Procedure A.

2.9 LENSES / FACEPLATES / TRIM

A. Where plastic lens is indicated, provide lens of 100 percent virgin acrylic (polymethyl methacrylate), nominal 0.125in (3mm) thick, unless otherwise indicated. Lens is to be strain-free, uniform in appearance, and destaticized.

B. Where clear acrylic lens is indicated, provide lens with a minimum visible light transmittance of 92 percent, unless otherwise indicated.

C. Where prismatic acrylic lens is indicated, lens shall be composed of 3/16in (4.7mm) square non-convex prismatic cones of maximum 0.080in (2mm) depth and aligned 45° to the length and width of the lens panel, unless otherwise specified. Lens shall be a minimum of 7.5 oz. per square foot (2289g/m2). Lens shall have minimum 80 percent visible light transmittance.

D. Where diffuse acrylic lens is indicated, lens shall be diffuse frosted white, high transmission acrylic with a minimum 73 percent visible light transmittance unless otherwise indicated. Provide nominal 0.125in (3mm) thick lens unless otherwise specified.

E. Where acrylic "overlay" is indicated, lens shall be supported by other rigid luminaire members, such as louvers or shelves. Lens shall be white or clear, as specified, with a minimum 79 percent visible light transmission for white lenses, and a minimum 83 percent transmission for clear lenses. Provide 0.040in (1mm) thick lens unless otherwise indicated.

F. Make lenses, louvers, or other light diffusing elements contained in frames removable, but positively held within the frames so that hinging or other motion of the frame will not cause the diffusing element to drop out.

G. For recessed luminaires with trim that is removable or open for access to the interior of the luminaire, and serves as a ceiling trim, provide trim that is positively held to the luminaire body by adjustable means that permit the trim to be drawn up to the ceiling as tight as necessary to ensure complete contact of faceplate with ceiling surrounding the luminaire.

2.10 RATED LOCATION LUMINAIRES

A. General:

1. Provide luminaires designed and manufactured specifically for "rated" (e.g., damp, wet, shower, hazardous) location service. Components, including nuts, bolts, rivets, springs, and similar parts shall be made of materials of effective corrosion resistance, or of materials which have been subjected to finishing treatment which will assure such resistance.
2. Luminaires not otherwise protected with lenses or louvers shall be protected with securely fastened bird screens when used in exterior locations.
3. Provide anodized aluminum for aluminum parts of exterior luminaires that are not specified as requiring a painted finish.
4. All luminaires shall be constructed according to UL procedures, and listed by UL or ETL for the appropriate category.

5. All luminaires or equipment located wholly or partly out of doors shall be considered subject to severe marine type corrosive conditions and shall be suitably manufactured and installed.

B. Damp Location:

1. In addition to the requirements of Paragraph A, above, damp location luminaires shall meet or exceed the following criteria:
   a. Provide metal parts of luminaires, which are specified as requiring painting, for use in outdoor or damp locations, which are painted with suitable weather and moisture resisting qualities.
   b. Provide luminaires for use outdoors, or in areas designated as damp locations, which are suitably and effectively gasketed to prevent access of moisture into electrical components or enclosing diffusers, lenses or globes.
   c. Luminaires shall be UL or ETL listed for damp locations.

C. Wet Location:

1. In addition to the requirements of Paragraph A, above, wet location luminaires shall meet or exceed the following criteria:
   a. Any exposed luminaires shall be UL or ETL rated for wet locations.
   b. Provide luminaires for use outdoors, or in areas designated as wet locations, which are suitably and effectively gasketed to prevent access of moisture into electrical components or enclosing diffusers, lenses or globes.

D. "Bathtub and Shower" Locations:

1. In addition to the requirements of Paragraphs A&B, above, "Bathtub and Shower" location luminaires shall meet or exceed the following criteria:
   a. Luminaire shall be wet location rated.
   b. Luminaire shall be recessed or surface-mounted at or above 8ft (2.43m) above and at least 3ft (0.91m) horizontally from the highest point in the shower (threshold) or the tub (tub rim).
   c. Luminaires used in or near showers, or in similar locations, shall be UL or ETL listed specifically for such use.

E. Hazardous Location:

1. In addition to the requirements of Paragraph A, above, hazardous location luminaires shall meet or exceed the following criteria:
   a. Each luminaire shall be protected against physical damage by a suitable guard or by location.
   b. Each luminaire shall be identified as a complete assembly for the relevant location and shall be clearly marked to indicate the maximum wattage of lamps for which it is intended.
   c. Pendant-mounted luminaires shall be suspended by and supplied through threaded rigid metal conduit stems and threaded joints shall be provided with set-screws or other effective means to prevent loosening. For stems longer than 12in (300mm), permanent and effective bracing against lateral displacement shall be provided at a level no more than 12in (300mm) above the lower end of the stem.
   d. Boxes and fittings used in support of luminaires shall be identified for Class I locations.

2.11 LUMINAIRE DESCRIPTIONS

A. General:

1. Provide luminaires which conform to the above standards and criteria, as indicated on the drawings, and as indicated above and in Part 2.1.
2. Verify mounting conditions and trim for all luminaire types.
3. Verify all voltages, and verify which luminaires require ducted or plenum air supply or return capability or are to be static.
4. Catalogue or series numbers, when shown herein, are intended to aid in establishing general type or category of luminaires. A luminaire shall be provided that meets the complete performance descriptions, as well as information provided by detail drawings. Standard catalogue cuts, when included, are for general assistance. Written luminaire descriptions below, and on electrical drawings, are the primary basis for luminaire specification.
5. All finishes are to be factory applied, including colored flanges and trims.
6. Luminaires shall be constructed and supported to withstand seismic disturbances without damage.

PART III - EXECUTION

3.1 EXECUTION REQUIREMENTS

A. Refer to DDC General Conditions for execution requirements.

3.2 GENERAL:

A. Install luminaires complete as indicated, and with equipment, materials, parts, attachments, devices, aligner and filler clips, hardware, hangers, cables, supports, channels, frames and brackets necessary to make a safe, complete, and fully operative installation.
B. Verify and provide luminaires that are appropriate for the ceiling and mounting conditions of the project.
C. Coordinate with other trades as appropriate to properly interface installation of luminaires with other work.
D. Reject and do not install blemished, damaged, or unsatisfactory luminaires. Replace imperfect or unsatisfactory luminaires, if installed, as directed by the Commissioner.
E. Set luminaires, when installed, to be true, and free of light leaks, warps, dents, or other irregularities. No light leaks are permitted at the ceiling line or from any visible part or joint of the luminaires. Install luminaires plumb, square, and level with ceiling and walls, in alignment with adjacent luminaires, and secure in accordance with manufacturers' directions and approved shop drawings. Install all adjacent and continuous luminaires straight and trued, aligned in both plan and elevation. Supply and install alignment rods or joint straps as required to achieve this effect.
F. Provide finish for exposed parts or trims as specified. If not indicated, provide a finish as directed by the Commissioner.
G. Do not install reflector cones, aperture plates, lenses, diffusers, louvers, and decorative elements of luminaires until completion of wet work, plastering, painting and general clean-up in the area of the luminaires.
H. Mount luminaires at heights and locations indicated on the Contract Drawings, or as required by the Commissioner. Mounting heights specified or indicated are to be to the bottom of each luminaire for suspended and ceiling-mounted luminaires, and to the center of each luminaire for wall-mounted luminaires, unless otherwise noted. Obtain approval of the exact mounting for luminaires on the job before installation is commenced and, where applicable, after coordinating with the type, style, and pattern of the ceiling being installed.
I. Conform to the requirements of NFPA 70. Supports shall be suitable for local seismic zone.

J. In Mechanical Equipment Rooms, luminaires shall be hung from ceilings after piping and equipment therein has been installed. Exact locations for such luminaires shall be determined at the job site during the course of the work, in coordination with the mechanical work.

K. Adequately protect the housing of recessed luminaires during installation by internal blocking or framing to prevent distortion of sides, or dislocation of threaded lugs, which, upon completion, shall be in perfect alignment and match the corresponding holes in frames or rims. Holding screws shall be inserted freely without forcing and shall remain easily removable for servicing.

L. Ground non-current-carrying parts of electrical equipment in accordance with UL and NEC provisions.

M. Upon completion of installation of luminaires, and after building circuits have been energized, apply electrical energy to demonstrate capability and compliance with requirements. Where possible, correct malfunctioning units at the site, then re-test to demonstrate compliance. Otherwise, remove and replace with new units, and proceed with re-testing. Dates and times for all field tests shall be established by the Commissioner. Coordinate all test requirements with the Commissioner.

1. For normal and emergency building lighting, upon completion of the installation, conduct an operating test to show that the equipment operates in accordance with the requirements of this and other relevant sections.
2. Test all wiring with an insulation testing instrument, both before and after connection of luminaires and equipment. The minimum resistance shall be 250,000 ohms.

N. Upon completion of the installation, the luminaires and lighting equipment shall be order free from defects in condition and finish. At time of final inspection, all luminaires and equipment shall be clean, fully lamped, and be complete with required lenses or diffusers, reflectors, side panels, louvers, or other components necessary for the function of the luminaires. Any reflectors, lenses, diffusers, side panels or other parts damaged prior to the final inspection shall be replaced by Contractor.

O. Luminaires that are part of the Work of this section shall not be used for work lights during construction, except in Mechanical Equipment rooms. Contractor shall provide adequate portable or temporary lighting

P. Vibration Isolation: Mount and support all luminaires in such a manner to isolate the luminaire from structure-borne vibration, including but not limited to vibration caused by fans, motors, moveable tracks, moveable partitions, portable carts, vehicles, etc.

3.3 ACCESSIBILITY

A. Install equipment such as junction and pull boxes, luminaire housings, transformers, drivers, switches and controls, and other apparatus that shall be reached from time to time for operation and maintenance, to be easily accessible and appropriate for mounting and ceiling conditions.

3.4 SUPPORTS

A. Luminaires shall be securely fastened as per manufacturer's instructions. Provide plaster frames or mounting frames for luminaires that require them. Such frames shall be appropriate for the ceiling construction in which they are installed.

B. Provide necessary hardware with luminaires, such as stems, plates, plaster frames, hangers and similar items, for safe support of the luminaire. Provide plaster frames made of non-ferrous metal, or of steel that has been suitably rustproofed after fabrication, as described above.

C. Provide supports for luminaires that are adequate to support the weight of the luminaires.

D. Provide hanging devices which, if visible from normal viewing angles, exactly match luminaire finishes specified, unless otherwise noted.
E. Where necessary to meet fire resistance requirements provide enclosures housing recessed luminaires that are constructed to provide required fire resistance rating.
F. Provide attachment devices including brackets and cast metal shapes with the requisite rigidity and strength to maintain continuous alignment of installed luminaires. Attach luminaires to ceiling support members, and do not depend upon lathing, plaster or ceiling tile for alignment or support.
G. Provide luminaires mounted in suspended ceilings that are supported by saddle hangers or the bars attached to runners or between crossbars of ceiling systems. Provide mounting splines or other positive means of maintaining alignment and rigidity.
H. Provide supporting members that are surface passivated, and which are primed or paint-dipped to resist corrosion.
I. Provide fastening devices of a positive locking type, which do not require special tools to apply or remove them. Do not use tie wires in place of fastening devices.
J. Attach reflectors to housings by means of safety chains, which shall prevent reflectors from falling. No part of the chain may be visible after installation, when viewed from any angle up to 50 degrees from the vertical.
K. Provide pendant or surface mounted luminaires with required mounting devices and accessories, including hickeys, stud-extensions, ball aligners, canopies, and stems. Uniformly maintain the luminaire heights shown on the Contract Drawings or established in the field. The allowable tolerances in individual luminaire mounting shall not exceed 1/4 inch (7mm) and may not vary more than 1/2 inch (14mm) from the mounting height shown on the drawings. Install luminaires hung in continuous runs absolutely level, and in line with each other.
L. Provide an approved ceiling canopy for each stem, exactly matching specified finishes.
M. Place stems to be vertical and plumb.
N. Recessed and semi-recessed luminaires:

1. Support rods or wires shall be provided with a minimum of four rods or wires per luminaire and located not more than six inches (152mm) from each corner of each luminaire.
2. Do not support luminaires by ceiling acoustical panels.
3. Where luminaires of sizes less than the ceiling grid are indicated to be centered in the acoustical panel, support such luminaires independently or with at least two 3/4 inch (19mm) metal channels spanning and wired to the ceiling tees.

O. Seismic Protection for Lighting Fixtures: Provide fixtures and support suitable to withstand seismic disturbances without damage. Luminaire supports shall be of materials which are suitable for the seismic zone.
P. In addition to the regular fixture support requirements, provide the following seismic protective support features:

1. Recessed individual or continuous row of fixtures shall be provided with fixture support wires attached to the building structural members.
2. Surface mounted individual or continuous rows of fixtures shall be attached to a support suitable for the seismic zone specified. Fixtures attached to underside of a structural slab shall be properly anchored to the slab at each corner of the fixture. Each wall mounted light fixture shall be secured in a manner to hold the unit in place during a seismic disturbance.

3. Pendant supported fixtures shall also be provided with a flexible hanger device at the attachment to the fixture channel to preclude breaking of the support. The motion of swivels or hinged joints shall not cause sharp bends in conductors or damage to insulation.
4. Suspension systems for light fixtures, as installed that are free to swing a minimum of 45 degrees from the vertical in all directions without coming in contact with other parts of the building, and will withstand, without failure, a force of not less than 4 times the weight it is intended to support will be acceptable.

3.5 AIMING AND ADJUSTMENT

A. Provide manpower and tools for final focusing and adjustment, under supervision, of all adjustable luminaires after regular working hours (i.e., after dark in daylighted areas) whenever necessary. All fixtures shall be locked into place so that the aiming is not disturbed during future re-lamping.
B. Preliminary aiming diagrams can be requested during the shop drawing submittals.
C. When extra lenses, louvers or shields are specified, the Contractor shall change accessories until the Commissioner makes a final selection.
D. The Contractor shall note final aiming and locked positions and include that information in the O&M manual.

3.6 CLEANING

A. Immediately prior to occupancy, clean reflector cones, reflectors, aperture plates, lenses, louvers, lamps and decorative elements. As per manufacturer's instructions, destaticize lenses after cleaning, installing them to leave no finger or dirt marks.
B. Upon completion of the luminaire installation and at the time of final inspection, luminaires shall be clean, and free from marks, dust, spotting or other defects. Replace any broken or defective parts prior to final inspection. Replace or make good all defects revealed by final inspection.
C. Protect installed luminaires from damage during the remainder of construction period.

3.7 MANUALS

A. The Contractor shall provide Commissioner with maintenance manual and operational submittals, as called for in DDC General Conditions.

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SECTION 27 02 00
Structured Cabling For Voice & Data Systems

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The following documents apply to all required work for the Project: (1) the Contract Drawings, (2) the Specifications, (3) the General Conditions, (4) the Addendum and (5) the Contract (City of New York Standard Construction Contract).

B. LEED / Environmentally Preferable Purchase (EPP) General Requirements:
   1. Refer to DDC General Conditions and the Addendum to the General Conditions
   2. LEED requirements apply to all Phase II work with the exception of the Existing Building scope. EPP requirements apply to the project's Existing Building scope only.

1.2 SUMMARY

A. Contractor shall provide materials, labor, equipment and services necessary to furnish, deliver and install all work of this section, as shown on the drawings, as specified herein, and or as required by job conditions.

B. The additional related sections that apply to the work within this section include the following:
   1. Division 8
   2. Division 26
   3. Division 28

C. Make adjustments to the work as may be necessary or requested in order to resolve physical space issues or conflicts preserve aesthetics and clearances and or avoid architectural features, elements, openings, structural members and or the work of other trades.

D. Typical details, where indicated, apply to each and every item of the project where such details are applicable.
   1. Typical details are not repeated in full on the plans, and are diagrammatic only, with the intent that such details shall be incorporated in full, throughout the project as applicable.

1.3 SUBMITTAL PROCEDURES

A. Refer to DDC general conditions section 01 33 00 "Submittal Procedures".

B. Special conditions :
   1. Pre-construction
      a. Product data sheets as specified herein.
      b. Original shop drawings as specified herein.
      c. Control systems/ programming submittals as specified herein.
   2. During construction
      a. Pull schedules as specified herein.

b. Progress reports as specified herein.

3. Post construction
   a. Record set as built drawings as specified herein.
   b. Updated pull schedules as specified herein.
   c. Field tests reports as specified herein.

C. Do not commence work, which requires prior review and or approval of a submittal, until receipt of a returned submittal, annotated with appropriate direction and or approval.

1.4 QUALIFICATIONS

A. The Installer shall have a minimum of three years verifiable and demonstrated experience in the installation, operation and maintenance of large-scale and complex voice / data communications systems and related technologies.

B. Contractor shall have successfully completed projects and installations of similar size, scope and complexity.
   1. The installation of all components, software and testing shall be accomplished by contractor/technicians who have been regularly installing systems of the size, scope and complexity of this project for a period of not less than two years and are certified by each manufacturer under this project scope. The contractor shall also be properly trained by the equipment manufacturer on the specific components being installed in their systems under this project scope.
   2. The contractor shall own and maintain tools and equipment necessary for successful installation and testing of the system components included in this scope and has personnel who are adequately trained in the use of such tools and equipment.
   3. The contractor will provide a complete list of all manufacturer certifications applicable to this project.

1.5 SCOPE OF WORK

A. This section covers the installation, control and operation of hardware, cabling, and licenses for all telecommunications cabling systems work for voice and data systems, audio visual systems, security systems, as well as other low voltage trades.

B. This specification contains sections that call out responsibilities for both the low voltage contractor and the general/electrical contractor. Contractor must confirm any/all responsibilities or limitations as defined herein.

C. All functions and requirements identified in these specifications must operate simultaneously and to the fullest extent described. Any item identified in the specification which is omitted from the final equipment list, either unintentionally or intentionally, will be provided to The City of New York at no fee.

D. The City of New York shall have no restriction as to the use and function of these technology systems. In the event that The City of New York uses any portion of the system prior to project completion, such use does not constitute acceptance of that system and the contractor is still required to perform all tasks as outlined in this document.

E. Contractor will provide the following:

1. Furnish all materials in new and unused condition, free from defects, damage or corrosion. All materials shall meet all applicable codes provided a standard has been established for the material in question.
2. It is the sole responsibility of the contractor to ensure that all systems are fabricated, assembled and installed complete, including all normal, customary and required miscellaneous parts, components, hardware, materials, cables, connectors, power supplies, POE injectors, com ports, rack mount kits and any and all other supplies as may be necessary, but not specifically defined, or otherwise identified within these specifications.
3. Prior to procurement, the contractor shall review and verify all product specifications and manufacturer model and part numbers to ensure specified equipment and components meet the functional requirements defined within these specifications.
4. In the event that specified equipment and or components are back-ordered and or otherwise unavailable in time to meet the project schedule, and or have been discontinued between the date of issuance of these specifications and the contractor response date, the contractor shall provide the manufacturer's specified current comparable and functionally equivalent alternate and or replacement model.
5. The contractor shall coordinate and confirm the final locations, colors and finishes of all IT, audio visual and Security devices with the Commissioner and general contractor, including, but not limited to connection plates, inserts and wall panels, touch screens or intercom devices, wall boxes, interconnects, etc.

1.6 CONTRACTOR REQUIREMENTS

A. The contractor shall provide all normal and customary technical, administrative and other support services as required to ensure satisfactory performance and on-schedule delivery of the contracted work.

B. The contractor is required to implement practices and procedures to meet the project's environmental performance goals, sustainable design performance criteria and include achieving the LEED certification as specified in section sustainable design requirements. Substitutions, or other changes to the work proposed by the contractor or their subcontractors, shall not be allowed if such changes compromise the stated LEED requirements.

C. Contractors project resources shall include but are not limited to engineering; cad/drafting; programming; fabrication; installation; certification, instructions; warranty service; procurement, warehouse, delivery and logistics; along with project management and administration.

D. The contractor shall staff the project with sufficient manpower as required to meet and maintain the project schedule and to keep pace with the work of cooperative trades.

E. Designate a qualified foreman. The foreman shall be present in the field at all times during the performance of the work.

F. Provide a supervisory work force sufficient to maintain efficient performance of the contractor's responsibilities.

G. Use only skilled and reliable work force and discontinue the services of anyone employed on this project upon written request by the City of New York, Commissioner, or Engineering Services.

H. Use personnel who are qualified at minimum to perform all of the installation and testing work activities required under the contract.

I. The contractor shall provide a minimum of two qualified technicians, each of whom will have actively participated in the project and have a demonstrated knowledge and understanding of project scope, to conduct and perform all final system testing, calibration and adjustment, demonstration, diagnostic evaluation and or corrective action as required to ensure all equipment, components and systems conform to the project specifications.

J. The contractor shall exercise care and due diligence at all times and shall provide full and active cooperative participation during all phases of the project.

K. The contractor shall furnish all submittals in a timely manner and as otherwise specified herein

L. The contractor shall render and submit original shop drawings, which shall include, but shall not be limited to;

1. Schematic and block diagrams detailing all system equipment placement and type, circuits and wiring, connections and terminations, pin-outs, color codes and cabling id and numbering schemes.
2. Installation and mounting details including, but not limited to all equipment, component and device dimensioned location and installation details.
3. Elevation detail drawings including, but not limited to dimensioned structural mounting, backing and blocking; equipment and mount detail, device and junction boxes, low voltage rings, conduit and cable paths etc.
4. Provide all pertinent electrical, video/data /video and other required low voltage wiring specifications and details for coordination with related work performed by other trades.
5. Provide reflected ceiling plans as required.
6. Wiring riser diagrams, including all closet layout requirements, additional conduit requirements and infrastructure needs
7. Furniture integration detail drawings for coordination with work performed by other trades.
8. Dimensioned shop drawings for all components integrated within any furniture, millwork or other areas in this contract including, but not limited to wall mounted devices, ceiling mounted devices, floor mounted devices, display mounts, table boxes, and equipment racks etc.
9. Rack and equipment enclosure elevation drawings, including rack unit RU configuration, calculated power, thermal loads and management, cable management and ventilation "clear area" details and dimensions.
10. Detailed drawings and specifications for all architectural and aesthetic elements including, but not limited to wall mounted devices, ceiling mounted devices, floor mounted devices, display mounts, table boxes, and equipment racks etc., inclusive of colors and finishes.
    a. Coordinate final locations, colors and finishes with the Commissioner.
11. Complete and accurate record set as built drawings, which shall be provided to the Commissioner upon completion of the work.
12. Drawings provided as a part of this specification shall not be used and or submitted as shop drawings
    a. The contractor shall render and submit original shop drawings and submittals as required.

M. The contractor shall be responsible for the initial and final calibration and adjustment of the systems as specified herein.

N. Voice / Data/ Audio Visual/ Security and all other low voltage cable installation standards shall reflect NEC, ICIA, I-EEE, TIA/EIA and BICSI standards. Manufacturers' instructions shall be used for in-process quality control and final acceptance of the work. The strictest of all requirements shall apply.

O. The contractor shall provide all necessary test equipment and accessories required to conduct and document system performance evaluations, demonstrations and acceptance testing as specified herein.
   1. All test equipment shall be fully functional and shall have valid certificates of calibration as applicable.

P. The contractor shall provide complete and comprehensive narrative and practical hands-on instruction in the proper operation, use, care and maintenance of the specified equipment, components and systems, to the personnel designated by the Commissioner.
   1. Instructing shall be conducted by a suitably qualified instructor
      a. In the event contractor does not have certified and qualified instructors on staff for specific equipment, components and or software, a manufacturer's representative for such instruction will be provided by the contractor, at no additional fee to the City of New York.
   2. All instructing shall take place at the installed systems locations, after acceptance.
   3. The contractor shall provide a minimum of two hours of end-user instructions and one hour of advanced technical instructions for any system included in this specification.
      a. Advanced instructions will include a comprehensive review of system specifications and diagrams and detailed instruction in the modes of operation, routine service and maintenance, diagnostic troubleshooting and reconfiguration of the systems.
   4. The contractor shall provide follow-up instructions within sixty days of the completion of initial instructions, which shall be conducted at the discretion and convenience of the City of New York.
   5. The contractor comply with all applicable governmental regulations and with all federal, state, county, city, and other applicable building codes, ordinances, and regulations and the most recent edition of the following technical standards and design guidelines including the latest amendments and all applicable addenda. See 1.16
      a. ANSI/NECA/BICSI-568 b standard for installing commercial building telecommunications cabling per latest edition.
      b. TIA-606-b, administration standard for commercial telecommunications infrastructure per latest edition.
      c. TIA-607-c, commercial building grounding and bonding requirements for telecommunications per latest edition.
      d. ANSI/NECA/BICSI-568, standard for installing commercial building edition.
      e. BICSI, telecommunications cabling per latest telecommunications distribution methods manual per latest manual

Q. These specifications provide a complete workable telecommunications cabling system including optical fiber, coaxial and unshielded twisted pair cable, and ready for the City of New York's use. These documents address new station cabling, riser cabling and telecommunications room equipment, as well as cable connectivity.
   1. In some locations, there may be requirements for faceplates designed for furniture system modular cut outs. Refer to drawing for exact outlet locations. Confirm with Commissioner in field.
   2. All station cabling shall be category 6/RG 6 coaxial plenum rated cable and must support the following applications: gigabit Ethernet, ATM at 155mbps, T-1 /E-1, ADSL and ISDN.
   3. All twisted pair/category 6 cables - cable must be separated by color for voice services, data services and video services. All cable must be plenum rated and coloring schemes must match existing cable infrastructure or be approved by the Commissioner prior to installation.

4. Installation must provide end-to-end connectivity of the appropriate category of cable and components for utilization of the full bandwidth capability on all pairs or strands.
5. As a part of this contract The City of New York will be constructing new telecommunication/server rooms throughout the building. Rooms will be constructed by the GC as located and sized on the floor plans. Low voltage contractor is responsible to run cable from every station location back to a local closet in the apartment unit. For the common area stations contractor is responsible to run cable from station location back to the local riser closet as shown on electrical drawings, or directly to the main distribution closet MDF / server room.
6. Low voltage contractor to provide and install backbone fiber optic riser cabling. This cabling includes all connectivity between the main MDF location and IDF closets. The low voltage contractor shall furnish, install, terminate and test all tie cables.
7. The low voltage contractor shall furnish, install, terminate and test armored multimode and armored single mode fiber cable to the IDF. All fiber will be terminated onto LC - lucent style connectors. Cables shall route through EMT riser conduit or sleeve provided by the electrical contractor.
8. Furnish and install all workstation jacks, connectors, patch cords for all ports at both ends, terminating devices, faceplates, frame "bezel" and similar components required for a complete installation.
9. Furnish and install all cable supports j-hooks, including mounting and installation hardware required for a complete installation. J-hook support hardware shall not be fastening to movable wall, sheet rock or stubs. All support shall be fastening into above concrete slab at ceiling or ceiling joist.
10. All WAP terminations shall be located on dedicated patch panel in the 2 post rack.
11. Furnish and install all labeling and documentation of all cables, racks, outlets and hardware installed under this contract. The contractor shall ensure that all labeling and numbering is in accordance with the City of New York's in-house standards.
12. Provide all testing, test documentation and warranties at completion of project.
13. Provide all connections to the telecommunications grounding system at multiple bus bars as noted on drawings.
14. Provide all fire-stopping of all rated wall and floor penetrations and openings through rated walls and floors after installation of telecommunications cabling. Approved sealant by the Commissioner and engineer licensed in the State of New York shall be used within barrier wall per drawings
15. Furnish and install all non-specified miscellaneous hardware, including, but not limited to nuts, bolts, re enterable cable ties, spiral wrap, wire rings, supporting hardware and similar components required for a complete cabling system installation.

1.7 PRODUCT DATA SHEETS

A. Product data sheet submittals shall consist of the following
   1. Cover sheet
   2. Date of submittal
   3. Project name and address
   4. Number of submittal
   5. Name and address of the contractor
   6. Table of contents with index
      a. Include page and item numbers of the corresponding specification section and/or drawing number of the contract documents.
   7. Product name and manufacturer
   8. Manufacturers' technical specifications and data sheets of all items specified herein.
      a. Submit only pertinent pages. Do not submit entire product catalogs.

b. Clearly identify the specific product being submitted using appropriate markings and arrows. Only use highlighters or coloring that will appear on reproductions or photocopies.

9. Identify any options and or accessories that are applicable to the project.
10. Confirm and verify all product quantities and manufacturer model and part numbers are current, correct and complete, including required accessories and or options that are require for full and completely working AV systems.
11. Identify the installation location of each piece of equipment, including room number and or room name.
12. Identify special coordination requirements for the product
13. Identify "long lead" procurement requirements for the specified product as may be applicable

B. Preparation and transmittal
1. Each submittal shall be in accordance with the procedures outlined herein.
2. Bind and package each submittal with tabs and table of contents as appropriate
3. Sheet size shall be standard 8-1/2" x 11"
4. Submit all product data sheet submittals for each system, subsystem, or unit of work as one submittal
5. Submit three copies to the Commissioner U.O.N.

1.8 SHOP DRAWINGS

A. The contractor shall render and submit complete original shop drawings as specified within this section.

B. Drawings issued as a part of this specification shall not be submitted as shop drawings.

C. Each shop drawing submittal rendered by the contractor shall consist of the following
1. Title block
2. Project name and address
3. Number of submittal
4. Date of submittal
5. Name and address of the contractor
6. Drawing scale
7. Diagrams showing evidence of compliance with contract documents and coordination with other trades. See section 1.10 pull schedules as a part of shop drawing submittal.
8. Associated wiring diagrams of all equipment, with types and model numbers specified
9. Fully dimensioned housing and mounting drawings, including information on finishes
10. Specific notation of field measurements at accurate scale
11. Identification of specific products and materials used
12. Reference room numbers and or room names on all shop drawings
13. Compliance with specified standards
14. Dimensions at accurate scale

D. Preparation and transmittal
1. Each submittal shall be in accordance with the procedures outlined herein and shall provide adequate space for action marking adjacent to the title block.
2. All sketches and drawings shall be issued by the contractor using the following sheet sizes: a. Sketches sheet size shall be 8-1/2" x 11" b. Drawings: sheet size shall be 24" x 36"
3. Submit all shop drawing submittals for each system, subsystem, or unit of work as one complete submittal.

4. Submit three copies to the Commissioner U.O.N.

1.9 PULL SCHEDULES

A. The pull schedule shall include, but is not limited to:
   1. Cover sheet
   2. Project name and address
   3. Number of pull schedule submittal
   4. Date of pull schedule submittal
   5. Name and address of the contractor
   6. Pull schedule data field
      a. Field 1: room number /location of device
      b. Field 2: sequential cable number
      c. Field 3: voice / data / video/ security cable ID
      d. Field 4: cable type
      e. Field 5: equipment manufacturer and model number
      f. Field 6: equipment serial number
      g. Field 7: jack and or connection label as applicable.
      h. Field 8: rack label as applicable

B. Preparation and transmittal
   1. The pull schedules will be computer-generated and must be submitted to the Commissioner for review.
   2. Submit three copies to the Commissioner.
   3. The pull schedule will be submitted with the shop drawings

1.10 COMMISSIONING

A. Prior to final acceptance of the installation the following testing and documents shall be performed and provided to the Commissioner.
   1. Perform and document a complete system acceptance test.
   2. Provide testing reports indicating all devices tested, pass/fail status, and actions taken to resolve problems on failed tests.
   3. Provide "as built" drawings showing each device and wiring connection in hard copy and in electronic format
   4. Provide a complete set of operating instructions for hardware devices and a complete software user manual.

B. Closeout
   1. The contractor shall submit a complete, updated drawing set and pull schedules accurately reflecting the completed work including all field changes, modifications and or revisions.
   2. The contractor shall individually bind and submit to the Commissioner for review and approval, all record set, as built drawings, updated pull schedules, user guides and manuals, equipment lists with serial numbers, test results and a completed check out list, for each contracted system, prior to issuing closeout documentation to the Commissioner.

C. Acceptance
1. Once the testing has been completed, as-builts and testing documentation shall be delivered to the Commissioner, to satisfy that all work is in accordance with the contract documents, the Commissioner shall notify the contractor in writing of the acceptance of the work performed.

1.11 REPORTING

A. The contractor shall submit weekly progress reports, which shall include, but shall not be limited to;
1. Installation schedule risks, issues, conflicts and or delays.
2. Status of the installation, detailing all remaining tasks and proposed completion dates.
3. Percentage of completion of each activity
4. Gantt chart format showing continuous vertical lines to identify the first working day of each week.
5. Illustration defining how the start of a given activity depends on completion of preceding activities, and how the completion of a given activity may restrain or constrain the start of subsequent activities.
6. Identification of the critical path.
7. Requests for receiving major equipment and material shipments.
8. Requests for subcontractor access to the job site.
9. Requests for utilities and or services disconnection and or connection.
10. Delays and stoppages.
a. Note that delays and or stoppages shall not affect the scheduled completion date, unless approved in writing by the Commissioner.
11. Emergencies and accidents.
12. Losses of material and or property.

B. Preparation and transmittal of progress reports
1. Each item shall include
a. A detailed explanation;
b. A description of the actions to be taken;
c. The party responsible for executing those actions.
2. Progress reports shall be generated and delivered to the Commissioner, three business days prior to the weekly project meeting, for the duration of the project.

1.12 DOCUMENTATION

A. Record set drawings / as-built drawings
1. As mentioned herein this specification the record set, as-built drawings, shall include but may not be limited to equipment and cabling layout and location, schematic and block diagrams, equipment and cable labeling, cable termination points, equipment rack and room layouts and equipment installation details.
2. The as-built drawings shall accurately reflect and include all field changes made during construction and shall completely and accurately reflect the conditions of the installed systems at the time of acceptance.

B. Operation and maintenance manuals
1. These manuals shall utilize a combination of narrative text, graphics and images to describe to the user, how to properly operate and maintain the systems.

a. The user of this manual is presumed to be technically competent, but unfamiliar with the specific systems

2. Manuals shall be tabbed and indexed by room and subsystem.
3. Manuals shall include the frequency and scheduled intervals of all system maintenance requirements.
4. The operation section shall describe all modes of normal operation and the procedures necessary to activate and properly operate each system so as to meet the functional use requirements described within the specifications.
5. The operation section shall include a laminated 8.5 in. X 11 in. "quick reference guide" to the basic operation and use of each installed system.
6. The operation section shall include simplified block diagrams for each system and subsystem, with all input and output circuit cable and terminal block numbers and jack field circuit ID Designations.
   a. A copy of this block diagram drawing shall be laminated and included within each equipment rack or equipment location.
   b. All block diagrams shall reference room numbers and or room names.
7. The maintenance section shall provide a recommended maintenance schedule, with reference to the applicable pages in the manufacturer's maintenance manuals.
8. The maintenance manual shall include completed copies of all manufacturer warranty cards, indexed by component type and room number and or room name.
9. The maintenance section shall include a list of all required "consumable" products required to maintain the normal operation of each system and or subsystem, including, but not limited to filters, batteries and lamps.
10. In the event that adequate and or sufficiently detailed service or maintenance information is not provided by the manufacturer, the contractor shall provide the information necessary to ensure proper care and maintenance.
11. At acceptance testing, the contractor shall provide two final revision copies of the operation and maintenance manuals to the Commissioner.
12. It is expected that user instructions shall be based on the user of these manuals.
13. The contractor shall provide two laminated copies of the record set as built drawings IT drawings for each specified system.
14. Until final record set of as-built drawings are approved and accepted, an up-to-date field set of drawings will be maintained in the site office of the Commissioner.
15. The contractor shall provide bound copies of all product maintenance manuals.
16. Pull schedule as required per this specification.
17. Software documentation as required per this specification.
18. The contractor shall deliver three complete copies of all closeout documentation to the Commissioner, prior to scheduling system demonstration and acceptance testing.

1.13 WARRANTY

A. The contractor shall warrant all work including, but not limited to all equipment, components, hardware, materials, installation and integration work and services, programming and software, against defects in workmanship and or materials for a period of one year, commencing upon the date of acceptance by the Commissioner. Where manufacturer's warranty is longer than one year, the contractor shall offer the extended warranty.

B. Provide a 20 year manufacturer's warranty for the systems operation and performance.

C. In order to maintain certain manufacturers' warranties, specified and covered equipment must be installed, configured, programmed, aligned and or otherwise serviced solely and exclusively by factory authorized technicians and/or factory representatives.

D. All equipment provided by the contractor shall be new and shall meet or exceed all latest and current published specifications issued by the manufacturer

E. The contractor shall provide only the latest model, revision or version of a specified piece of equipment, component and or software, effective at the time of response.

1.14 JOB CONDITIONS

A. Verify all existing conditions. Refer to the Commissioner for coordination and clarification before the response date, of any discrepancies concerning existing conditions, drawings, and specifications.

B. Clarify with the Commissioner, all locations including conduit and cable paths. Where discrepancies occur and instructions have been obtained, abide by the direction and decision of the Commissioner.

C. Contractor is solely responsible to conduct ongoing surveys and inspections of all work areas, throughout the construction process, in order to locate and confirm all penetrations, poke-thru and floor boxes, furniture openings, sleeves, conduit and conduit stubs, bushings, cable trays, blocking and backing, in-wall display mount and conduit termination boxes, AV device boxes, low voltage rings, pull strings, and all other elements associated with this work provided by others that support the this installation.
   1. If during the course of ongoing survey and inspection, the contractor observes a condition which appears to conflict with the project plans and specifications, the contractor shall immediately notify Commissioner of the potential discrepancy.
   2. The project/construction manager shall evaluate the reported condition and provide the contractor with direction as may be required

D. It shall be the contractor's responsibility to cooperate, at all times, and to the fullest extent, with any and all other trades performing work on the premises, in order to avoid delays in the work, lost time, work stoppages, interference and or other inefficiencies.

E. The contractor shall be responsible for meeting all project schedules and milestone dates.

F. Contractor will furnish, install, and terminate all required wire and cable so that all Voice / Data /AV & Security systems will operate as complete and functioning per the design intent.

G. Comply with all requirements regarding the use of cable with respect to spread of fire. Refer to drawings for identification of air plenum and other spaces having special cabling requirements.

H. It is the responsibility of the contractor to provide wiring that is in compliance with all applicable manufacturers' recommendations, standards, regulations and requirements stated herein and the DDC general conditions.

I. Comply with all seismic requirements regarding the installation of all hardware, mounts, equipment and or components.

J. It is the responsibility of the contractor to employ installation means and methods that are in compliance with all applicable manufacturers' recommendations, standards, regulations and requirements stated herein and the DDC general conditions

K. The contractor shall be solely responsible for the care, custody, safety and protection of all installed and configured systems and non-installed, stored materials, tools and supplies.

1.15 CODES AND STANDARDS

A. All work performed under the this scope / specification shall conform to the all requirements stated herein and to any/all applicable codes and standards as defined by all federal, state and local municipalities having jurisdiction. This is most notably including but not limited to;
   1. Current NEC 2020 Code / National fire protection association
   2. NFPA 70 national electrical code current and applicable sections including, but not limited to article 250 grounding and article 800 communications circuits.
   3. Underwriter's laboratories, Inc.
      a. UL listed
      b. UL approved
   4. Building officials and code administrators /BOCA international, Inc.
   5. In the event that a conflict occurs, the contractor is directed to meet, satisfy, adhere to and or otherwise comply with and conform to the most stringent requirement under the scope of this specification.

1.16 DELIVERY, STORAGE, AND HANDLING

A. Delivery
   1. Deliver materials and equipment in sufficient time to allow for inspection, installation and testing in accordance with the project schedule.
      a. All arrangements for access and unloading at the site shall be coordinated and scheduled with the Commissioner, not less than forty-eight hours prior to the scheduled delivery
   2. Movement, staging and layout of material, either at the time of delivery or subsequently, shall be the sole responsibility of the contractor
   3. The contractor shall be solely responsible for ensuring that all equipment can be successfully delivered to the installation locations including, but not limited to elevator cab size and stairwell dimensions and all door, corridor and turn radius dimensions.
   4. Delivery schedules, which may be affected by environmental conditions, shall be noted in writing to the, not less than twenty-four hours prior to the scheduled delivery.

B. Storage and protection
   1. The contractor shall be solely responsible for the care, custody and safekeeping of all equipment, components, materials, tools and supplies while stored on the job site, including all tools, materials and test equipment, which are, and shall remain the property of the contractor.
   2. The contractor shall take all reasonable and necessary precautions to protect all work from dust, debris and damage during construction.

1.17 CLEAN-UP

A. The contractor shall be responsible for the cleanup and restoration of all areas and work affected by this installation.

B. The contractor shall, on a daily basis, remove all debris created, caused, or resulting from this work, including all cut and removed cables, connectors and all other work- related debris.

C. Prior to acceptance of work, all areas used or entered by the contractor must be cleared of any materials or debris caused directly or indirectly by the contractor, to the satisfaction of the Commissioner.

PART 2 - PRODUCTS

2.1 GENERAL

A. The requirements in the section shall apply to all areas receiving systems, subsystems and or equipment and components as described herein.

B. Provide materials and equipment conforming to the applicable requirements of:
1. Underwriters Laboratories :UL
2. National Electrical Code : NEC
3. American National Standards Institute : ANSI
4. Federal Communications Commission : FCC

C. Contractor shall provide only equipment, components and materials, which are new, free from use and fully covered by all applicable manufacturers' warranties.

D. Contractor will provide the equipment as required by the design intent herein. Only current-model components, equipment and materials shall be provided. Do not provide obsolete or discontinued models.
1. Review all materials and equipment immediately and or installation and inform the Commissioner of any obsolete or discontinued items and or products.
2. Review all equipment lists at time of procurement, confirming product availability and delivery lead time with manufacturers and distributors.

E. In the event that unplanned delays or backorder status of specified products may adversely impact the project schedule, the contractor shall propose equivalent replacements and or upgrades, at no additional fee to the City of New York.

2.2 MANUFACTURERS

A. This structured cabling system is based on the following basis of design with product manufacturers and performance specification as provided below:
1. Category 6 cables: General or approved equal
2. Category 5 cables: General or approved equal
3. Fiber optic cables: General or approved equal

4. Coax cables: General or approved equal
5. Wall/Cover plates: Panduit or approved equal
6. Wall jack in wall/face plate: Panduit or approved equal
7. Patch panels 24 & 48 port: Panduit or approved equal
8. Wire managers and rack accessories: Panduit or approved equal
9. Fire stopping: STI or approved equal
10. Equipment racks and enclosures: Middle Atlantic or approved equal
11. D-rings: Arlington Industries or approved equal
12. J-hooks: Caddy or approved equal

2.3 PRODUCT – STRUCTURED CABLING REQUIREMENTS

A. Contractor will be installing new 2 post equipment racks with new vertical wire managers as indicated on plans and per manufacturer's recommendation., Mounted in these racks will be patch panels for all telecommunications, audio visual , security and other low voltage cable needs.

B. Racks and vertical wire managers shall be Middle Atlantic or approved equal as noted in material listing. . Contractor shall secure all racks directly to floor slab using 5/8" hardware.

C. Mounted in these racks will be all copper patch panels for station cable and tie cable termination. Final configuration of racks, wire managers and patch panels shall be approved prior to installation and must be based on manufacturer's recommendation or industries standards/best practices. Room layouts and rack elevations must be submitted to Commissioner at least three weeks prior to installation.

D. 24-port UTP modular patch panel, high-density, rack mountable. Performance compliant with ANSI/TIA/EIA 568 category 6 for terminating horizontal CAT 6 UTP cabling. Universal wiring scheme T568A/B. Complete with strain relief cable manager in rear.

E. Standard UTP jack - female 8-pin modular connector compliant with category 6 punch down termination. For insertion into standard faceplates. Universal EIA T568A/T568B pinning as required.
   1. Verify and confirm finish and colors of items specified in this section with Commissioner prior to purchase. In some locations, there may be a requirement for faceplates designed for furniture system modular cut outs.

F. Cat 6 modular patch cords & pre-patch. 4-pair UTP 24-AWG stranded. Color blue. PVC. Blue patch cords inside IDF.

G. The contractor shall furnish and install the cable tray system as depicted in telecommunication /server room detail. Recommended elevation of 8' above finished floor is required unless otherwise prohibited.

H. Ladder rack shall be black in color, secured to the building structure, ceilings, walls, and/or the tops of the racks using support plates or other such manufacturers' approved product including threaded rod, uni-strut and expansion anchors.

I. Each telecom rack will be provided with cable radius protectors sized for the ladder rack being installed where appropriate.

J. "J" hooks. Suitable for attachment to beam flanges, "U" channel, purlings, deck plates, smooth or threaded rod. For use as a cable support in ceilings and beneath access floors. Design to be used with cat6 or cat6a cabling is required.

K. Labels, Self-adhesive, self-laminating, with white matte finish printing area, clear plastic shield. Used for cable identification. Labels shall be provided on both ends of all cables or City of New York's standards.

L. All standard faceplates: accommodates 1, 2 or 4 inserts. Attaches to standard NEMA single-gang plastic. Please see TC 400 series drawings for "typical" details and confirm with Commissioner for final configuration requirements.

M. If manufacturer model numbers have changed since the production of this specification the following shall be applicable:
   1. All cable connectors and hardware must meet or exceed the minimum standards as defined by manufactures for a fully functioning telecommunications distribution system.

PART 3 - EXECUTION

3.1 GENERAL

A. Refer to DDC General Conditions for execution requirements.

B. The contractor shall comply with all safety guidelines and regulations established for the project.

C. Contractor will review all related electrical, telecommunications, audio visual, security, millwork and all other drawings for coordination with other trades.

D. Contractor will compare all related electrical, telecommunications, audio visual, security, millwork and other requirements and specifications with these drawings and specifications report any discrepancies to Commissioner,

E. Contractor will field survey and confirm the location and required size of all conduit, in-wall boxes, sleeves, penetrations, raceways, cable paths, cable tray, junction boxes and device boxes provided by others, which are intended for use in their installation of the specified systems.

F. Contractor will prepare all pre-construction submittals as specified herein.

G. Contractor shall provide all equipment required unless otherwise noted. Equipment shall be installed in accordance with the manufacturers' recommendations. This information shall be provided to the Commissioner at the time catalog cuts and shop drawings are submitted for approval.

H. Contractor will complete fabrication, installation, integration, testing, commissioning and certification of all work specified herein. Contractor will perform all settings, adjustments and programming required for a complete and operational system as directed by the Commissioner.

I. Contractor will follow manufacturers' instructions for installing all video/data/voice or other low voltage cabling. Where instructions are unavailable, follow approved industry practices/best practices.

J. Contractor shall maintain a current copy of this specification and related drawings at the job site at all times.

K. Any/all restoration or changes caused by contractor's neglect shall be made at contractor's expense. Protect finished work of other trades from damage or defacement and remedy any damages as required.

3.2 INSTALLATION

A. Installation shall include the delivery, unloading, setting in place, rack-mounting, fastening to or within furniture, millwork, walls, floors, ceilings, counters or other structures where required; installation and interconnection of all wiring of the system components; equipment alignment and adjustments; and all other work whether or not expressly described or defined herein, which is necessary to result in the complete and satisfactory installation of fully operational systems as described within the project plans and specifications herein.

B. Identification for all equipment racks shall bear an identification plate, provided and installed by the contractor, which shall be mounted on the front of each equipment rack.

C. Engraving shall be yellow/gold filled times new roman lettering on a black background or as appropriate to the identification plate material

D. All work shall be performed in accordance with, but not limited to these specifications and drawings and the best practices associated with such work.

E. All work shall be performed in accordance with all of the applicable manufacturers' recommendations, standards, regulations and requirements stated herein and the DDC general conditions

F. If, in the opinion of the contractor, an installation practice is desired or required, which is at variance with, and or contrary to these specifications or drawings, a written request for modification shall be made to the Commissioner.
   1. Modifications shall not commence without prior written approval of the Commissioner

G. All equipment shall be firmly secured in place unless requirements of in-use motion and or portability dictate otherwise.

H. Fastenings and support hardware shall be grade 8 or better and shall be sized as required to support their loads with a minimum safety factor of not less than five, and with maximum tolerances as specified by the manufacturer, or whichever is greater.

I. The contractor shall be solely responsible for ensuring that all installation means and methods conform to the applicable manufacturers' recommendations, standards, regulations and requirements stated herein and the DDC general conditions.

J. All boxes, plates, panels, equipment and other project elements shall be properly secured and installed plumb, level and square.

K. All wall mounted back boxes shall be provided in coordinated fashion with the schedule of the general contractor and shall be pre-drilled to meet conduit specifications.

L. All cables, regardless of length, shall be marked with wrap- around number or letter cable markers at both ends as specified herein. There shall be no unmarked cables at any place, point or location in any system or subsystem.

M. All inter-rack cabling shall be neatly installed, secured, dressed, and adequately supported. Audio and video cabling shall be separated from each other and from power cabling.

N. Terminal blocks, boards, strips, or connectors shall be furnished for all cables, which interface with racks, cabinets, consoles, or equipment modules.

O. All cables shall be neatly grouped according to signal type and level. In order to reduce crosstalk and other types of signal contamination, separate groups shall be formed for the following cables;
1. Power cables
2. Control cables
3. Video cables
4. Audio cables
5. Voice/data cables
6. Any/all low voltage cables not defined above

P. Maintain minimum twelve-inch separation between all low voltage and telecommunication cables running exposed in ceiling or floor voids and parallel electrical cables/conduits.
1. Avoid electromagnetic interference / EMI and route cables to maintain the following minimum distances:
   a. Twelve inches from high voltage lighting
   b. Thirty-six inches from power lines of 5 KVA or greater
   c. Forty inches from transformers or motors

Q. No cable shall be installed having a bend radius, less than that recommended by the cable manufacturer.

R. Cable and wiring shall be protected at all times during installation.

S. All cable runs shall be continuous, with no factory or field splices.

T. All cabling, wiring and equipment shall have an independent means of support furnished and installed by the contractor.
1. At no time, shall an audiovisual system cable, wire or component be supported on or by sprinkler pipes, HVAC ducts, lighting fixtures, ceiling grid and or tiles and or any other equipment or infrastructure.
2. All installation means and methods shall conform to the applicable manufacturers' recommendations, standards, regulations and requirements stated herein and the DDC general conditions
3. Follow room boundaries when pulling cables through ceilings for distribution into walls, conduits, wiring channels, outlets, etc
4. All cable distribution from the communications/technology closets or racks to all work locations except as noted shall be run in the voids above ceilings as shown on drawings. Ceiling support grids and service hangers shall not be used to support cabling.
5. Cable shall be loose bundled into cable supports. Use only approved re-enterable cable ties to secure cables in overhead distribution.

3.3 CABLES AND CONNECTORS

A. All voice /data - audio / video – security and control cables are based on the following acceptable product manufacturers and must have all the appropriate performance specifications and criteria. All other cable types are to be submitted to the Commissioner and the City of New York for consideration and approval;
   1. General
   2. Belden
   3. Westpenn
   4. Creston
   5. Extron
   6. Or approved equal

B. Jacks, faceplates and wall outlets at the user locations, termination blocks and individual lateral cables shall be labeled with at minimum machine generated black uppercase lettering on a permanent adhesive label stock, covered with a permanent water resistant sealer. Labeling stock and/or lettering must be used that provides a high contrast with the color of the terminating equipment, faceplate or cable.

C. If at any time during the job the permanent cable tag becomes illegible or is defaced or removed, immediately replace it with a duplicate pre-printed cable tag.

D. Cable identification system shall be via color coding in accordance with the EIA-606 standards.
   1. Place labels on both ends of the cable at least 4 inches from the point at which the cable is terminated on the connector or terminal block.
   2. Provide permanent, machine generated cable tags. Temporary tags are acceptable only during construction
   3. Cable identification numbers when provided on plans are presented in an abbreviated format. Contractor is required to provide all cables id's and they will at minimum indicate the floor, originating closet/rack id, and the sequential cable number as shown on drawings.

E. All cable installed without conduit shall be plenum rated and shall match the same performance specifications of the manufacturers approved cables for this installation.

F. Cables running in areas exposed to environmental factors such as, but not limited to, UV, chemicals, direct burial, etc. Shall be rated for such exposure and shall match the performance specifications of the manufacturers approved cables for this installation.

G. All cables shall be cut to the length dictated by the cable run. No splices shall be permitted and cable slack shall be as follows .any cable length not defined below must be confirmed by Commissioner.
   1. Provide a minimum of 12-inches of slack at each terminal box or behind each faceplate after jack installation is completed to allow for easy dismounting and extension of outlet covers and wire terminations.
   2. Provide a minimum of 2-feet slack in a loop in UTP at the head of each stub-up or distribution conduit.
   3. Provide a minimum of 12-feet slack in a loop in optical fiber cable at its point of entry to an equipment room.
   4. Provide a minimum of 15-feet slack for each mounted wireless access point outlet.

H. All rack wiring connections and all equipment mounted in drawers or on slides, shall include interconnecting cables with a service loop of sufficient length so as to facilitate access and freedom of movement during installation and servicing.

I. No cable shall be installed with a bend radius less than that recommended by the cable manufacturer.

J. Connector types
   1. Connectors for all signal types are to be submitted to for approval

K. Patch panel assignments
   1. All patch panels shall be wired so that signal "sources" outputs appear on the upper row of a row pair; and all "loads" inputs appear on the lower row of a row pair.

L. Patch panel designation strips
   1. All audio and video patch panel designation strips shall utilize alphanumeric identifications and descriptive information.
      a. The jack position in each horizontal row shall be numbered sequentially from left to right.
      b. The horizontal jack rows shall be lettered sequentially from top to bottom.
      c. The alphanumeric identification of each jack shall be included on the functional block drawings, as well as on reproductions of these drawings, which shall be mounted in an appropriate location near the patch bays.

M. Fire stopping system
   1. Seal all penetrations through fire rated walls, floors and walls created by or made on the behalf of the contractor so that the original fire rating of the floor or wall is maintained as required by article 300-21 of the national electric code.
   2. Contractor shall use only fm approved fire-stopping materials and methods. All materials and methodologies shall be submitted to the project manager prior to utilization.
   3. Install approved penetration sealant material that has passed fire exposure testing in accordance with standard time-temperature curve in the standard, UL, ASTM e 119, and NFPA 251 and the hose stream test in accordance with UL.
   4. Install approved penetration seal materials in accordance with design requirements and manufacturer's instructions. All substitutions must be approved by Commissioner and the City of New York.
   5. Provide removable fire-stopping pillows IPC flame safe seal bags or approved equivalent in an approved fashion in openings greater than 4" diameter, or 4" x 4" square cross section. Provide wire mesh grate over bags as recommended by manufacturer subsequent to installation.
   6. Verify that all penetrating elements and supporting devices have been installed and temporary lines have been removed.
      a. If forms of damming materials are installed, they shall be removed after the designated cure time.

N. System checkout
   1. Before acceptance tests are scheduled, the contractor shall perform comprehensive system tests and checkouts
   2. The contractor shall furnish all required test equipment and shall perform all work necessary to determine and or modify performance of the system to meet the requirements of this specification.
   3. During performance testing, all equipment shall be operated under standard conditions as recommended by the manufacturer

4. Test and certify all audio and video systems for compliance with the performance standards using the test procedures defined later in this specification
5. Maintain documentation of all performance tests for reference by the Commissioner during the system acceptance test.
6. At the conclusion of testing, return all equipment settings to previously calibrated "normal" operating positions.
7. Provide written records of all test results in spreadsheet form.
8. Check and confirm all control functions for proper operation, throughout the entire signal path, from all controlling devices to all controlled devices.
9. Adjust, balance and align all equipment for optimum quality and to meet the Commissioners approval and manufacturer's published specifications.
10. Establish and mark "normal" settings for all level controls and record these settings in the "system operation and maintenance manual".
11. The contractor shall provide test results and settings for all equipment and systems to the Commissioner at least three business days prior to scheduled acceptance testing.
12. The contractor shall notify the Commissioner, in writing, that the work is complete and ready for acceptance testing.
    a. The work shall be considered ready for acceptance testing when the contractor notifies Commissioner, in writing, that the following conditions are met:
        1) The contractor has pre-tested all systems such that all sub- systems, functions, software and equipment are properly installed, set-up, configured, de-bugged and fully operational as specified.
        2) The contractor has supplied the Commissioner with the written test results and documentation as listed above, for all rooms and systems.
        3) The contractor has supplied the Commissioner with manuals, instruction materials and all other required as-built documentation, revised to reflect comments and or revisions arising from the review cycles listed elsewhere within this document.
13. Should the systems not be ready for testing by the Commissioner at the date and time indicated by the contractor, system acceptance testing may be rescheduled at the sole discretion of the Commissioner.

3.4 GROUNDING

A. All grounding shall conform to all applicable national electric code requirements including, but not limited to article 250 see 1.16.

B. The contractor shall be solely responsible for ensuring all work provided under this scope is free of crosstalk, hum, buzz and or other defects or anomalies resulting from improper grounding.

C. A single, primary "system ground" shall be established for each system. All grounding conductors shall connect to this primary system ground.
    1. The system ground shall be provided in the equipment racks and shall consist of a copper bar of sufficient size to accommodate all secondary grounding conductors.

D. Under no condition and in no circumstance, shall the ac neutral conductor, either in the power panel or in a receptacle outlet, be used for a system ground.

E. It shall be the responsibility of the contractor to follow good engineering practice, as outlined above, and to deviate from these practices only when necessary to minimize crosstalk and to maximize signal-to-noise ratios in the audio, video, and control systems.

3.5 CABLE INSTALLATION

A. Special conditions

1. Furnish and install communications cables per the drawings and specifications provided by the Commissioner and per the manufacturer's recommendations.
2. Install each backbone cable as an uninterrupted conductor section from the MDF to its point of termination the IDF closet, as indicated on the drawings, without splices or mechanical couplers between the points of origin and termination.
3. Install each station cable as an uninterrupted conductor section from the IDF closet to the user-end termination point, as indicated on the drawings, without splices or mechanical couplers between the points of origin and termination.
4. Contractor shall support all backbone cables and all primary horizontal cable bundles on open mesh cable tray to be furnished and installed under the telecommunications pathways work. No non-re-enterable tie wraps shall be used to secure cables to the trays.
5. Where horizontal cables exit trays to run to workstation locations, contractor shall furnish and install J-hooks with the appropriate mounting hardware every 5-feet oc maximum for open cable runs. J-hooks shall not be fastened to suspended ceiling support structures, electrical or plumbing piping or any other trade work.
6. Provide all other outlet configurations in accordance with the drawings and manufacturers recommendations.
7. All wall, ceiling, outdoor and indoor cameras shall have a 2 gang back box that is protected from weather, vandalism etc, and prior to security contractor's final connection.
8. Unless otherwise noted, route all intra-building station cables above the finished ceilings, transitioning vertically to wall mounted back boxes and/or surface-mounted wiring channels via conduit stub-ups into the ceiling void or to floor boxes or poke-thru fittings to the floor above, as required.
9. Label each outlet and each cable with an appropriate id number.
10. Do not exceed a pulling tension of 25 lbs. On 4-pair UTP cables.
11. To limit the incidence of micro-bending of the individual fiber strands, use mesh-type, swivel-eye pulling grips for all fiber optic cable pulling. This type of pulling grip is also recommended for all other building cable, as required.
12. Stations/faceplates will be installed in various configurations as noted on the drawings. All cables will be plenum category 6 / RG 6 cable. Station locations are indicated on the plans using a unique triangle designation as defined on the drawing symbol legend. All locations and mounting heights must be confirmed with drawings.
    a. At the station cables will be terminated on individual category 6 modules be secured into a flush wall mounted faceplate whose port opening count matches the quantity of cables at that station. If blank inserts are required their color shall match the color of the face plate.
    b. At the closet all cables shall terminate in a rack mounted patch panel. Cables shall be cut down on rack mounted 24/48 port CAT 6 patch panels. A cut down schedule shall be provided by contractor prior to cable installation and termination.
    c. These CAT 6 cables shall be terminated in a separate CAT 6 patch panel that is dedicated for back of house and operations support staff. BOH coaxial shall be left with 15 feet of slack coiled at rack in main technology room for connectivity to headend system.

d. Printed next to it and will receive one category 6 cable. At the station this cable shall be terminated on a white CAT 6 jack secured into a standard faceplate that is to match other finished wall plates. At the closet these cables will terminate in the IDF on rack mounted 24/48 port category 6 patch panel.

13. Floor box locations are designated on the floor plans using a triangle inside a square with a numerical subscript. This number indicates the quantity of cables to this station. At the station cables will be terminated on individual category 6 modules secured into the frame which in turn will be secured into the floor box.

a. Any unused ports in the mounting frame shall be provided with blank modules whose color matches that of the frame or other plates. Low voltage contractor is responsible for all finish faceplates at floor boxes. At the closet these cables will terminate in the IDF on rack mounted 24/48 port category 6 patch panel.

b. Certain floor box locations are designed for audio visual connectivity and these locations are to have a FSR fl-500p floor box 6" deep.

c. Contractor must take care when installing these FSR floor boxes as the conduit feed must line up appropriately so that cable within the box allows for separation of power and low voltage cabling. Conduits/cables will route through floor slab exiting to ceiling cavity of floor below and into wall cavity conduit running up the wall and through to back of appropriate back box. General contractor/electrical contractor is responsible to identify these locations prior to purchase and installation. Certain floor boxes in conference rooms will feed directly to a wall mounted display while other floor boxes will feed back to a centralized AV closet.

d. All cable shall be terminated on individual category 6 modules secured into a flush wall mount style faceplate whose port count matches the number of cables. Any unused ports in the faceplate shall be provided with blank modules whose color matches the other faceplates.

14. Where appropriate in a cavity within the furniture leg or cubical backing station cables shall exit conduit and be terminated into a surface mounted plate/box. Each cable shall be terminated on individual category 6 modules secured into a flush mount style face plate whose port count matches the number of cables. Any unused ports in the faceplate shall be provided with blank modules whose color matches the faceplate.
    a. At the closet these cables will terminate in the equipment rack mounted 24/48 port category 6 patch panel. A cut down schedule shall be provided prior to cable installation and termination.

15. Where appropriate in a cavity within the furniture leg or cubical backing station cables shall exit conduit and be terminated into a surface mounted plate/box. Each cable shall be terminated on individual Category 6 modules secured into a flush mount style face plate whose port count matches the number of cables. Any unused ports in the faceplate shall be provided with blank modules whose color matches the faceplate.
    a. At the station, prior to termination, 15 feet of slack cable shall be coiled and supported at the WAP location. Cables will be terminated on an individual category 6 plug providing for direct connection into the wireless antenna.
    b. At the closet these cables will terminate in the IDF on a rack mounted 24/48 port category 6 patch panel. A cut down schedule shall be provided prior to cable installation and termination.

16. Security camera cabling stations are designated on the floor plans by a camera icon. Each location shall be provided with a single category 6 data cable.

a. At the station, prior to termination, 15 feet of slack cable shall be coiled and supported at the camera location. Cables will be terminated on an individual category 6 plug providing for direct connection into the camera.
b. All security cables shall originate in the main technology closet. At the closet cable shall terminate on separate rack mounted 24/48 port patch panel dedicated to security devices. A cut down schedule must be provided prior to cable installation and termination.

3.6 IDF CLOSETS

A. All cables, after entry into the equipment rooms must be secured to backboards and dressed into supports. The general contractor/electrical contractor shall attach the cables where required to plywood backboards using velcro-type re-enterable cable ties at spacing of approximately 12 inches. Velcro cable ties shall be secured to backboards using #10 machine screws and metallic washers, or rigid tabs.

B. Support all cables mounted onto patch panels with strain management bars on rear of rack.

C. Route cables from work locations into equipment rooms via overhead distribution. Maintain overhead distribution wherever possible within equipment rooms.

3.7 TEST EQUIPMENT

A. The contractor shall provide all appropriate test equipment as required by Commissioner and the City of New York. Equipment shall be factory calibrated and fully operational for acceptance testing;

B. Test equipment minimum requires are as follows;
1. Metallic cable pair tester: independent technologies, test-all iv or 25, Simon Company multi-test mt-5000 or equivalent
2. 4-pair UTP automated cable tester: tester shall be compliant with ANSI/TIA/EIA-568- provide bi-directional testing and test in excess of category 6 permanent link and channel requirements. Test equipment must be approved by Commissioner prior to use on the job. Agilent Wire scope 350, Micro test Omni scanner, Fluke DSP 4000 or approved equal may be used.

3.8 CABLE TESTING

A. Test all cables installed.

B. Pre-installation inspection.
1. Visually inspect all cables, cable reels and shipping cartons for shipping damage. Return visibly damaged items to the manufacturer.
2. Perform an end-to-end test for continuity, ground fault, shorts and crossed pairs for each cable pair/conductor.

C. Post installation testing
1. Test only completed systems. Partial or statistically sampled testing is not acceptable, except by prior, written approval from the Commissioner..
2. Perform an end-to-end test for continuity, ground fault, shorts and crossed pairs for each cable pair/conductor.

a. Test cable pairs from the work area outlet, through all conductors, patches and cross connects, to the equipment room
b. Test horizontal cable pairs not cross-connected to backbone from their furthest termination point to the work area outlet.
c. Test backbone cable pairs not cross-connected to horizontal cables from their furthest termination point to the equipment room,

3. 4-pair CAT 6 and CAT 6a UTP: in addition to end-to-end tests listed above
   a. Conduct a permanent link test of each cable including: wire map, length, insertion loss, next loss, psnext loss, elfext loss, pselfext loss, propagation delay, and delay skew with injected standard signals, utilizing automated test equipment. Record all results. Test bi-directionally in accordance with ANSI/TIA/EIA-568 and compare results with the performance requirements of ANSI/TIA/EIA-568-b.1 and/or b.2-1 respectively.
   b. Test cabling not cross connected or patched within the closet as a permanent link.
4. Remove all defective cables from cable pathways. Do not abandon cables in place.
5. The Commissioner reserves the right to observe the conduct of any or all portions of the testing process and to conduct, and to require the contractor, using the contractor's equipment and labor, a random re-test of up to five percent of the cable plant to confirm documented test results.
6. Document all test results and corrective procedures and submit to the Commissioner within ten working days of test completion.
7. In addition to the actions specified above, the contractor may be required to be present while the Commissioner conducts performance tests of the transport electronics connected to the cabling system.

END OF SECTION 27 02 00

SECTION 270500
Common Work Results for Communications

PART 1 - GENERAL

1.1. RELATED DOCUMENTS

A. The following documents apply to all required work for the Project: (1) the Contract Drawings, (2) the Specifications, (3) the General Conditions, (4) the Addendum and (5) the Contract (City of New York Standard Construction Contract).

B. LEED / Environmentally Preferable Purchase (EPP) General Requirements:

1. Refer to DDC General Conditions and the Addendum to the General Conditions.
2. LEED requirements apply to all Phase II work with the exception of the Existing Building scope. EPP requirements apply to the project's Existing Building scope only.

1.2. SUMMARY

A. Section Includes:

1. Communications equipment coordination and installation.
2. Sleeves for pathways and cables.
3. Sleeve seals.
4. Grout.
5. Common communications installation requirements.

B. Related Sections include the following:

1. Section 078413 "Firestops and Smokeseals" for sleeve and firestopping selection and application.
2. Section 079200 "Interior Joint Sealants" for join sealant size, depth, and location.
3. Section 083113 "Access Doors" for locating access panels and doors for communication items that are behind finished surfaces.

1.3. DEFINITIONS

A. EPDM: Ethylene-propylene-diene terpolymer rubber.

B. NBR: Acrylonitrile-butadiene rubber.

1.4. SUBMITTALS

A. Refer to DDC General Conditions Section 01 33 00 "Submittal Procedures."

1.5. COORDINATION

A. Coordinate arrangement, mounting, and support of communications equipment:

1. To allow maximum possible headroom unless specific mounting heights that reduce headroom are indicated.
2. To provide for ease of disconnecting the equipment with minimum interference to other installations.
3. To allow right of way for piping and conduit installed at required slope.
4. So connecting pathways, cables, wireways, cable trays, and busways will be clear of obstructions and of the working and access space of other equipment.

B. Coordinate installation of required supporting devices and set sleeves in cast-in-place concrete, masonry walls, and other structural components as they are constructed.

C. Coordinate location of access panels and doors for communications items that are behind finished surfaces or otherwise concealed. Access doors and panels are specified in Section 083113 "Access Doors."

D. Coordinate sleeve selection and application with selection and application of firestopping specified in Section 078413 Firestops and Smokeseals."

1.6. QUALITY ASSURANCE

A. Refer to DDC General Conditions Section 01 40 00 "Quality Requirements."

PART 2 - PRODUCTS

2.1. SLEEVES FOR PATHWAYS AND CABLES

A. Steel Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, galvanized steel, plain ends.

B. Cast-Iron Pipe Sleeves: Cast or fabricated "wall pipe," equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop, unless otherwise indicated.

C. Sleeves for Rectangular Openings: Galvanized sheet steel.

1. Minimum Metal Thickness:

   a. For sleeve cross-section rectangle perimeter less than 50 inches (1270 mm) and no side more than 16 inches (400 mm), thickness shall be 0.052 inch (1.3 mm).
   b. For sleeve cross-section rectangle perimeter equal to, or more than, 50 inches (1270 mm) and 1 or more sides equal to, or more than, 16 inches (400 mm), thickness shall be 0.138 inch (3.5 mm).

2.2. SLEEVE SEALS

A. Description: Modular sealing device, designed for field assembly, to fill annular space between sleeve and pathway or cable.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. Advance Products & Systems, Inc.

b. Calpico, Inc.
c. Metraflex Co.
d. Pipeline Seal and Insulator, Inc.
e. Or Approved Equal.

2. Sealing Elements: EPDM NBR interlocking links shaped to fit surface of cable or conduit. Include type and number required for material and size of pathway or cable.
3. Pressure Plates: Plastic or Carbon steel .Include two for each sealing element.
4. Connecting Bolts and Nuts: Carbon steel with corrosion-resistant coating of length required to secure pressure plates to sealing elements. Include one for each sealing element.

2.3. GROUT

A. Nonmetallic, Shrinkage-Resistant Grout: ASTM C 1107, factory-packaged, nonmetallic aggregate grout, noncorrosive, nonstaining, mixed with water to consistency suitable for application and a 30-minute working time.

PART 3 - EXECUTION

3.1. EXECUTION REQUIREMENTS

A. Refer to DDC General Conditions for execution requirements.

3.2. COMMON REQUIREMENTS FOR COMMUNICATIONS INSTALLATION

A. Comply with NECA 1.

B. Measure indicated mounting heights to bottom of unit for suspended items and to center of unit for wall-mounting items.

C. Headroom Maintenance: If mounting heights or other location criteria are not indicated, arrange and install components and equipment to provide maximum possible headroom consistent with these requirements.

D. Equipment: Install to facilitate service, maintenance, and restoration of components of both communications equipment and other nearby installations. Connect in such a way as to facilitate future disconnecting with minimum interference with other items in the vicinity.

E. Right of Way: Give to piping systems installed at a required slope.

3.3. SLEEVE INSTALLATION FOR COMMUNICATIONS PENETRATIONS

A. Communications penetrations occur when pathways, cables, wireways, or cable trays penetrate concrete slabs, concrete or masonry walls, or fire-rated floor and wall assemblies.

B. Concrete Slabs and Walls: Install sleeves for penetrations unless core-drilled holes or formed openings are used. Install sleeves during erection of slabs and walls.

C. Use pipe sleeves unless penetration arrangement requires rectangular sleeved opening.

D. Fire-Rated Assemblies: Install sleeves for penetrations of fire-rated floor and wall assemblies unless openings compatible with firestop system used are fabricated during construction of floor or wall.

E. Cut sleeves to length for mounting flush with both surfaces of walls.

F. Extend sleeves installed in floors 2 inches (50 mm) above finished floor level.

G. Size pipe sleeves to provide 1/4-inch (6.4-mm) annular clear space between sleeve and pathway or cable, unless indicated otherwise.

H. Seal space outside of sleeves with grout for penetrations of concrete and masonry

1. Promptly pack grout solidly between sleeve and wall so no voids remain. Tool exposed surfaces smooth; protect grout while curing.

I. Interior Penetrations of Non-Fire-Rated Walls and Floors: Seal annular space between sleeve and pathway or cable, using joint sealant appropriate for size, depth, and location of joint. Comply with requirements in Section 079200 "Interior Joint Sealants."

J. Fire-Rated-Assembly Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pathway and cable penetrations. Install sleeves and seal pathway and cable penetration sleeves with firestop materials. Comply with requirements in Section 078413 "Firestops and Smokeseals."

K. Roof-Penetration Sleeves: Seal penetration of individual pathways and cables with flexible boot-type flashing units applied in coordination with roofing work.

L. Aboveground, Exterior-Wall Penetrations: Seal penetrations using steel cast-iron pipe sleeves and mechanical sleeve seals. Select sleeve size to allow for 1-inch (25-mm) annular clear space between pipe and sleeve for installing mechanical sleeve seals.

M. Underground, Exterior-Wall Penetrations: Install cast-iron pipe sleeves. Size sleeves to allow for 1-inch (25-mm) annular clear space between pathway or cable and sleeve for installing mechanical sleeve seals.

3.4. SLEEVE-SEAL INSTALLATION

A. Install to seal exterior wall penetrations.

B. Use type and number of sealing elements recommended by manufacturer for pathway or cable material and size. Position pathway or cable in center of sleeve. Assemble mechanical sleeve seals and install in annular space between pathway or cable and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

END OF SECTION 270500

SECTION 27 40 00
Audio Visual Communications

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The following documents apply to all required work for the Project: (1) the Contract Drawings, (2) the Specifications, (3) the General Conditions, (4) the Addendum and (5) the Contract (City of New York Standard Construction Contract).

B. LEED / Environmentally Preferable Purchase (EPP) General Requirements:
   1. Refer to DDC General Conditions and the Addendum to the General Conditions
   2. LEED requirements apply to all Phase II work with the exception of the Existing Building scope. EPP requirements apply to the project's Existing Building scope only.

1.2 SUMMARY

A. Contractor shall provide materials, labor, equipment and services necessary to furnish, deliver and install all work of this section, as shown on the drawings, as specified herein, and or as required by job conditions.

B. Drawings and all general provisions of the contract, including all general and supplementary conditions will apply to the work within this section.
   1. Division 8
   2. Division 26
   3. Division 28

C. Make adjustments to the work as may be necessary or requested in order to resolve physical space issues or conflicts preserve aesthetics and clearances and or avoid architectural features, elements, openings, structural members and or the work of other trades.

1.3 SUBMITTAL PROCEDURES

A. Refer to DDC general conditions section 01 33 00 "Submittal Procedures".

B. Special conditions :
   1. Pre-construction
      a. Product data sheets as specified herein.
      b. Original shop drawings as specified herein.
      c. Control systems/ programming submittals as specified herein.
   2. During construction
      a. Pull schedules as specified herein.
      b. Progress reports as specified herein.
   3. Post construction

a. Record set of as built drawings as specified herein.
b. Updated pull schedules as specified herein.
c. Field tests reports as specified herein.

1.4 QUALIFICATIONS

A. The installer shall have a minimum of three years verifiable and demonstrated experience in the installation, operation and maintenance of large-scale and complex Audio Visual systems and related technologies.

B. Contractor shall have successfully completed projects and installations of similar size, scope and complexity.
1. The installation of all components, software and testing shall be accomplished by contractor/technicians who have been regularly installing systems of the size, scope and complexity of this project for a period of not less than two years and are properly trained by each manufacturer under this project scope. The contractor shall also be certified by the equipment manufacturer on the specific components being installed in their systems under this project scope.
2. The contractor shall own and maintain tools and equipment necessary for successful installation and testing of the system components included in this scope and has personnel who are adequately trained in the use of such tools and equipment.
3. The contractor will provide a complete list of all manufacturer certifications applicable to this project.

1.5 SCOPE OF WORK

A. This section covers the installation, control and operation of hardware, software, cabling and licenses for all audio visual systems work. Also see section 01.

B. This specification contains sections that call out responsibilities for both the audio visual contractor and the general/electrical contractor. Contractor must confirm any/all responsibilities or limitations as defined herein.

C. All functions and requirements identified in these specifications must operate simultaneously and to the fullest extent described. Any item in the specification which is omitted from the final equipment list, either unintentionally or intentionally, will be provided to client with no fee.

D. Client shall have no restriction as to the use and function of these technology systems. In the event that client uses any portion of the system prior to project completion, such use does not constitute acceptance of that system and the contractor is still required to perform all tasks as outlined in this document.

E. Contractor will provide the following:
1. Furnish all materials in new and unused condition, free from defects, damage or corrosion. All materials shall meet all applicable codes provided a standard has been established for the material in question
2. It is the sole responsibility of the contractor to ensure that all systems are fabricated, assembled and installed complete, including all normal, customary and required miscellaneous parts, components, hardware, materials, cables, connectors, power supplies, POE injectors, com ports, rack mount kits

and any and all other supplies as may be necessary, but not specifically defined, or otherwise identified within these specifications.

3. Prior to procurement, the contractor shall review and verify all product specifications and manufacturer model and part numbers to ensure specified equipment and components meet the functional requirements defined within these specifications.
4. In the event that specified equipment and or components are back-ordered and or otherwise unavailable in time to meet the project schedule, and or have been discontinued between the date of issuance of these specifications and the response date, the contractor shall provide the manufacturer's specified current comparable and functionally equivalent alternate and or replacement model.
5. The contractor shall coordinate and confirm the final locations, colors and finishes of all audio visual devices with the Commissioner and general contractor, including, but not limited to connection plates, inserts and flat panels, touch screens or projection screens, wall boxes, interconnects , mounting brackets etc.

1.6 CONTRACTOR REQUIREMENTS

A. The contractor shall provide all normal and customary technical, administrative and other support services as required to ensure satisfactory performance and on-schedule delivery of the contracted work.

B. The contractor is required to implement practices and procedures to meet the project's environmental performance goals, sustainable design performance criteria and include achieving the LEED certification as specified in section sustainable design requirements. Substitutions, or other changes to the work proposed by the contractor or their subcontractors, shall not be allowed if such changes compromise the stated LEED requirements.

C. The contractor shall staff the project with sufficient manpower as required to meet and maintain the project schedule and to keep pace with the work of cooperative trades.

D. Designate a qualified foreman. The foreman shall be present in the field at all times during the performance of the work.

E. Provide a supervisory work force sufficient to maintain efficient performance of the contractor's responsibilities.

F. Use only skilled and reliable work force and discontinue the services of anyone employed on this project upon written request by the Commissioner.

G. Use personnel who are qualified, at minimum to perform all of the installation and testing work activities required.

H. The contractor shall provide a minimum of two qualified technicians, each of whom will have actively participated in the project and have a demonstrated knowledge and understanding of project scope, to conduct and perform all final system testing, calibration and adjustment, demonstration, diagnostic evaluation and or corrective action as required to ensure all equipment, components and systems conform to the project specifications.

I. The contractor shall exercise care and due diligence at all times and shall provide full and active cooperative participation during all phases of the project.

J. The contractor shall furnish all submittals in a timely manner and as otherwise specified herein

K. The contractor shall render and submit original shop drawings, which shall include, but shall not be limited to;
   1. Schematic and block diagrams detailing all system equipment placement and type, circuits and wiring, connections and terminations, pin-outs, color codes and cabling id and numbering schemes.
   2. Installation and mounting details including, but not limited to all equipment, component and device dimensioned location and installation details.
   3. Elevation detail drawings including, but not limited to dimensioned structural mounting, backing and blocking; equipment and mount detail, device and junction boxes, low voltage rings, conduit and cable paths etc.
   4. Provide all pertinent electrical, video/data /video and other required low voltage wiring specifications and details for coordination with related work performed by other trades.
   5. Provide reflected ceiling plans as required.
   6. Wiring riser diagrams, including all closet layout requirements, additional conduit requirements and infrastructure needs
   7. Furniture integration detail drawings for coordination with work performed by other trades.
   8. Dimensioned shop drawings for all components integrated within any furniture, millwork or other areas in this contract including, but not limited to wall mounted devices, ceiling mounted devices, floor mounted devices, display mounts, table boxes, and equipment racks etc.
   9. Rack and equipment enclosure elevation drawings, including rack unit RU configuration, calculated power, thermal loads and management, cable management and ventilation "clear area" details and
   10. Detailed drawings and specifications for all architectural and aesthetic elements including, but not limited to wall mounted devices, ceiling mounted devices, floor mounted devices, display mounts, table boxes, and equipment racks etc., inclusive of colors and finishes.
       a. Coordinate final locations, colors and finishes with the Commissioner.
   11. Complete and accurate record set as built drawings, which shall be provided to the Commissioner upon completion of the work.
   12. Drawings provided as a part of this specification shall not be used and or submitted as shop drawings
       a. The contractor shall render and submit original shop drawings and submittals as required.

L. The contractor shall be responsible for the initial and final calibration and adjustment of the systems as specified herein.

M. Voice / data/ audio visual/ security and all other low voltage cable installation standards shall reflect NEC, ICIA, IEEE, TIA/EIA and BICSI standards. Manufacturers' instructions shall be used for in-process quality control and final acceptance of the work. The strictest of all requirements shall apply.

N. The contractor shall provide all necessary test equipment and accessories required to conduct and document system performance evaluations, demonstrations and acceptance testing as specified herein.
   1. All test equipment shall be fully functional and shall have valid certificates of calibration as applicable.

O. The contractor shall provide complete and comprehensive narrative and practical hands-on instructions in the proper operation, use, care and maintenance of the specified equipment, components and systems, to the personnel designated by the Commissioner.
   1. Instructing shall be conducted by a suitably qualified instructor
      a. In the event contractor does not have certified and qualified instructors on staff for specific equipment, components and or software, a manufacturer's representative for such instruction will be provided by the contractor, at no additional fee to the City of New York.
   2. All instructing shall take place at the installed systems locations, after acceptance.
   3. The contractor shall provide a minimum of two hours of end-user instruction and one hour of advanced technical instruction for any system included in this specification.
      a. Advanced instruction will include a comprehensive review of system specifications and diagrams and detailed instruction in the modes of operation, routine service and maintenance, diagnostic troubleshooting and reconfiguration of the systems.
   4. The contractor shall provide follow-up instruction within sixty days of the completion of initial instructions, which shall be conducted at the discretion and convenience of the Commissioner..
   5. Comply with all applicable governmental regulations and with all federal, state, county, city, and other applicable codes, ordinances, and regulations and the most recent edition of technical standards and design guidelines including the latest amendments and all applicable addenda. See 1.16

1.7 PRODUCT DATA SHEETS

A. Submittals shall consist of the following
   1. Cover sheet
   2. Date of submittal
   3. Project name and address
   4. Number of submittal
   5. Name and address of the contractor
   6. Table of contents with index
   7. Include page and item numbers of the corresponding specification section and/or drawing number of the contract documents.
   8. Product name and manufacturer
   9. Manufacturers' technical specifications and data sheets of all items specified herein.
      a. Submit only pertinent pages. Do not submit entire product catalogs.
      b. Clearly identify the specific product being submitted using appropriate markings and arrows. Only use highlighters or coloring that will appear on reproductions or photocopies.
   10. Identify any options and or accessories that are applicable to the project.
   11. Confirm and verify all product quantities and manufacturer model and part numbers are current, correct and complete, including required accessories and or options that are require for full and completely working AV systems.
   12. Identify the installation location of each piece of equipment, including room number and or room name.
   13. Identify special coordination requirements for the product
   14. Identify "long lead" procurement requirements for the specified product as may be applicable

B. Preparation and transmittal

1. Each submittal shall be in accordance with the procedures outlined herein.
2. Bind and package each submittal with tabs and table of contents as appropriate
3. Sheet size shall be standard 8-1/2" x 11"
4. Submit all product data sheet submittals for each system, subsystem, or unit of work as one submittal
5. Submit three copies to the Commissioner U.O.N.

1.8 SHOP DRAWINGS

A. The contractor shall render and submit complete original shop drawings as specified within this section.

B. Drawings issued as a part of this specification shall not be submitted as shop drawings.

C. Each shop drawing submittal rendered by the contractor shall consist of the following

1. Title block
2. Project name and address
3. Number of submittal
4. Date of submittal
5. Name and address of the contractor
6. Drawing scale
7. Diagrams showing evidence of compliance with contract documents and coordination with other trades. See section 1.10 pull schedules as a part of shop drawing submittal.
8. Associated wiring diagrams of all equipment, with types and model numbers specified
9. Fully dimensioned housing and mounting drawings, including information on finishes
10. Specific notation of field measurements at accurate scale
11. Identification of specific products and materials used
12. Reference room numbers and or room names on all shop drawings
13. Compliance with specified standards
14. Dimensions at accurate scale

D. Preparation and transmittal

1. Each submittal shall be in accordance with the procedures outlined herein and shall provide adequate space for action marking adjacent to the title block.
2. All sketches and drawings shall be issued by the contractor using the following sheet sizes: a. Sketches sheet size shall be 8-1/2" x 11" b. Drawings: sheet size shall be 24" x 36"
3. Submit all shop drawing submittals for each system, subsystem, or unit of work as one complete submittal.
4. Submit three copies to the construction manager U.O.N.

1.9 PULL SCHEDULES

A. The pull schedule shall include, but is not limited to:
1. Cover sheet
2. Project name and address
3. Number of pull schedule submittal

4. Date of pull schedule submittal
5. Name and address of the contractor
6. Pull schedule data field
   a. Field 1: room number /location of device
   b. Field 2: sequential cable number
   c. Field 3: voice / data / video/ security cable id
   d. Field 4: cable type
   e. Field 5: equipment manufacturer and model number
   f. Field 6: equipment serial number
   g. Field 7: jack and or connection label as applicable.
   h. Field 8: rack label as applicable

B. Preparation and transmittal

1. The pull schedules will be computer-generated and must be submitted to the Commissioner for review.
2. Submit three copies to the Commissioner.
3. The pull schedule will be submitted with the shop drawings

1.10 COMMISSIONING

A. Prior to final acceptance of the installation the following testing and documents shall be performed and provided to the Commissioner.
   1. Perform and document a complete system acceptance test.
   2. Provide testing reports indicating all devices tested, pass/fail status, and actions taken to resolve problems on failed tests.
   3. Provide "as built" drawings showing each device and wiring connection in hard copy and in electronic format
   4. Provide a complete set of operating instructions for hardware devices and a complete software user manual.

B. Closeout
   1. The contractor shall submit a complete, updated drawing set and pull schedules accurately reflecting the completed work including all field changes, modifications and or revisions.
   2. The contractor shall individually bind and submit to the Commissioner for review and approval, all record set, as built drawings, updated pull schedules, user guides and manuals, equipment lists with serial numbers, test results and a completed check out list, for each contracted system, prior to issuing closeout documentation to the Commissioner.

C. Acceptance
   1. Once the testing has been completed, as-builts and testing documentation delivered to the Commissioner, to satisfy that all work is in accordance with the contract documents, the Commissioner shall notify the contractor in writing of the acceptance of the work performed.

1.11 REPORTING

A. The contractor shall submit weekly progress reports, which shall include, but shall not be limited to;
   1. Installation schedule risks, issues, conflicts and or delays.
   2. Status of the installation, detailing all remaining tasks and proposed completion dates.
   3. Percentage of completion of each activity
   4. Gantt chart format showing continuous vertical lines to identify the first working day of each week.
   5. Illustration defining how the start of a given activity depends on completion of preceding activities, and how the completion of a given activity may restrain or constrain the start of subsequent activities.
   6. Identification of the critical path.
   7. Requests for receiving major equipment and material shipments.
   8. Requests for subcontractor access to the job site.
   9. Requests for utilities and or services disconnection and or connection.
   10. Delays and stoppages.
      a. Note that delays and or stoppages shall not affect the scheduled completion date, unless approved in writing by the Commissioner.
   11. Emergencies and accidents.
   12. Losses of material and or property.

B. Preparation and transmittal of progress reports
   1. Each item shall include
      a. A detailed explanation;
      b. A description of the actions to be taken;
      c. The party responsible for executing those actions.
   2. Progress reports shall be generated and delivered to the Commissioner, three business days prior to the weekly project meeting, for the duration of the project.

1.12 DOCUMENTATION

A. Record set drawings / as-built drawings
   1. As mentioned herein this specification the record set, as-built drawings, shall include but may not be limited to equipment and cabling layout and location, schematic and block diagrams, equipment and cable labeling, cable termination points, equipment rack and room layouts and equipment installation details.
   2. The as-built drawings shall accurately reflect and include all field changes made during construction and shall completely and accurately reflect the conditions of the installed systems at the time of acceptance.

B. Operation and maintenance manuals
   1. These manuals shall utilize a combination of narrative text, graphics and images to describe to the user, how to properly operate and maintain the systems.
      a. The user of this manual is presumed to be technically competent, but unfamiliar with the specific systems
   2. Manuals shall be tabbed and indexed by room and subsystem.
   3. Manuals shall include the frequency and scheduled intervals of all system maintenance requirements.

4. The operation section shall describe all modes of normal operation and the procedures necessary to activate and properly operate each system so as to meet the functional use requirements described within the specifications.
5. The operation section shall include a laminated 8.5 in. X 11 in. "quick reference guide" to the basic operation and use of each installed system.
6. The operation section shall include simplified block diagrams for each system and subsystem, with all input and output circuit cable and terminal block numbers and jack field circuit ID Designations.
   a. A copy of this block diagram drawing shall be laminated and included within each equipment rack or equipment location.
   b. All block diagrams shall reference room numbers and or room names.
7. The maintenance section shall provide a recommended maintenance schedule, with reference to the applicable pages in the manufacturer's maintenance manuals.
8. The maintenance manual shall include completed copies of all manufacturer warranty cards, indexed by component type and room number and or room name.
9. The maintenance section shall include a list of all required "consumable" products required to maintain the normal operation of each system and or subsystem, including, but not limited to filters, batteries and lamps.
10. In the event that adequate and or sufficiently detailed service or maintenance information is not provided by the manufacturer, the contractor shall provide the information necessary to ensure proper care and maintenance.
11. At acceptance testing, the contractor shall provide two final revision copies of the operation and maintenance manuals to the Commissioner.
12. It is expected that instructions shall be based on the use of these manuals.
13. The contractor shall provide two laminated copies of the record set as built drawings AV drawings for each specified system.
14. Until final record set of as-built drawings are approved and accepted, an up-to-date field set of drawings will be maintained in the site office of the Commissioner.
15. The contractor shall provide bound copies of product data sheets, which shall be sorted in accordance with the specifications section.
16. The contractor shall provide bound copies of all product maintenance manuals.
17. Pull schedule as required per this specification.
18. Software documentation as required per this specification.
19. The contractor shall deliver three complete copies of all closeout documentation to the Commissioner prior to scheduling system demonstration and acceptance testing.

1.13 SOFTWARE SPECIFICATIONS

A. Software shall be defined as any and all programs, routines, symbolic languages and or other data and or instructions which run or operate a computer and or processor included within the contracted systems, and shall include, but is not limited to the control of all equipment listed within this specification and as shown on all related drawings, including, but not limited to all AV equipment, components and devices, lighting and dimming systems, motorized shades and drapes, fire alarm systems, occupancy sensors and partition sensors.

B. The operational capabilities and system functions defined within these project plans and specifications are intended to describe design intent and are provided for reference only. It is the responsibility of the

contractor to ensure that all functional elements of the plans and specifications are successfully implemented as described herein.

1. When applicable contractor provided user-interface graphics, logos, icons, symbols and nomenclature shall be submitted to, and approved by the Commissioner.
2. Demonstration and acceptance testing will be performed upon documented completion of commissioning and certification, at which time, all source code and graphic user interfaces shall be complete, error free and fully functional.
3. The contractor shall meet with the Commissioner to review end-user feedback and or observations made during the initial period of use.
4. The contractor shall make minor modifications to the system programming as may be required to simplify and or enhance the end-user experience.
5. Minor programming modifications shall not include changes which alter the specified design intent and or requirements.

1.14 WARRANTY

A. The contractor shall warrant all work including, but not limited to all equipment, components, hardware, materials, installation and integration work and services, programming and software, against defects in workmanship and or materials for a period of one year, commencing upon the date of acceptance by the City of New York. Where manufacturer's warranty is longer than one year, the contractor shall offer the extended warranty.

B. Provide a manufacturer's warranty for the systems operation and performance. Documented certification of training must be presented to client with the contractor's response.

C. All equipment provided by the contractor shall be new and shall meet or exceed all latest and current published specifications issued by the manufacturer

D. The contractor shall provide only the latest model, revision or version of a specified piece of equipment, component and or software, effective at the time of their response.

1.15 JOB CONDITIONS

A. Verify all existing conditions. Refer to the Commissioner for coordination and clarification of any discrepancies concerning existing conditions, drawings, and specifications.

B. Clarify with the Commissioner, all locations including conduit and cable paths. Where discrepancies occur and instructions have not been obtained, abide by the direction and decision of the Commissioner.

C. Contractor is solely responsible to conduct ongoing surveys and inspections of all work areas, throughout the construction process, in order to locate and confirm all penetrations, poke-thru and floor boxes, furniture openings, sleeves, conduit and conduit stubs, bushings, cable trays, blocking and backing, in-wall display mount and conduit termination boxes, AV device boxes, low voltage rings, pull strings, and all other elements associated with this work provided by others that support the this installation.

1. If during the course of ongoing survey and inspection, the contractor observes a condition which appears to conflict with the project plans and specifications, the contractor shall immediately notify the Commissioner of the potential discrepancy.
2. The Commissioner shall evaluate the reported condition and provide the contractor with direction as may be required

D. It shall be the contractor's responsibility to cooperate, at all times, and to the fullest extent, with any and all other trades performing work on the premises, in order to avoid delays in the work, lost time, work stoppages, interference and or other inefficiencies.

E. The contractor shall be responsible for meeting all project schedules and milestone dates.

F. Contractor will furnish, install, and terminate all required wire and cable to the extent not provided by others so that all AV systems will operate as complete and functioning per the design intent.

G. Comply with all requirements regarding the use of cable with respect to spread of fire. Refer to drawings for identification of air plenum and other spaces having special cabling requirements.

H. It is the responsibility of the contractor to provide wiring that is in compliance with all applicable manufacturers' recommendations, standards, regulations and requirements stated herein and the DDC general conditions.

I. Comply with all seismic requirements regarding the installation of all hardware, mounts, equipment and or components.

J. It is the responsibility of the contractor to employ installation means and methods that are in compliance with all applicable manufacturers' recommendations, standards, regulations and requirements stated herein and the DDC general conditions.

K. The contractor shall be solely responsible for the care, custody, safety and protection of all installed and configured systems and non-installed, stored materials, tools and supplies.

1.16 CODES AND STANDARDS

A. All work performed under the this scope / specification shall conform to the all requirements stated herein and to any/all applicable codes and standards as defined by all federal, state and local municipalities having jurisdiction. This is most notably including but not limited to;
1. Current NEC 2020 / National fire protection association
2. NFPA 70 national electrical code current and applicable sections including, but not limited to article 250 grounding and article 800 communications circuits.
3. Underwriter's laboratories, Inc.
   a. UL listed
   b. UL approved
4. Building officials and code administrators /BOCA international, Inc.
5. International building code 2012

6. In the event that a conflict occurs, the contractor is directed to meet, satisfy, adhere to and or otherwise comply with and conform to the most stringent requirement under the scope of this specification.

1.17 DELIVERY, STORAGE, AND HANDLING

A. Delivery
   1. Deliver materials and equipment in sufficient time to allow for inspection, installation and testing in accordance with the project schedule.
      a. All arrangements for access and unloading at the site shall be coordinated and scheduled with the Commissioner, not less than forty-eight hours prior to the scheduled delivery
   2. Movement, staging and layout of material, either at the time of delivery or subsequently, shall be the sole responsibility of the contractor.
   3. The contractor shall be solely responsible for ensuring that all equipment can be successfully delivered to the installation locations including, but not limited to elevator cab size and stairwell dimensions and all door, corridor and turn radius dimensions.
   4. Delivery schedules, which may be affected by environmental conditions, shall be noted in writing to the Commissioner, not less than twenty-four hours prior to the scheduled delivery.

B. Storage and protection
   1. The contractor shall be solely responsible for the care, custody and safekeeping of all equipment, components, materials, tools and supplies while stored on the job site, including all tools, materials and test equipment, which are, and shall remain the property of the contractor.
   2. The contractor shall take all reasonable and necessary precautions to protect all work from dust, debris and damage during construction.

1.18 CLEAN-UP

A. The contractor shall be responsible for the cleanup and restore of all areas and work affected by this installation.

B. The contractor shall, on a daily basis, remove all debris created, caused, or resulting from this work, including all cut and removed cables, connectors and all other work- related debris.

C. Prior to acceptance of work, all areas used or entered by the contractor must be cleared of any materials or debris caused directly or indirectly by the contractor, to the satisfaction of the Commissioner.

1.19 QUALITY ASSURANCE

A. Refer to DDC General Conditions Section 01 40 00 "Quality Requirements".

PART 2 - PRODUCTS

2.1 GENERAL

A. The requirements in the section shall apply to all areas receiving systems, subsystems and or equipment and components as described herein.

B. Provide materials and equipment conforming to the applicable requirements of:
1. Underwriters Laboratories :UL
2. National Electrical Code : NEC
3. American National Standards Institute : ANSI
4. Federal Communications Commission : FCC

C. Contractor shall provide only equipment, components and materials, which are new, free from use and fully covered by all applicable manufacturers' warranties.

D. Contractor will provide the equipment as required by the design intent herein . Only current-model components, equipment and materials shall be provided. Do not provide obsolete or discontinued models.
1. Review all materials and equipment immediately prior to procurement and or installation and inform the Commissioner of any obsolete or discontinued items and or products.
2. Review all equipment lists at time of procurement, confirming product availability and delivery lead time with manufacturers and distributors.

E. In the event that unplanned delays or backorder status of specified products may adversely impact the project schedule, the contractor shall propose equivalent replacements and or upgrades, at no additional fee to the City of New York.

2.2 APPROVED MANUFACTURERS

A. This audio visual system is based on the following product manufacturers and performance specification as provided below:
1. Flat panel displays: Samsung or approved equal
2. Display wall mounts: Chief manufacturing or approved equal
3. Av signal conversion and transport: Extron or approved equal
4. Av signal switching and routing: Extron or approved equal
5. Av control: Extron or approved equal
6. Av equipment racks and enclosures: Middle Atlantic or approved equal
7. Audio digital signal processor : Extron or approved equal
8. Distributed Video/ Amplifiers and distribution: Blonder Tounge or approved equal
9. Projector : NEC or approved equal
10. Projection screen : Draper or approved equal
11. Projector Mount: Extron or approved equal
12. Ceiling Speakers: JBL or approved equal
13. Indoor/Outdoor paging horns : Bogen or approved equal
14. Paging System : Bogen or approved equal

2.3 PRODUCT REQUIREMENTS – AUDIO VISUAL

A. Contractor will install audio & video systems that shall allow users to;
   1. Display video, Standard TV content on wall-mounted large- format flat panel displays in throughout the new building.
   2. Present content from an owner-furnished HDMI connection on pc with direct connection to flat panel display.
   3. Reproduce program audio via display built-in speaker system and over head speakers via audio amplifier
   4. Control conference displays via manufacturer-supplied IR remote control.
   5. Build Blonder Tounge "head-end system" to support all remote TV displays in cafeterias, break rooms, and conference rooms or common areas
   6. Reproduce program audio and tie into house audio system with over head speakers

B. AV equipment racks with new vertical wire managers as indicated on plans, per manufacturer's recommendation, for all AV equipment. Mounted in these racks will be patch panels, audio visual components , other low voltage support equipment

C. Racks and vertical wire managers shall be Middle Atlantic or approved equal part numbers as noted in material listing. This equipment shall be furnished and installed as shown on the floor plans. Contractor shall hardware castor base to the av rack so it can be moved within the server closet.

D. Mounted in these racks will be all copper patch panels for station cable and tie cable termination. Final configuration of racks, wire managers and patch panels shall be approved by the Commissioner prior to installation and must be based on manufacturer's recommendation or industries standards/best practices. Room layouts and rack elevations must be submitted to the Commissioner at least three weeks prior to installation.

PART 3 - EXECUTION

3.1 GENERAL

A. Refer to DDC General Conditions for execution requirements.

B. The contractor shall comply with all safety guidelines and regulations established for the project.

C. Contractor will review all related electrical, telecommunications, audio visual, security, millwork and architectural drawings for coordination with other trades.

D. Contractor will compare all related electrical, telecommunications, audio visual, security, millwork and architectural drawings and specifications with these drawings and specifications, report any discrepancies to the Commissioner,

E. Contractor will field survey and confirm the location and required size of all conduit, in-wall boxes, sleeves, penetrations, raceways, cable paths, cable tray, junction boxes and device boxes provided by others, which are intended for use in their installation of the specified systems.

F. Contractor will prepare all pre-construction submittals as specified herein.

G. Contractor shall provide all equipment required, unless otherwise noted. Equipment shall be installed in accordance with the manufacturers' recommendations. This information shall be provided to the City of New York and the Commissioner at the time catalog cuts and shop drawings are submitted for approval.

H. Contractor will complete fabrication, installation, integration, testing, commissioning and certification of all work specified herein. Contractor will perform all settings, adjustments and programming required for a complete and operational system as directed by Commissioner.

I. Contractor will follow manufacturers' instructions for installing all video/data/voice or other low voltage cabling. Where instructions are unavailable, follow approved industry practices/best practices.

J. Contractor shall maintain a current copy of this specification and related drawings at the job site at all times.

K. Any/all restoration or changes caused by contractor's neglect shall be made at contractor's expense. Protect finished work of other trades from damage or defacement and remedy any damages as required.

3.2 INSTALLATION

A. Installation shall include the delivery, unloading, setting in place, rack-mounting, fastening to or within furniture, millwork, walls, floors, ceilings, counters or other structures where required; installation and interconnection of all wiring of the system components; equipment alignment and adjustments; and all other work whether or not expressly described or defined herein, which is necessary to result in the complete and satisfactory installation of fully operational systems as described within the project plans and specifications herein.

Identification for all equipment racks shall bear an identification plate, provided and installed by the contractor, which shall be mounted on the front of each equipment rack

B. Engraving shall be yellow/gold filled times new roman lettering on a black background or as appropriate to the identification plate material

C. All work shall be performed in accordance with, but not limited to these specifications and drawings and the best practices associated with such work.

D. All work shall be performed in accordance with the applicable manufacturers' recommendations, standards, regulations and requirements stated herein and the DDC general conditions.

E. If, in the opinion of the contractor, an installation practice is desired or required, which is at variance with, and or contrary to these specifications or drawings, a written request for modification shall be made to the Commissioner.
   1. Modifications shall not commence without prior written approval of the Commissioner.

F. All equipment shall be firmly secured in place unless requirements of in-use motion and or portability dictate otherwise.

G. Fastenings and support hardware shall be grade 8 or better and shall be sized as required to support their loads with a minimum safety factor of not less as five and with maximum tolerances as specified by the manufacturer or whichever is greater.

H. The contractor shall be solely responsible for ensuring that all installation means and methods conform to the applicable manufacturers' recommendations, standards, regulations and requirements stated herein and the DDC general conditions.

I. All boxes, plates, panels, equipment and other project elements shall be properly secured and installed plumb, level and square.

J. All wall mounted back boxes shall be provided in coordinated fashion with the schedule of the general contractor and shall be pre-drilled to meet conduit specifications.

K. With regard to the installation of equipment and cable, thoughtful consideration shall be given not only to operational efficiency, but also to overall aesthetic factors.

L. All cables, regardless of length, shall be marked with wrap- around number or letter cable markers at both ends as specified herein. There shall be no unmarked cables at any place, point or location in any system or subsystem.

M. All inter-rack cabling shall be neatly installed, secured, dressed, and adequately supported. Audio and video cabling shall be separated from each other and from power cabling.

N. Terminal blocks, boards, strips, or connectors shall be furnished for all cables, which interface with racks, cabinets, consoles, or equipment modules.

O. All cables shall be neatly grouped according to signal type and level. In order to reduce crosstalk and other types of signal contamination, separate groups shall be formed for the following cables;
   1. Power cables
   2. Control cables
   3. Video cables
   4. Audio cables
   5. Voice/data cables
   6. Any/all low voltage cables not defined above

P. Maintain minimum twelve-inch separation between all low voltage and telecommunication cables running exposed in ceiling or floor voids and parallel electrical cables/conduits.
   1. Avoid electromagnetic interference, EMI route cables to maintain the following minimum distances:
      a. Twelve inches from high voltage lighting
      b. Thirty-six inches from power lines of 5 KVA or greater
      c. Forty inches from transformers or motors

Q. No cable shall be installed having a bend radius, less than that recommended by the cable manufacturer.

R. Cable and wiring shall be protected at all times during installation.

S. All cable runs shall be continuous, with no factory or field splices.

T. All cabling, wiring and equipment shall have an independent means of support furnished and installed by the contractor.
   1. At no time, shall an audiovisual system cable, wire or component be supported on or by sprinkler pipes, HVAC ducts, lighting fixtures, ceiling grid and or tiles and or any other equipment or infrastructure.
   2. All installation means and methods shall conform to the applicable manufacturers' recommendations, standards, regulations and requirements stated herein and the DDC general conditions
   3. Follow room boundaries when pulling cables through ceilings for distribution into walls, conduits, wiring channels, outlets, etc
   4. All cable distribution from the communications/technology closets or racks to all work locations, except as noted, shall be run in the voids above ceilings as shown on drawings. Ceiling support grids and service hangers shall not be used to support cabling.
   5. Cable shall be loose bundled into cable supports. Use only approved re-enterable cable ties to secure cables in overhead distribution.

3.3 CABLES AND CONNECTORS

A. All voice /data - audio / video – security and control cables are based on the following acceptable product manufacturers and must have all the appropriate performance specifications and criteria. All other cable types are to be submitted to the Commissioner and the City of New York for consideration and approval;
   1. General
   2. Belden
   3. West Penn
   4. Creston
   5. Extron
   6. Or approved equal

B. Jacks, faceplates and wall outlets at the user locations, termination blocks and individual lateral cables shall be labeled with at minimum machine generated black uppercase lettering on a permanent adhesive label stock, covered with a permanent water resistant sealer. Labeling stock and/or lettering must be used that provides a high contrast with the color of the terminating equipment, faceplate or cable.

C. If at any time during the job the permanent cable tag becomes illegible or is defaced or removed, immediately replace it with a duplicate pre-printed cable tag.

D. Cable identification system shall be via color coding in accordance with the eia-606 standards.
   1. Place labels on both ends of the cable at least 4 inches from the point at which the cable is terminated on the connector or terminal block.
   2. Provide permanent, machine generated cable tags. Temporary tags are acceptable only during construction. Label each tag with the appropriate cable number as shown on the drawings and as indicated on the cable schedules provided by the Commissioner.
   3. Cable identification numbers when provided on plans are presented in an abbreviated format. Contractor is required to provide all cables id's and they will at minimum indicate the floor, originating closet/rack id, and the sequential cable number as shown on drawings.

E. All cable installed without conduit shall be plenum rated and shall match the same performance specifications of the manufacturers approved cables for this installation.

F. Cables running in areas exposed to environmental factors such as, but not limited to, UV, chemicals, direct burial, etc. Shall be rated for such exposure and shall match the performance specifications of the manufacturers approved cables for this installation.

G. All cables shall be cut to the length dictated by the cable run. No splices shall be permitted and cable slack shall be as follows .any cable length not defined below must be confirmed by Commissioner.
   1. Provide a minimum of 12-inches of slack at each terminal box or behind each faceplate after jack installation is completed to allow for easy dismounting and extension of outlet covers and wire terminations.
   2. Provide a minimum of 2-feet slack in a loop in UTP at the head of each stub-up or distribution conduit.
   3. Provide a minimum of 12-feet slack in a loop in optical fiber cable at its point of entry to an equipment room.
   4. Provide a minimum of 15-feet slack for each mounted wireless access point outlet.

H. All rack wiring connections and all equipment mounted in drawers or on slides, shall include interconnecting cables with a service loop of sufficient length so as to facilitate access and freedom of movement during installation and servicing.

I. No cable shall be installed with a bend radius less than that recommended by the cable manufacturer.

J. Connector types
   1. Connectors for all signal types are to be submitted to Commissioner and the City of New York for approval

K. Patch panel assignments
   1. All patch panels shall be wired so that signal "sources" outputs appear on the upper row of a row pair; and all "loads" inputs appear on the lower row of a row pair.

L. Patch panel designation strips
   1. All audio and video patch panel designation strips shall utilize alphanumeric identifications and descriptive information.
      a. The jack position in each horizontal row shall be numbered sequentially from left to right.
      b. The horizontal jack rows shall be lettered sequentially from top to bottom.
      c. The alphanumeric identification of each jack shall be included on the functional block drawings, as well as on reproductions of these drawings, which shall be mounted in an appropriate location near the patch bays.

M. Fire stopping system
   1. Seal all penetrations through fire rated walls, floors and walls created by or made on the behalf of the contractor so that the original fire rating of the floor or wall is maintained as required by article 300-21 of the national electric code.
   2. Contractor shall use only fm approved fire-stopping materials and methods. All materials and methodologies shall be submitted to the project manager prior to utilization.
   3. Install approved penetration sealant material that has passed fire exposure testing in accordance with standard time-temperature curve in the standard, UL, ASTM e 119, and NFPA 251 and the hose stream test in accordance with UL.

4. Install approved penetration seal materials in accordance with design requirements and manufacturer's instructions. All substitutions must be approved by Commissioner.
5. Provide removable fire-stopping pillows, IPC flame safe seal bags or approved equivalent in an approved fashion in openings greater than 4" diameter, or 4" x 4" square cross section. Provide wire mesh grate over bags as recommended by manufacturer subsequent to installation.
6. Verify that all penetrating elements and supporting devices have been installed and temporary lines have been removed.
    a. If forms of damming materials are installed, they shall be removed after the designated cure time.

N. System checkout
1. Before acceptance tests are scheduled, the contractor shall perform comprehensive system tests and checkouts
2. The contractor shall furnish all required test equipment and shall perform all work necessary to determine and or modify performance of the system to meet the requirements of this specification.
3. During performance testing, all equipment shall be operated under standard conditions as recommended by the manufacturer
4. Test and certify all audio and video systems for compliance with the performance standards using the test procedures defined later in this specification
5. Maintain documentation of all performance tests for reference by the Commissioner during the system acceptance test.
6. At the conclusion of testing, return all equipment settings to previously calibrated "normal" operating positions.
7. Provide written records of all test results in spreadsheet form.
8. Check and confirm all control functions for proper operation, throughout the entire signal path, from all controlling devices to all controlled devices.
9. Adjust, balance and align all equipment for optimum quality and to meet the Commissioners approval and manufacturer's published specifications.
10. Establish and mark "normal" settings for all level controls and record these settings in the "system operation and maintenance manual".
11. The contractor shall provide test results and settings for all equipment and systems to the Commissioner at least three business days prior to scheduled acceptance testing.
12. The contractor shall notify the Commissioner, in writing, that the work is complete and ready for acceptance testing by the Commissioner.
    a. The work shall be considered ready for acceptance testing when the contractor notifies the Commissioner, in writing, that the following conditions are met:
        1) The contractor has pre-tested all systems such that all sub- systems, functions, software and equipment are properly installed, set-up, configured, de-bugged and fully operational as specified.
        2) The contractor has supplied the Commissioner with the written test results and documentation as listed above, for all rooms and systems.
        3) The contractor has supplied the Commissioner with manuals, instruction materials and all other required as-built documentation, revised to reflect comments and or revisions arising from the review cycles listed elsewhere within this document.
13. Should the systems not be ready for testing by the Commissioner and the City of New York at the date and time indicated by the contractor, system acceptance testing may be rescheduled at the sole discretion of the Commissioner.

3.4 GROUNDING

A. All grounding shall conform to all applicable national electric code requirements including, but not limited to article 250. See 1.16

B. The contractor shall be solely responsible for ensuring all work provided under this scope is free of crosstalk, hum, buzz and or other defects or anomalies resulting from improper grounding.

C. A single, primary "system ground" shall be established for each system. All grounding conductors shall connect to this primary system ground.
   1. The system ground shall be provided in the equipment racks and shall consist of a copper bar of sufficient size to accommodate all secondary grounding conductors.

D. Under no condition and in no circumstance, shall the ac neutral conductor, either in the power panel or in a receptacle outlet, be used for a system ground.

E. It shall be the responsibility of the contractor to follow good engineering practice, as outlined above, and to deviate from these practices only when necessary to minimize crosstalk and to maximize signal-to-noise ratios in the audio, video, and control systems.

3.5 CABLE INSTALLATION

A. Special conditions
   1. Furnish and install communications cables per the drawings and specifications provided by the Commissioner and per the manufacturer's recommendations.
   2. Install each backbone cable as an uninterrupted conductor section from the MDF/IDF to its point of termination, as indicated on the drawings, without splices or mechanical couplers between the points of origin and termination.
   3. Contractor shall support any/all cables and all primary horizontal cable bundles on j-hook. to be furnished and installed under the telecommunications pathways work. No non-re-enterable tie wraps shall be used to secure cables to the trays.
   4. Where horizontal cables exit trays to run to workstation locations, contractor shall furnish and install j-hooks with the appropriate mounting hardware every 5-feet of cable, maximum for open cable runs. J-hooks shall not be fastened to suspended ceiling support structures, electrical or plumbing piping or any other trade work.
   5. Provide all other outlet configurations in accordance with the drawings and manufacturers recommendations.
   6. Unless otherwise noted, route all intra-building station cables above the finished ceilings, transitioning vertically to wall mounted back boxes and/or surface-mounted wiring channels via conduit stub-ups into the ceiling void or to floor boxes or poke-thru fittings to the floor above, as required.
   7. Label each outlet and each cable with an appropriate id number.
   8. Do not exceed a pulling tension of 25 lbs. On 4-pair UTP cables.
   9. To limit the incidence of micro-bending of the individual fiber strands, use mesh-type, swivel-eye pulling grips for all fiber optic cable pulling. This type of pulling grip is also recommended for all other building cable, as required.

10. AV faceplates will be installed in various configurations as noted on the drawings. All cables will be plenum category 6 / RG 6 cable. Station locations are indicated on the plans using a unique triangle designation as defined on the drawing symbol legend. All locations and mounting heights must be confirmed with the drawings.
    a. At the face plates cables will be terminated on individual category 6 modules in back of Extron device. If blank inserts are required their color shall match the color of the face plate.
    b. These CAT 6 cables shall be terminated on the other end into the Extron switcher device.

11. Floor box locations are designated on the floor plans using a triangle inside a square with a numerical subscript. This number indicates the quantity of cables to this station. At the station cables will be terminated on individual category 6 modules secured into the frame which in turn will be secured into the floor box.

    a. Any unused ports in the mounting frame shall be provided with blank modules whose color matches that of the frame or other plates. Low voltage contractor is responsible for all finish faceplates at floor boxes. At the closet these cables will terminate in the IDF on rack mounted 24/48 port category 6 patch panels.

    b. Certain floor box locations are designed for audio visual connectivity and these locations are to have a FSR fl-500p floor box 6" deep.

    c. Contractor must take care when installing these FSR floor boxes as the conduit feed must line up appropriately so that cable within the box allows for separation of power and low voltage cabling. Conduits/cables will route through floor slab exiting to ceiling cavity of floor below and into wall cavity conduit running up the wall and through to back of appropriate back box. General contractor/electrical contractor is responsible to identify these locations prior to purchase and installation. This floor box is in the multi-purpose room and will feed directly to a ceiling mounted Extron switch. Additionally this floor box will have CAT 6 feeds back to a centralized MDF closet for hard wire connection under the table.

    d. All cable shall be terminated on individual category 6 modules secured into a flush style faceplate whose port count matches the number of cables. Any unused ports in the faceplate shall be provided with blank modules whose color matches the other faceplates.

3.6 IDF CLOSETS

A. All cables, after entry into the equipment rooms must be secured to backboards and dressed into supports. The low voltage contractor shall attach the cables where required to plywood backboards using Velcro-type re-enterable cable ties at spacing of approximately 12 inches. Velcro cable ties shall be secured to backboards using #10 machine screws and metallic washers, or rigid tabs.

B. At AV rack contractor shall support all cables with strain management bars on rear of rack.

C. Route cables from work locations into equipment rooms via overhead distribution. Maintain overhead distribution wherever possible within equipment rooms.

3.7 TEST EQUIPMENT

A. The contractor shall provide all appropriate test equipment as required by the Commissioner and the City of New York. Equipment shall be factory calibrated and fully operational for acceptance testing;

B. Test equipment minimum requires are as follows;
   1. Metallic cable pair tester: independent technologies, test-all iv or 25, Simon Company multi-test mt-5000 or equivalent
   2. 4-pair UTP automated cable tester: tester shall be compliant with ANSI/TIA/EIA-568- provide bi-directional testing and test in excess of category 6 permanent link and channel requirements. Test equipment must be approved by Commissioner prior to use on the job. Agilent Wire scope 350, Micro test Omni scanner, Fluke DSP 4000 or approved equal my be used.

3.8 CABLE TESTING

A. Test all cables installed under the contract.

B. Pre-installation inspection.
   1. Visually inspect all cables, cable reels and shipping cartons for shipping damage. Return visibly damaged items to the manufacturer.
   2. Perform an end-to-end test for continuity, ground fault, shorts and crossed pairs for each cable pair/conductor.

C. Post installation testing
   1. Test only completed systems. Partial or statistically sampled testing is not acceptable, except by prior, written approval from the Commissioner.
   2. Perform an end-to-end test for continuity, ground fault, shorts and crossed pairs for each cable pair/conductor.
      a. Test cable pairs from the work area outlet, through all conductors, patches and cross connects, to the equipment room
      b. Test horizontal cable pairs not cross-connected to backbone from their furthest termination point to the work area outlet.
      c. Test backbone cable pairs not cross-connected to horizontal cables from their furthest termination point to the equipment room,
   3. 4-pair CAT 6 and CAT 6a UTP: in addition to end-to-end tests listed above
      a. Conduct a permanent link test of each cable including: wire map, length, insertion loss, next loss, psnext loss, elfext loss, pselfext loss, propagation delay, and delay skew with injected standard signals, utilizing automated test equipment. Record all results. Test bi-directionally in accordance with ANSI/TIA/EIA-568 and compare results with the performance requirements of ANSI/TIA/EIA-568-b.1 and/or b.2-1 respectively.
      b. Test cabling not cross connected or patched within the closet as a permanent link.
   4. Remove all defective cables from cable pathways. Do not abandon cables in place.
   5. The Commissioner reserves the right to observe the conduct of any or all portions of the testing process and to conduct, and to require the contractor, using the contractor's equipment and labor, a random re-test of up to five percent of the cable plant to confirm documented test results.
   6. Document all test results and corrective procedures and submit to the Commissioner and the City of New York within ten working days of test completion.

7. In addition to the actions specified above, the contractor may be required to be present while the Commissioner conducts performance tests of the transport electronics connected to the cabling system.

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SECTION 28 08 00
COMMISSIONING OF ELECTRONIC SECURITY SYSTEMS

PART I - GENERAL

1.1 RELATED DOCUMENTS

A. The following documents apply to all required work for the project: (1) the contract drawings, (2) the Specifications, (3) the General Conditions, (4) the Addendum and (5) the Contract (City of New York Standard Construction Contract).

1.2 SUMMARY

A. This section includes commissioning process requirements for facility Electronic Security systems, assemblies, and equipment.

B. Related Sections:

1. Refer to DDC General Conditions for commissioning process requirements.

1.3 DESCRIPTION

A. Commissioning: Commissioning is a systematic process of ensuring that all building systems, including the mechanical and electrical systems, have been installed in the prescribed manner, are functionally checked and capable of being operated and maintained to perform with the design intent and have documentation to support proper installation and operation. The Commissioning Agent (CxA) shall provide the City of New York with an unbiased, objective view of the system's installation, operation and performance. This process does not eliminate or reduce the responsibility of the Contractor to provide a complete design or installing Sub-Contractors to provide a finished product. Commissioning is intended to enhance the quality of each system installation, startup and transfer to beneficial use by the City of New York.

B. Commissioning during the construction phase is intended to achieve the following specific objectives, according to the Contract Documents:

1. Verify that applicable equipment and systems are installed according to the manufacturer's recommendations and to industry accepted minimum standards and that they receive adequate operational checkout by installing Sub-Contractors.
2. Verify and document proper performance of equipment and systems.
3. Verify that Operation & Maintenance documentation is complete and transferred to City of New York.
4. Verify that proper orientation program has been implemented for the City of New York service personnel.
5. Ensure that provisions are in place for a post occupancy review with O&M staff within 10 months after Substantial Completion.

C. The Commissioning process shall be a team effort and encompass, as well as coordinate, the traditionally separate functions of system documentation, system installation, equipment startup, control system calibration, testing, and verification and performance checkouts.

D. The CxA will work closely with the construction team, cooperating on and coordinating all Cx activities with the Commissioner, Contractor, Sub-Contractors, manufacturers and equipment suppliers.

E. The Cx process shall not reduce the responsibility of the Contractor to comply with the Contract Documents.

1.4 DEFINITIONS

A. Refer to DDC General Conditions for definitions.

1.5 SUBMITTALS

A. Refer to DDC General Conditions for CxA's role.

B. Refer to DDC General Conditions for specific submittal requirements. In addition, provide the following:

1. Certificates of readiness
2. Certificates of completion of installation, prestart, and startup activities.
3. O&M manuals
4. Field / factory Test reports

1.6 QUALITY ASSURANCE

A. Test Equipment Calibration Requirements: The Contractor will comply with test equipment manufacturer's calibration procedures and intervals. Recalibrate test instruments immediately after instruments have been repaired resulting from being dropped or damaged. Affix calibration tags to test instruments. Furnish calibration records to CxA upon request.

1.7 COORDINATION

A. Refer to DDC General Conditions for requirements pertaining to coordination during the commissioning process.

PART II - PRODUCTS

2.1 TEST EQUIPMENT

A. The Contractor shall ensure that the equipment and system perform startup, initial checkout and functional performance testing as outlined in the DDC General Conditions. For example, the Contractor shall ensure the Sub-Contractors provides and installs security system be responsible for all standard testing equipment for the electronic security systems in Division 28. A sufficient quantity of two-way radios shall be provided by the Contractor.

B. Special equipment, tools and instruments (specific to a piece of equipment and only available from vendor) required for testing shall be included in the price to the City of New York and left on site, except for stand-alone data logging equipment that may be used by the CxA.

C. Test equipment and software required by any equipment manufacturer for programming and/or start-up, whether specified or not, shall be provided by the manufacturer of the equipment. The Constractor shall ensure that the manufacturer provide the test equipment, demonstrate its use, and assist in the commissioning process as needed. Test equipment (and software) shall become the property of the City of New York upon completion of the commissioning process.

D. All testing equipment shall be of sufficient quality and accuracy to test and/or measure system performance with the tolerances specified in the Specifications.

PART III - EXECUTION

3.1 GENERAL DOCUMENTATION REQUIREMENTS

A. The Contractor shall cause the Sub-Contractor(s) to provide instruction responsibility to the CxA in preparing Installation Check Sheets for all commissioned components, equipment, and systems.

B. Red-lined Drawings:

1. The Contractor shall cause the Sub-Contractor(s) to verify all equipment, systems, instrumentation, wiring and components are shown correctly on red-lined drawings.
2. Preliminary red-lined drawings must be made available to the Commissioning Team for use prior to the start of Functional Performance Testing.
3. Changes, as a result of Functional Testing, must be incorporated into the final as-built drawings, which will be created from the red-lined drawings.
4. The Contractor will create the as-built drawings.

C. Operation and Maintenance Data:

1. The Contractor shall cause the Sub-Contractor to provide a copy of O&M literature within 45 days of each submittal acceptance for use during the commissioning process for all commissioned equipment and systems.
2. The CxA will review the O&M literature once for conformance to project requirements.
3. The CxA will receive a copy of the final approved O&M literature once corrections have been made by the Contractor.

D. Demonstration and Instruction:

1. The Contractor shall cause the Sub-Contractor to provide demonstration and operator's instruction as required by the contract document.
2. A complete instruction plan and schedule must be submitted by the Contractor to the CxA four weeks (4) prior to any such event.
3. Agenda for each instruction session shall be submitted to the CxA at least one (1) week prior to the session.
4. The CxA shall be notified at least seventy-two (72) hours in advance of scheduled tests so that testing may be observed by the CxA. A copy of the test record shall be provided to the CxA and Commissioner.

5. Engage a Factory-authorized service representative to demonstrate City of New York service personnel to adjust, operate, and maintain specific equipment.

6. Instruct City of New York service personnel on procedures and schedules for starting and stopping, trouble shooting, servicing, and maintaining equipment.

7. Review and update data in O&M Manuals.

3.2 CONTRACTOR RESPONSIBILITIES FOR SUB-CONTRACTOR PERFORMANCE

A. The Contractor shall cause the Sub-Contractor to have the following instruction responsibilities in performing security system work. The commissioning responsibilities are as follows (all referrences apply to comissioning equipment and system only):

1. Perform commissioning tests as per the written procedures and at the direction of the CxA

2. Attend construction phase controls coordination meetings.

3. Participate in Security systems, assemblies, equipment, and component maintenance orientation and inspection as directed by the CxA.

4. Provide information requested by the CxA for final commissioning documentation.

5. Include requirements for submittal data, operation and maintenance data, and instruction in each purchase order or sub-contract written.

6. Prepare preliminary schedule for Security system orientations and inspections, operation and maintenance manual submissions, instruction sessions, equipment start-up and task completion for the City of New York. Distribute preliminary schedule to commissioning team members.

7. Update schedule as required throughout the construction period.

8. During the startup and initial checkout process, execute the related portions of the prefunctional checklists for all commissioned equipment.

9. Perform all verification and functional performance tests in the presence of the CxA as required.

10. Provide measuring instruments and logging devices to record test data, and provide data acquisition equipment to record data for the complete range of testing for the required test period.

11. Gather operation and maintenance literature on all equipment, and assemble in binders as required by the specifications. Submit to CxA forty five (45) days after submittal acceptance.

12. Coordinate with the CxA to provide seventy-two (72) hour advance notice so that the witnessing of equipment and system start-up and testing can begin.

13. Notify the CxA a minimum of two weeks in advance for start of the testing work.

14. Participate in, and schedule vendors and Sub-Contractors to participate in the operator's orientation sessions.

15. Provide written notification to the Commissioner and CxA that the following work has been completed in accordance with the contract documents, and that the equipment, systems, and sub-system are operating as required.

a. Security equipment including but not limited to end devices, panel boards, enclosures, cabinets, power supplies, network interface(s) and all other equipment furnished under this Division.

b. Cameras

c. Identification readers

d. Intrusion sensors

e. Motion sensors and facility perimeter devices

f. Automatic gateway and portal latching devices

g. Logging and recording devices

h. Alarm and logging systems

16. The Contractor shall attend the 10-month warranty walkthrough with the City of New York service personnels and the CxA.

17. The Contractor shall ensure that the equipment suppliers document the performance of their equipment.

18. The Contractor shall ensure that equipment Suppliers perform the following tasks:

a. Provide all requested submittal data, including detailed start-up procedures and specific responsibilities of the City of New York, to keep warranties in force.

b. Assist in equipment testing per agreements.

c. Provide information requested by CxA regarding equipment sequence of operation and testing procedures.

19. Refer to DDC General Conditions for additional responsibilities.

3.3 CxA's RESPONSIBILITIES

A. Refer DDC General Conditions for CxA's Responsibilities.

3.4 TESTING PREPARATION

A. Certify in writing to the CxA that Electronic Security systems, subsystems, and equipment have been installed, checked for proper connection and communication, calibrated, started and are operating according to the Contract Documents.

B. Certify in writing to the CxA that Electronic Security systems have been completed and calibrated, that they are operating according to the Contract Documents, and that pretest set-points have been recorded.

C. Certify in writing that testing procedures have been completed and that testing reports have been submitted, discrepancies corrected, and corrective work approved.

D. Place systems, subsystems, and equipment into operating mode to be tested (e.g., normal shutdown, normal auto position, normal manual position, unoccupied cycle, emergency power, and alarm conditions).

E. Inspect and verify the position of each device and interlock identified on checklists.

F. Testing Instrumentation: Install measuring instruments and logging devices to record test data as directed by the CxA.

3.5 GENERAL TESTING REQUIREMENTS

A. Provide technicians, instrumentation, and tools to perform commissioning test at the direction of the CxA.

B. Scope of Electronic Security testing shall include the entire installation, from the incoming power equipment throughout the low voltage system. Testing shall include measuring, but not limited to resistance, voltage, and amperage of system(s) and devices.

C. Test all operating modes, interlocks, control responses, and responses to abnormal or emergency conditions, and verify proper response of automation system controllers and sensors.

D. Prepare detailed testing plans, procedures, and checklists for Electronic Security systems, subsystems, and equipment with guidance from CxA.

E. Simulated conditions may need to be imposed using an artificial load when it is not practical to test under live conditions. Before simulating conditions, calibrate testing instruments. Provide equipment to simulate loads. Set simulated conditions and document simulated conditions and methods of simulation. After tests, return settings to normal operating conditions.

F. The CxA may direct that set points be altered when simulating conditions is not practical.

G. If tests cannot be completed because of a deficiency outside the scope of the Electronic Security system, document the deficiency and report it to the Commissioner. After deficiencies are resolved, reschedule tests.

3.6 WORKMANSHIP

A. Provide the work in accordance with DDC General Conditions.

3.7 ELECTRONIC SECURITY SYSTEMS, SUBSYSTEMS, AND EQUIPMENT TESTING PROCEDURES

A. Prior to performing Preliminary Testing, inspection, and/or final testing procedures, the Contractor shall insure the following:

1. Safe and proper operation of all components, devices or equipment, and the absence of extraneous or interfering signals
2. Proper grounding of devices and equipment
3. Integrity of signal and electrical system ground connections
4. Proper powering of devices and equipment
5. Integrity of all insulation, shield terminations and connections
6. Integrity of soldered connections and absence of solder splatter, solder bridges, debris of any kind

7. Proper dressing of wire and cable with labels matching as-build documents
8. "Wire-checking" of all circuitry, including phase and continuity
9. Preliminary targeting and setup of video camera assemblies
10. Mechanical integrity of all support and positioning provisions, i.e.: as provided for video cameras, monitors and any other equipment
11. Sequencing: If applicable, determine and record the sequence of energizing systems to minimize the risk of damage from improper startup
12. Proper operation of devices and systems in accordance with specified performance requirements
13. System is programmed for alarm reporting of each device and associated with the graphical maps
14. Verify system programming is defined.
15. Verify with Commissioner the provided designations for all devices.

B. Equipment Testing and Acceptance Procedures: Testing requirements are specified in Division 28. Provide submittals, test data, inspector record, and test instrumentation certifications to the CxA.

C. System Testing: Field testing plans and testing requirements are specified in Division 28. Assist the CxA with preparation of testing plans.

D. System Testing: Provide technicians, instrumentation, tools and equipment to test performance of designated systems and devices at the direction of the CxA.

E. The CxA shall determine the sequence of testing and testing procedures for each equipment item and component section to be tested.

F. Perform a Preliminary Inspection and Test to determine the operating status of components and systems prior to Final Acceptance Testing.

G. Testing Security Equipment, Enclosures, and Cabinets
1. Test each equipment enclosure for tamper alarm
2. Test each power supply battery for power loss alarm reporting
3. Test 120VAC power loss alarm
4. Test for communication loss with server reporting

H. Test power stand-by provisions (UPS, battery backup, generator backup)

I. Testing Electronic Access Control Doors
1. Doors with Automatic door operators
   a. Door is locked in secure mode
   b. Door is unlocked by manual command from system workstation in secure mode

c. Door is unlocked by time zone

d. REX does not unlock door

e. Door relocks on time zone

f. Door relocks during day mode on manual command from system workstation.

2. Doors or Gates with card reader

a. Door unlocks by use of the card reader for programmed unlock time and does not alarm when door is opened

b. Door is locked in secure mode

c. Door is unlocked by manual command from system workstation

d. Door is unlocked by time zone

e. Door relocks immediately when door closes after valid passage (does not wait for preprogrammed duration)

f. REX for door does not unlock door

g. REX for gates does not unlock gate

h. Door relocks on time zone

i. Door relocks during day mode on manual command from system workstation

J. Testing Video Surveillance System

1. Live viewing

a. Verify each camera live viewing at the monitoring workstation is in focus

b. Verify each camera live viewing at Central Command Post is in focus

c. During an alarm event verify camera and pre-programmed views associated with alarm event are displayed at the viewing location(s)

d. Verify camera identification match Owner defined description.

2. Recorded Images

a. Verify each camera viewing of recorded images at the monitoring workstation

b. Verify each camera viewing of recorded images at Central Command Post

c. Verify alarm event is recorded as specified in 28 23 00

3.8 OPERATION AND MAINTENANCE MANUALS

A. The Operation and Maintenance Manuals shall conform to Contract Documents requirements.

B. Refer the DDC General Conditions for the Contractor and CxA roles in the Operation and Maintenance Manual contribution, review, and approval process.

3.9 INSTRUCTION OF FACILITY PERSONNEL

A. The Contractor shall have the following instruction responsibilities:

1. Provide the CxA with an instruction plan four weeks before the planned instruction.
2. Provide the service personnel with comprehensive instruction in the understanding of the systems and the operation and maintenance of each major piece of commissioned electrical equipment or system.
3. Instruction shall be recorded by the CxA and start with classroom sessions, if necessary, followed by hands on instruction on each piece of equipment, which shall illustrate the various modes of operation, including startup, shutdown, fire/smoke alarm, power failure, etc.
4. During any demonstration, should the system fail to perform in accordance with the requirements of the O&M manual or sequence of operations, the system will be repaired or adjusted as necessary and the demonstration repeated.
5. The appropriate trade or manufacturer's representative shall provide the instructions on each major piece of equipment. This person may be the start-up technician for the piece of equipment, the installing Sub-Contractor or manufacturer's representative. Practical building operating expertise as well as in-depth knowledge of all modes of operation of the specific piece of equipment is required. More than one party may be required to execute the instruction.
6. The instruction sessions shall follow the outline in the Table of Contents of the operation and maintenance manual and illustrate whenever possible the use of the O&M manuals for reference. Instruction shall include:
    a. Use the printed installation, operation and maintenance instruction material included in the O&M manuals.
    b. Include a review of the written O&M instructions emphasizing safe and proper operating requirements, preventative maintenance, special tools needed and spare parts inventory suggestions. The instruction shall include start-up, operation in all modes possible, shut-down, seasonal changeover and any emergency procedures.
    c. Discuss relevant health and safety issues and concerns.
    d. Discuss warranties and guarantees.
    e. Cover common troubleshooting problems and solutions.
    f. Explain information included in the O&M manuals and the location of all plans and manuals in the facility.
    g. Discuss any peculiarities of equipment installation or operation.
7. Hands-on instruction shall include start-up, operation in all modes possible, including manual, shut-down and any emergency procedures and preventative maintenance of all pieces of equipment.
8. The Contractor shall fully explain and demonstrate the operation, function and overrides of any local packaged controls, not controlled by the central control system.
9. Instruction shall occur after functional testing is complete, unless approved otherwise by the Commissioner.

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SECTION 28 10 00
Access Control & Video Surveillance

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The following documents apply to all required work for the Project: (1) the Contract Drawings, (2) the Specifications, (3) the General Conditions, (4) the Addendum and (5) the Contract (City of New York Standard Construction Contract).

B. LEED / Environmentally Preferable Purchase (EPP) General Requirements:
   1. Refer to DDC General Conditions and the Addendum to the General Conditions
   2. LEED requirements apply to all Phase II work with the exception of the Existing Building scope. EPP requirements apply to the project's Existing Building scope only.

1.2 SUMMARY

A. Contractor shall provide materials, labor, equipment and services necessary to furnish, deliver and install all work of this section, as shown on the drawings, as specified herein, and or as required by job conditions.

B. The additional related sections that apply to the work within this section include the following:
   1. Division 8
   2. Division 26
   3. Division 27

C. Make adjustments to the work as may be necessary or requested in order to resolve physical space issues or conflicts preserve aesthetics and clearances and or avoid architectural features, elements, openings, structural members and or the work of other trades.

D. Typical details, where indicated, apply to each and every item of the project where such details are applicable.
   1. Typical details are not repeated in full on the plans, and are diagrammatic only, with the intent that such details shall be incorporated in full, throughout the project as applicable.

1.3 SUBMITTAL PROCEDURES

A. Refer to DDC general conditions section 01 33 00 "Submittal Procedures".

B. Special conditions :
   1. Pre-construction
      a. Product data sheets as specified herein.
      b. Original shop drawings as specified herein.
      c. Control systems/ programming submittals as specified herein.

2. During construction
   a. Pull schedules as specified herein.
   b. Progress reports as specified herein.
3. Post construction
   a. Record set of as built drawings as specified herein.
   b. Updated pull schedules as specified herein.
   c. Field tests reports as specified herein.

1.4 QUALIFICATIONS

A. The installer shall have a minimum of three years verifiable and demonstrated experience in the installation, operation and maintenance of large-scale and complex security systems and related technologies.

B. Contractor shall have successfully completed projects and installations of similar size, scope and complexity.
   1. The installation of all components, software and testing shall be accomplished by contractor/technicians who have been regularly installing systems of the size, scope and complexity of this project for a period of not less than two years and are properly trained by each manufacturer under this project scope. The contractor shall also be certified by the equipment manufacturer on the specific components being installed in their systems under this project scope.
   2. The contractor shall own and maintain tools and equipment necessary for successful installation and testing of the system components included in this scope and have personnel who are adequately trained in the use of such tools and equipment.
   3. The contractor will provide a complete list of all manufacturer certifications applicable to this project.

1.5 SCOPE OF WORK

A. This section covers the installation, control and operation of hardware, software, cabling and licenses for all security/ access control systems work.

B. This specification contains sections that calls out responsibilities for both the security contractor and the general/electrical contractor. Contractor must confirm any/all responsibilities or limitations as defined herein.

C. All functions and requirements identified in these specifications must operate simultaneously and to the fullest extent described. Any item in the specification which is omitted from the final equipment list, either unintentionally or intentionally, will be provided to the City of New York with no fee

D. The City of New York shall have no restriction as to the use and function of these technology systems. In the event that client uses any portion of the system prior to project completion, such use does not constitute acceptance of that system and the contractor is still required to perform all tasks as outlined in this document.

E. Contractor will provide the following:

1. Furnish all materials in new and unused condition, free from defects, damage or corrosion. All materials shall meet all applicable codes provided a standard has been established for the material in question
2. It is the sole responsibility of the contractor to ensure that all systems are fabricated, assembled and installed complete, including all normal, customary and required miscellaneous parts, components, hardware, materials, cables, connectors, power supplies, POE injectors, com ports, rack mount kits and any and all other supplies as may be necessary, but not specifically defined, or otherwise identified within these specifications.
3. Prior to procurement, the contractor shall review and verify all product specifications and manufacturer model and part numbers to ensure specified equipment and components meet the functional requirements defined within these specifications.
4. In the event that specified equipment and or components are back-ordered and or otherwise unavailable in time to meet the project schedule, and or have been discontinued between the date of issuance of these specifications and the response date, the contractor shall provide the manufacturer's specified current comparable and functionally equivalent alternate and or replacement model.
5. The contractor shall coordinate and confirm the final locations, colors and finishes of all security devices with the Commissioner and general contractor, including, but not limited to connection plates, inserts and wall panels, touch screens or intercom devices, wall boxes, interconnects , card readers etc.

1.6 CONTRACTOR REQUIREMENTS

A. The contractor shall provide all normal and customary technical, administrative and other support services as required to ensure satisfactory performance and on-schedule delivery of the contracted work.

B. The contractor is required to implement practices and procedures to meet the project's environmental performance goals, sustainable design performance criteria and include achieving the LEED certification as specified in section sustainable design requirements. Substitutions, or other changes to the work proposed by the contractor or their subcontractors, shall not be allowed if such changes compromise the stated LEED requirements.

C. The contractor shall staff the project with sufficient manpower as required to meet and maintain the project schedule and to keep pace with the work of cooperative trades.

D. Designate a qualified foreman. The foreman shall be present in the field at all times during the performance of the work.

E. Provide a supervisory work force sufficient to maintain efficient performance of the contractor's responsibilities.

F. Use only skilled and reliable work force and discontinue the services of anyone employed on this project upon written request by the City of New York, Commissioner, or Engineering Services.

G. Use personnel who are qualified, at minimum to perform all of the installation and testing work activities required..

H. The contractor shall provide a minimum of two qualified technicians, each of whom will have actively participated in the project and have a demonstrated knowledge and understanding of project scope, to conduct and perform all final system testing, calibration and adjustment, demonstration, diagnostic evaluation and or corrective action as required to ensure all equipment, components and systems conform to the project specifications.

I. The contractor shall exercise care and due diligence at all times and shall provide full and active cooperative participation during all phases of the project.

J. The contractor shall furnish all submittals in a timely manner and as otherwise specified herein

K. The contractor shall render and submit original shop drawings, which shall include, but shall not be limited to;

1. Schematic and block diagrams detailing all system equipment placement and type, circuits and wiring, connections and terminations, pin-outs, color codes and cabling id and numbering schemes.
2. Installation and mounting details including, but not limited to all equipment, component and device dimensioned location and installation details.
3. Elevation detail drawings including, but not limited to dimensioned structural mounting, backing and blocking; equipment and mount detail, device and junction boxes, low voltage rings, conduit and cable paths etc.
4. Provide all pertinent electrical, video/data /video and other required low voltage wiring specifications and details for coordination with related work performed by other trades..
5. Provide reflected ceiling plans as required.
6. Wiring riser diagrams, including all closet layout requirements, additional conduit requirements and infrastructure needs
7. Furniture integration detail drawings for coordination with work performed by other trades..
8. Dimensioned shop drawings for all components integrated within any furniture, millwork or other areas in this contract including, but not limited to wall mounted devices, ceiling mounted devices, floor mounted devices, display mounts, table boxes, and equipment racks etc.
9. Rack and equipment enclosure elevation drawings, including rack unit RU configuration, calculated power, thermal loads and management, cable management and ventilation "clear area" details and.
10. Detailed drawings and specifications for all architectural and aesthetic elements including, but not limited to wall mounted devices, ceiling mounted devices, floor mounted devices, display mounts, table boxes, and equipment racks etc., inclusive of colors and finishes.
    a. Coordinate final locations, colors and finishes with the Commissioner.
11. Complete and accurate record set as built drawings, which shall be provided to the Commissioner upon completion of the work.
12. Drawings provided as a part of this specification shall not be used and or submitted as shop drawings
    a. The contractor shall render and submit original shop drawings and submittals as required.

L. The contractor shall be responsible for the initial and final calibration and adjustment of the systems as specified herein.

M. Voice / data/ audio visual/ security and all other low voltage cable installation standards shall reflect NEC, ICIA, IEEE, TIA/EIA and BICSI standards. Manufacturers' instructions shall be used for in-process quality control and final acceptance of the work. The strictest of all requirements shall apply.

N. The contractor shall provide all necessary test equipment and accessories required to conduct and document system performance evaluations, demonstrations and acceptance testing as specified herein.
   1. All test equipment shall be fully functional and shall have valid certificates of calibration as applicable.

O. The contractor shall provide complete and comprehensive narrative and practical hands-on instructions in the proper operation, use, care and maintenance of the specified equipment, components and systems, to the personnel designated by the Commissioner.
   1. /Instructing shall be conducted by a suitably qualified instructor
      a. In the event contractor does not have certified and qualified instructors on staff for specific equipment, components and or software, a manufacturer's representative for such instruction will be provided by the contractor, at no additional fee to the City of New York.
   2. All instructing shall take place at the installed systems locations, after acceptance.
   3. The contractor shall provide a minimum of two hours of end-user instructions and one hour of advanced technical instructions for any system included in this specification.
      a. Advanced instructions will include a comprehensive review of system specifications and diagrams and detailed instruction in the modes of operation, routine service and maintenance, diagnostic troubleshooting and reconfiguration of the systems.
   4. The contractor shall provide follow-up instructions within sixty days of the completion of initial training, which shall be conducted at the discretion and convenience of the Commissioner.
   5. Comply with all applicable governmental regulations and with all federal, state, county, city, and other applicable codes, ordinances, and regulations and the most recent edition of technical standards and design guidelines including the latest amendments and all applicable addenda. See 1.16

1.7 PRODUCT DATA SHEETS

A. Product data sheet submittals shall consist of the following
   1. Cover sheet
   2. Date of submittal
   3. Project name and address
   4. Number of submittal
   5. Name and address of the contractor
   6. Table of contents with index
      a. Include page and item numbers of the corresponding specification section and/or drawing number of the contract documents.
   7. Product name and manufacturer
   8. Manufacturers' technical specifications and data sheets of all items specified herein.
      a. Submit only pertinent pages. Do not submit entire product catalogs.
      b. Clearly identify the specific product being submitted using appropriate markings and arrows. Contractor should only use highlighters or coloring that will appear on reproductions or photocopies.
   9. Identify any options and or accessories that are applicable to the project.
   10. Confirm and verify all product quantities and manufacturer model and part numbers are current, correct and complete, including required accessories and or options that are require for full and completely working security systems.
   11. Identify the installation location of each piece of equipment, including room number and or room name.

12. Identify special coordination requirements for the product
13. Identify "long lead" procurement requirements for the specified product as may be applicable

B. Preparation and transmittal
1. Each submittal shall be in accordance with the procedures outlined herein.
2. Bind and package each submittal with tabs and table of contents as appropriate
3. Sheet size shall be standard 8-1/2" x 11"
4. Submit all product data sheet submittals for each system, subsystem, or unit of work as one submittal
5. Submit three copies to the Commissioner U.O.N.

1.8 SHOP DRAWINGS

A. The contractor shall render and submit complete original shop drawings as specified within this section.

B. Drawings issued as a part of this specification shall not be submitted as shop drawings.

C. Each shop drawing submittal rendered by the contractor shall consist of the following
1. Title block
2. Project name and address
3. Number of submittal
4. Date of submittal
5. Name and address of the contractor
6. Drawing scale
7. Diagrams showing evidence of compliance with contract documents and coordination with other trades. See section 1.10 pull schedules as a part of shop drawing submittal.
8. Associated wiring diagrams of all equipment, with types and model numbers specified
9. Fully dimensioned housing and mounting drawings, including information on finishes
10. Specific notation of field measurements at accurate scale
11. Identification of specific products and materials used
12. Reference room numbers and or room names on all shop drawings
13. Compliance with specified standards
14. Dimensions at accurate scale

D. Preparation and transmittal
1. Each submittal shall be in accordance with the procedures outlined herein and shall provide adequate space for action marking adjacent to the title block.
2. All sketches and drawings shall be issued by the contractor using the following sheet sizes: a. Sketches sheet size shall be 8-1/2" x 11" b. Drawings: sheet size shall be 24" x 36"
3. Submit all shop drawing submittals for each system, subsystem, or unit of work as one complete submittal.
4. Submit three copies to the Commissioner U.O.N.

1.9 PULL SCHEDULES

A. The pull schedule shall include, but is not limited to:
1. Cover sheet

2. Project name and address
3. Number of pull schedule submittal
4. Date of pull schedule submittal
5. Name and address of the contractor
6. Pull schedule data field
   a. Field 1: room number /location of device
   b. Field 2: sequential cable number
   c. Field 3: voice / data / video/ security cable id
   d. Field 4: cable type
   e. Field 5: equipment manufacturer and model number
   f. Field 6: equipment serial number
   g. Field 7: jack and or connection label as applicable.
   h. Field 8: rack label as applicable

B. Preparation and transmittal
   1. The pull schedules will be computer-generated and must be submitted to the Commissioner for review.
   2. Submit three copies to the Commissioner.
   3. The pull schedule will be submitted with the shop drawings

1.10 COMMISSIONING

A. Prior to final acceptance of the installation the following testing and documents shall be performed and provided to the Commissioner.
   1. Perform and document a complete system acceptance test.
   2. Provide testing reports indicating all devices tested, pass/fail status, and actions taken to resolve problems on failed tests.
   3. Provide "as built" drawings showing each device and wiring connection in hard copy and in electronic format
   4. Provide a complete set of operating instructions for hardware devices and a complete software user manual.

B. Closeout
   1. The contractor shall submit a complete, updated drawing set and pull schedules accurately reflecting the completed work including all field changes, modifications and or revisions.
   2. The contractor shall individually bind and submit to the Commissioner for review and approval, all record set, as built drawings, updated pull schedules, user guides and manuals, equipment lists with serial numbers, test results and a completed check out list, for each contracted system, prior to issuing closeout documentation to the Commissioner.

C. Acceptance
   1. Once the testing has been completed, as-builts and testing documentation delivered to the Commissioner, to satisfy that all work is in accordance with the contract documents, the Commissioner shall notify the contractor in writing of the acceptance of the work performed. The date of this acceptance shall constitute the commencement of the warranty period.

1.11 REPORTING

A. The contractor shall submit weekly progress reports, which shall include, but shall not be limited to;
   1. Installation schedule risks, issues, conflicts and or delays.
   2. Status of the installation, detailing all remaining tasks and proposed completion dates.
   3. Percentage of completion of each activity
   4. Gantt chart format showing continuous vertical lines to identify the first working day of each week.
   5. Illustration defining how the start of a given activity depends on completion of preceding activities, and how the completion of a given activity may restrain or constrain the start of subsequent activities.
   6. Identification of the critical path.
   7. Requests for receiving major equipment and material shipments.
   8. Requests for subcontractor access to the job site.
   9. Requests for utilities and or services disconnection and or connection.
   10. Delays and stoppages.
      a. Note that delays and or stoppages shall not affect the scheduled completion date, unless approved in writing by the Commissioner.
   11. Emergencies and accidents.
   12. Losses of material and or property.

B. Preparation and transmittal of progress reports
   1. Each item shall include
      a. A detailed explanation;
      b. A description of the actions to be taken;
      c. The party responsible for executing those actions.
   2. Progress reports shall be generated and delivered to the Commissioner three business days prior to the weekly project meeting, for the duration of the project.

1.12 DOCUMENTATION

A. Record set drawings / as-built drawings
   1. As mentioned herein this specification the record set, as-built drawings, shall include but may not be limited to equipment and cabling layout and location, schematic and block diagrams, equipment and cable labeling, cable termination points, equipment rack and room layouts and equipment installation details.
   2. The as-built drawings shall accurately reflect and include all field changes made during construction and shall completely and accurately reflect the conditions of the installed systems at the time of acceptance.

B. Operation and maintenance manuals
   1. These manuals shall utilize a combination of narrative text, graphics and images to describe to the user, how to properly operate and maintain the systems.
      a. The user of this manual is presumed to be technically competent, but unfamiliar with the specific systems
   2. Manuals shall be tabbed and indexed by room and subsystem.
   3. Manuals shall include the frequency and scheduled intervals of all system maintenance requirements.

4. The operation section shall describe all modes of normal operation and the procedures necessary to activate and properly operate each system so as to meet the functional use requirements described within the specifications.
5. The operation section shall include a laminated 8.5 in. X 11 in. "quick reference guide" to the basic operation and use of each installed system.
6. The operation section shall include simplified block diagrams for each system and subsystem, with all input and output circuit cable and terminal block numbers and jack field circuit ID Designations.
   a. A copy of this block diagram drawing shall be laminated and included within each equipment rack or equipment location.
   b. All block diagrams shall reference room numbers and or room names.
7. The maintenance section shall provide a recommended maintenance schedule, with reference to the applicable pages in the manufacturer's maintenance manuals.
8. The maintenance manual shall include completed copies of all manufacturer warranty cards, indexed by component type and room number and or room name.
9. The maintenance section shall include a list of all required "consumable" products required to maintain the normal operation of each system and or subsystem, including, but not limited to filters, batteries and lamps.
10. In the event that adequate and or sufficiently detailed service or maintenance information is not provided by the manufacturer, the contractor shall provide the information necessary to ensure proper care and maintenance.
11. At acceptance testing, the contractor shall provide two final revision copies of the operation and maintenance manuals to the Commissioner.
12. It is expected that user instructions shall be based on the use of these manuals.
13. The contractor shall provide two laminated copies of the record set as built drawings SEC drawings for each specified system.
14. Until final record set of as-built drawings are approved and accepted, an up-to-date field set of drawings will be maintained in the site office of the Commissioner.
15. The contractor shall provide bound copies of product data sheets, which shall be sorted in accordance with the specifications section.
16. The contractor shall provide bound copies of all product maintenance manuals.
17. Pull schedule as required per this specification.
18. Software documentation as required per this specification.
19. The contractor shall deliver three complete copies of all closeout documentation to the Commissioner, prior to scheduling system demonstration and acceptance testing.

1.13 SOFTWARE SPECIFICATIONS

A. Software shall be defined as any and all programs, routines, symbolic languages and or other data and or instructions which run or operate a computer and or processor included within the contracted systems, and shall include, but is not limited to the control of all equipment listed within this specification and as shown on all related drawings, including, but not limited to all security equipment, components and devices, lighting and dimming systems, motorized shades and drapes, fire alarm systems, occupancy sensors and partition sensors.

B. The operational capabilities and system functions defined within these project plans and specifications are intended to describe design intent and are provided for reference only. It is the responsibility of the

contractor to ensure that all functional elements of the plans and specifications are successfully implemented as described herein.

1. When applicable contractor provided user-interface graphics, logos, icons, symbols and nomenclature shall be submitted to, and approved by the City of New York.
2. Demonstration and acceptance testing will be performed upon documented completion of commissioning and certification, at which time, all source code and graphic user interfaces shall be complete, error free and fully functional.
3. The contractor shall meet with the City of New York to review end-user feedback and or observations made during the initial period of use.
4. The contractor shall make minor modifications to the system programming as may be required to simplify and or enhance the end-user experience.
5. Minor programming modifications shall not include changes which alter the specified design intent and or requirements.

1.14 WARRANTY

A. The contractor shall warrant all work including, but not limited to all equipment, components, hardware, materials, installation and integration work and services, programming and software, against defects in workmanship and or materials for a period of one year, commencing upon the date of acceptance by the Commissioner. Where manufacturer's warranty is longer than one year, the contractor shall offer the extended warranty.

B. Provide a manufacturer's warranty for the systems operation and performance. Documented certification of training/instructions must be presented to client with the contractor's response.

C. In order to maintain certain manufacturers' warranties, specified and covered equipment must be installed, configured, programmed, aligned and or otherwise serviced solely and exclusively by factory authorized technicians and/or factory representatives.

D. All equipment provided by the contractor shall be new and shall meet or exceed all latest and current published specifications issued by the manufacturer

E. The contractor shall provide only the latest model, revision or version of a specified piece of equipment, component and or software, effective at the time of their response.

1.15 JOB CONDITIONS

A. Verify all existing conditions. Refer to the Commissioner for coordination and clarification of any discrepancies concerning existing conditions, drawings, and specifications.

B. Clarify with the Commissioner, all locations including conduit and cable paths. Where discrepancies occur and instructions have not been obtained, abide by the direction and decision of the Commissioner

C. Contractor is solely responsible to conduct ongoing surveys and inspections of all work areas, throughout the construction process, in order to locate and confirm all penetrations, poke-thru and floor boxes, furniture openings, sleeves, conduit and conduit stubs, bushings, cable trays, blocking and backing, in-wall display

mount and conduit termination boxes, security device boxes, low voltage rings, pull strings, and all other elements associated with this work provided by others that support the this installation.

1. If during the course of ongoing survey and inspection, the contractor observes a condition which appears to conflict with the project plans and specifications, the contractor shall immediately notify the Commissioner of the potential discrepancy.
2. The project/construction manager shall evaluate the reported condition and provide the contractor with direction as may be required

D. It shall be the contractor's responsibility to cooperate, at all times, and to the fullest extent, with any and all other trades performing work on the premises, in order to avoid delays in the work, lost time, work stoppages, interference and or other inefficiencies.

E. The contractor shall be responsible for meeting all project schedules and milestone dates.

F. Contractor will furnish, install, and terminate all required wire and cable to the extent not provided by others so that all SEC systems will operate as complete and functioning per the design intent.

G. Comply with all requirements regarding the use of cable with respect to spread of fire. Refer to drawings for identification of air plenum and other spaces having special cabling requirements.

H. It is the responsibility of the contractor to provide wiring that is in compliance with all applicable manufacturers' recommendations, standards, regulations and requirements stated herein and the DDC general conditions

I. Comply with all seismic requirements regarding the installation of all hardware, mounts, equipment and or components.

J. It is the responsibility of the contractor to employ installation means and methods that are in compliance with all applicable manufacturers' recommendations, standards, regulations and requirements stated herein and the DDC general conditions

K. The contractor shall be solely responsible for the care, custody, safety and protection of all installed and configured systems and non-installed, stored materials, tools and supplies.

1.16 CODES AND STANDARDS

A. All work performed under the this scope / specification shall conform to the all requirements stated herein and to any/all applicable codes and standards as defined by all federal, state and local municipalities having jurisdiction. This is most notably including but not limited to;

1. Current NEC 2020 / National fire protection association
2. NFPA 70 national electrical code current and applicable sections including, but not limited to article 250 grounding and article 800 communications circuits.
3. Underwriter's laboratories, inc.
   a. UL listed
   b. UL approved
4. Building officials and code administrators /BOCA international, inc.
5. International building code 2012

6. In the event that a conflict occurs, the contractor is directed to meet, satisfy, adhere to and or otherwise comply with and conform to the most stringent requirement under the scope of this specification.

1.17 DELIVERY, STORAGE, AND HANDLING

A. Delivery
   1. Deliver materials and equipment in sufficient time to allow for inspection, installation and testing in accordance with the project schedule.
      a. All arrangements for access and unloading at the site shall be coordinated and scheduled with the Commissioner, not less than forty-eight hours prior to the scheduled delivery
   2. Movement, staging and layout of material, either at the time of delivery or subsequently, shall be the sole responsibility of the contractor
   3. The contractor shall be solely responsible for ensuring that all equipment can be successfully delivered to the installation locations including, but not limited to elevator cab size and stairwell dimensions and all door, corridor and turn radius dimensions.
   4. Delivery schedules, which may be affected by environmental conditions, shall be noted in writing to the Commissioner, not less than twenty-four hours prior to the scheduled delivery.

B. Storage and protection
   1. The contractor shall be solely responsible for the care, custody and safekeeping of all equipment, components, materials, tools and supplies while stored on the job site, including all tools, materials and test equipment, which are, and shall remain the property of the contractor.
   2. The contractor shall take all reasonable and necessary precautions to protect all work from dust, debris and damage during construction.

1.18 CLEAN-UP

A. The contractor shall be responsible for the cleanup and restore of all areas and work affected by this installation.

B. The contractor shall, on a daily basis, remove all debris created, caused, or resulting from this work, including all cut and removed cables, connectors and all other work- related debris.

C. Prior to acceptance of work, all areas used or entered by the contractor must be cleared of any materials or debris caused directly or indirectly by the contractor, to the satisfaction of the Commissioner .

1.19 QUALITY ASSURANCE

Refer to DDC General Conditions Section 01 40 00 "Quality Requirements".

PART 2 - PRODUCTS

2.1 GENERAL

A. The requirements in the section shall apply to all areas receiving systems, subsystems and or equipment and components as described herein.

B. Provide materials and equipment conforming to the applicable requirements of:
1. Underwriters Laboratories :UL
2. National Electrical Code : NEC
3. American National Standards Institute : ANSI
4. Federal Communications Commission : FCC

C. Contractor shall provide only equipment, components and materials, which are new, free from use and fully covered by all applicable manufacturers' warranties.

D. Contractor will provide the equipment as required by the design intent herein. Only current-model components, equipment and materials shall be provided. Do not provide obsolete or discontinued models.
1. Review all materials and equipment immediately prior to procurement and or installation and inform the Commissioner of any obsolete or discontinued items and or products.
2. Review all equipment lists, confirming product availability and delivery lead time with manufacturers and distributors.

E. In the event that unplanned delays or backorder status of specified products may adversely impact the project schedule, the contractor shall propose equivalent replacements and or upgrades, at no additional fee to the City of New York.

2.2 APPROVED MANUFACTURERS

A. This security system is based on the following product manufacturers and performance specification as provided below:
1. Access control / System and Software: TYCO / C-Cure or approved equal
2. Intercom : Buttefly MX or approved equal
3. Electric strike manufacturer: See door schedule
4. Electric lock manufacturer: See door schedule
5. Door contact - recessed manufacturer: GE-Sentrol or approved equal
6. Card reader manufacturer: HID multiclass or approved equal
7. Access control composite cable manufacturer: West Penn or approved equal
8. Access control reader cable manufacturer: West Penn part or approved equal
9. Access control door contact cable manufacturer: West Penn or approved equal
10. Access control REX cable manufacturer: West Penn or approved equal
11. Access control lock cable manufacturer: West Penn or approved equal
12. Category 6 cable manufacturer: General or approved equal
13. Device power supply manufacturer: Altronix or approved equal
14. 24 port POE gigabit switch manufacturer: Hewlett-Packard or approved equal
15. Patch panels 24 & 48 port: Panduit or approved equal

16. Wire managers and rack accessories: Middle Atlantic or approved equal

2.3 PRODUCT - ACCESS CONTROL SYSTEM REQUIREMENTS

A. The access control software shall be interfaced to control the new access points, traditional door locks and monitor input points, and relay controlled outputs located throughout the new buildings as documents on the contract drawings and as specified herein.

B. The access control software shall meet the following, minimum design and performance specifications.
1. Software shall enable the City of New York to pre-populate the access control database.
2. Software shall provide and utilize "wizard" style interactive guidance to allow the system administrator or operator to perform standard configuration tasks in a step-by-step process.
3. Software shall include and support digital interfacing between other security systems, as required by design.
4. Software shall support the capture of cardholder images and the creation of photo id badges integrated completely within the software application.
5. Software shall support user-defined data fields, in addition to those required by the system for basic cardholder management.
6. Software shall support user-defined macros to allow system activities and events to trigger pre-configured actions.
7. Software shall allow system operators to monitor operator selected doors in order to perform cardholder verification. With each card transaction, the stored image associated with that card will be immediately displayed on the operator workstation.
8. Software shall support the monitoring of input points at selected areas, as shown on the drawings, to provide alarm or event monitoring of these points and report changes in status for these input points to the operator through a real-time display.
9. Software shall support the control of elevator floor selection, where required by design and as indicated on the drawings, through associated field hardware.
10. Software shall support output control relays at selected areas, as shown on the drawings, to control external devices and interface with other systems.
11. Software shall support alarm and event filtering to allow user-defined exceptions to normal alarm and event displays to system operators.
12. Software shall include graphical maps displayed on selected system workstations to indicate the location of events, alarms, and system field devices on site specific maps. Each graphic or icon will be interactive to allow operator to select associated commands for that device from the directly from the icon.
13. Software shall support precision access to allow each cardholder to be provided access privileges to specific doors in addition to any doors included in their assigned access code.
14. Software shall interface with common radio paging services and email servers to enable system alarms, events, and other notifications to be transmitted to pre-selected pagers and email recipients.
15. Software shall include a custom report designed to allow the creation of user-defined reports. Software shall archive all events in a system event file and retain all of the current events until an archive is performed.

C. The access control software shall be capable of the following functions.
1. Software shall support, and operate on, an unlimited number of computer workstations.

2. Software shall support unlimited system users. Each system user may be defined specific privileges to perform software application functions.
3. Software shall interface with, and support, 255 system control processors /scp.
4. Software shall interface with, and support input points and output relays.
5. Software database shall have the capacity for unlimited card holders.
6. Software shall interface with, and support card readers as indicated on the drawings.
7. Software shall support time zone definitions capable of being associated with access codes or door command functions.
8. Software shall support holiday definitions of variable duration that may be grouped to associate with time zone exceptions on specific dates defined as holidays.
9. The system software must be able to support wifi locks.

D. The access control software shall be : TYCO
1. The chosen access control system is manufactured by Tyco. The system is managed from the 1st floor MDF room for.
2. The access control system shall include but not be limited to data gathering panels on site and in cloud environment, card readers, door position switches, passive infrared devices and user licenses etc.
3. Coordinate all connections to the LAN with low voltage cable installer as well as the Commissioner.
4. Store front locations are to be coordinated directly with the Commissioner. Contractor shall provide appropriate allowance for wired/wireless connectivity to these locations as shown in the sec drawings and architectural elevations.
5. When applicable elevator access control shall be integral to security access, control system and shall be capable of providing full elevator security and control through dedicated controllers without relying on the control-station host pc for elevator control decisions.
6. The access control system as specified shall allow the definition of floor access authorizations at designated by elevator lifts, and assign them to card holders. If a cardholder presents their card at the elevator reader, the system shall activate the elevator floor buttons the cardholder has authorized access
7. System setup shall, through programming, automatically secure and unsecure each floor select button of a car individually by time and day. Each floor select button within a car shall be separately controlled so that some floors may be secure while others remain unsecure
8. Access control panels and support equipment shall be located in centralized technology closet. This will be used to support doors that are centrally wired and all doors requiring centralized connectivity must be coordinated in the field by vendor and according to hardware schedule.

PART 3 - EXECUTION

3.1 GENERAL

A. Refer to DDC General Conditions for execution requirements.

B. The contractor shall comply with all safety guidelines and regulations established for the project.

C. Contractor will review all related electrical, telecommunications, audio visual, security, millwork and architectural drawings for coordination with other trades.

D. Contractor will compare all related electrical, telecommunications, audio visual, security, millwork and architectural drawings and specifications with these drawings and specifications, report any discrepancies to the Commissioner, Contractor will field survey and confirm the location and required size of all conduit, in-wall boxes, sleeves, penetrations, raceways, cable paths, cable tray, junction boxes and device boxes provided by others, which are intended for use in their installation of the specified systems.

E. Contractor will prepare all pre-construction submittals as specified herein.

F. Contractor shall provide all equipment, unless otherwise noted. Equipment shall be installed in accordance with the manufacturers' recommendations. This information shall be provided to the Commissioner at the time catalog cuts and shop drawings are submitted for approval.

G. Contractor will complete fabrication, installation, integration, testing, commissioning and certification of all work specified herein. Contractor will perform all settings, adjustments and programming required for a complete and operational system as directed by the Commissioner.

H. Contractor will follow manufacturers' instructions for installing all video/data/voice or other low voltage cabling. Where instructions are unavailable, follow approved industry practices/best practices.

I. Contractor shall maintain a current copy of this specification and related drawings at the job site at all times.

J. Any/all restoration or changes caused by contractor's neglect shall be made at contractor's expense. Protect finished work of other trades from damage or defacement and remedy any damages as required.

3.2 INSTALLATION

A. Installation shall include the delivery, unloading, setting in place, rack-mounting, fastening to or within furniture, millwork, walls, floors, ceilings, counters or other structures where required; installation and interconnection of all wiring of the system components; equipment alignment and adjustments; and all other work whether or not expressly described or defined herein, which is necessary to result in the complete and satisfactory installation of fully operational systems as described within the project plans and specifications herein.

B. Identification for all equipment racks shall bear an identification plate, provided and installed by the contractor, which shall be mounted on the front of each equipment rack

C. Engraving shall be yellow/gold filled times new roman lettering on a black background or as appropriate to the identification plate material

D. All work shall be performed in accordance with, but not limited to these specifications and drawings and the best practices associated with such work.

E. All work shall be performed in accordance with the applicable manufacturers' recommendations, standards, regulations and requirements stated herein and the DDC general conditions

F. If, in the opinion of the contractor, an installation practice is desired or required, which is at variance with, and or contrary to these specifications or drawings, a written request for modification shall be made to the Commissioner.
   1. Modifications shall not commence without prior written approval of the Commissioner.

G. All equipment shall be firmly secured in place unless requirements of in-use motion and or portability dictate otherwise.

H. Fastenings and support hardware shall be grade 8 or better and shall be sized as required to support their loads with a minimum safety factor of no less than five and with maximum tolerances as specified by the manufacturer, or whichever is greater.

I. The contractor shall be solely responsible for ensuring that all installation means and methods conform to the applicable manufacturers' recommendations, standards, regulations and requirements stated herein and the DDC general conditions.

J. All boxes, plates, panels, equipment and other project elements shall be properly secured and installed plumb, level and square.

K. All wall mounted back boxes shall be provided in coordinated fashion with the schedule of the general contractor and shall be pre-drilled to meet conduit specifications.

L. With regard to the installation of equipment and cable, thoughtful consideration shall be given not only to operational efficiency, but also to overall aesthetic factors.

M. All cables, regardless of length, shall be marked with wrap- around number or letter cable markers at both ends as specified herein. There shall be no unmarked cables at any place, point or location in any system or subsystem.

N. All inter-rack cabling shall be neatly installed, secured, dressed, and adequately supported. Audio and video cabling shall be separated from each other and from power cabling.

O. Terminal blocks, boards, strips, or connectors shall be furnished for all cables, which interface with racks, cabinets, consoles, or equipment modules.

P. All cables shall be neatly grouped according to signal type and level. In order to reduce crosstalk and other types of signal contamination, separate groups shall be formed for the following cables;
   1. Power cables
   2. Control cables
   3. Video cables
   4. Audio cables
   5. Voice/data cables
   6. Any/all low voltage cables not defined above

Q. Maintain minimum twelve-inch separation between all low voltage and telecommunication cables running exposed in ceiling or floor voids and parallel electrical cables/conduits.
   1. Avoid electromagnetic interference - EMI route cables to maintain the following minimum distances:

a. Twelve inches from high voltage lighting
b. Thirty-six inches from power lines of 5 KVA or greater
c. Forty inches from transformers or motors

R. No cable shall be installed having a bend radius, less than that recommended by the cable manufacturer.

S. Cable and wiring shall be protected at all times during installation.

T. All cable runs shall be continuous, with no factory or field splices.

U. All cabling, wiring and equipment shall have an independent means of support furnished and installed by the contractor.
1. At no time, shall an audiovisual system cable, wire or component be supported on or by sprinkler pipes, HVAC ducts, lighting fixtures, ceiling grid and or tiles and or any other equipment or infrastructure.
2. All installation means and methods shall conform to the applicable manufacturers' recommendations, standards, regulations and requirements stated herein and the DDC general conditions
3. Follow room boundaries when pulling cables through ceilings for distribution into walls, conduits, wiring channels, outlets, etc
4. All cable distribution from the communications/technology closets or racks to all work locations except as noted, shall be run in the voids above ceilings as shown on drawings. Ceiling support grids and service hangers shall not be used to support cabling.
5. Cable shall be loose bundled into cable supports. Use only approved re-enterable cable ties to secure cables in overhead distribution.

3.3 CABLES AND CONNECTORS

A. All voice /data - audio / video – security and control cables are based on the following acceptable product manufacturers and must have all the appropriate performance specifications and criteria. All other cable types are to be submitted to the Commissioner and the City of New York for consideration and approval;
1. General
2. Belden
3. West Penn
4. Creston
5. Extron
6. Or approved equal

B. Jacks, faceplates and wall outlets at the user locations, termination blocks and individual lateral cables shall be labeled with, at minimum machine generated black uppercase lettering on a permanent adhesive label stock, covered with a permanent water resistant sealer. Labeling stock and/or lettering must be used that provides a high contrast with the color of the terminating equipment, faceplate or cable.

C. If at any time during the job the permanent cable tag becomes illegible or is defaced or removed, immediately replace it with a duplicate pre-printed cable tag.

D. Cable identification system shall be via color coding in accordance with the eia-606 standards.

1. Place labels on both ends of the cable at least 4 inches from the point at which the cable is terminated on the connector or terminal block.
2. Provide permanent, machine generated cable tags. Temporary tags are acceptable only during construction. Label each tag with the appropriate cable number as shown on the drawings and as indicated on the cable schedules provided by the Commissioner and the City of New York
3. Cable identification numbers when provided on plans are presented in an abbreviated format. Contractor is required to provide all cables ID's and they will, at minimum indicate the floor, originating closet/rack id, and the sequential cable number as shown on contractors drawings.

E. All cable installed without conduit shall be plenum rated and shall match the same performance specifications of the manufacturers approved cables for this installation.

F. Cables running in areas exposed to environmental factors such as, but not limited to, UV, chemicals, direct burial, etc. Shall be rated for such exposure and shall match the performance specifications of the manufacturers approved cables for this installation.

G. All cables shall be cut to the length dictated by the cable run. No splices shall be permitted and cable slack shall be as follows .any cable length not defined below must be confirmed by the Commissioner.
1. Provide a minimum of 12-inches of slack at each terminal box or behind each faceplate after jack installation is completed to allow for easy dismounting and extension of outlet covers and wire terminations.
2. Provide a minimum of 2-feet slack in a loop in UTP at the head of each stub-up or distribution conduit.
3. Provide a minimum of 12-feet slack in a loop in optical fiber cable at its point of entry to an equipment room.
4. Provide a minimum of 15-feet slack for each mounted wireless access point outlet.

H. All rack wiring connections and all equipment mounted in drawers or on slides, shall include interconnecting cables with a service loop of sufficient length so as to facilitate access and freedom of movement during installation and servicing.

I. No cable shall be installed with a bend radius less than that recommended by the cable manufacturer.

J. Connector types
1. Connectors for all signal types are to be submitted to the Commissioner for approval

K. Patch panel assignments
1. All patch panels shall be wired so that signal "sources" outputs appear on the upper row of a row pair; and all "loads" inputs appear on the lower row of a row pair.

L. Patch panel designation strips
1. All audio and video patch panel designation strips shall utilize alphanumeric identifications and descriptive information.
   a. The jack position in each horizontal row shall be numbered sequentially from left to right.
   b. The horizontal jack rows shall be lettered sequentially from top to bottom.
   c. The alphanumeric identification of each jack shall be included on the functional block drawings, as well as on reproductions of these drawings, which shall be mounted in an appropriate location near the patch bays.

M. Fire stopping system
1. Seal all penetrations through fire rated walls, floors and walls created by or made on the behalf of the contractor so that the original fire rating of the floor or wall is maintained as required by article 300-21 of the national electric code.
2. Contractor shall use only fm approved fire-stopping materials and methods. All materials and methodologies shall be submitted to the project manager prior to utilization.
3. Install approved penetration sealant material that has passed fire exposure testing in accordance with standard time-temperature curve in the standard, UL, ASTM e 119, and NFPA 251 and the hose stream test in accordance with UL.
4. Install approved penetration seal materials in accordance with design requirements and manufacturer's instructions. All substitutions must be approved by the Commissioner.
5. Provide removable fire-stopping pillows IPC flame safe seal bags or approved equivalent, in an approved fashion in openings greater than 4" diameter, or 4" x 4" square cross section. Provide wire mesh grate over bags as recommended by manufacturer subsequent to installation.
6. Verify that all penetrating elements and supporting devices have been installed and temporary lines have been removed.
    a. If forms of damming materials are installed, they shall be removed after the designated cure time.

N. System checkout
1. Before acceptance tests are scheduled, the contractor shall perform comprehensive system tests and checkouts
2. The contractor shall furnish all required test equipment and shall perform all work necessary to determine and or modify performance of the system to meet the requirements of this specification.
3. During performance testing, all equipment shall be operated under standard conditions as recommended by the manufacturer
4. Test and certify all audio and video systems for compliance with the performance standards using the test procedures defined later in this specification
5. Maintain documentation of all performance tests for reference by the Commissioner and the City of New York during the system acceptance test.
6. At the conclusion of testing, return all equipment settings to previously calibrated "normal" operating positions.
7. Provide written records of all test results in spreadsheet form.
8. Check and confirm all control functions for proper operation, throughout the entire signal path, from all controlling devices to all controlled devices.
9. Adjust, balance and align all equipment for optimum quality and to meet the City of New York's approval and manufacturer's published specifications.
10. Establish and mark "normal" settings for all level controls and record these settings in the "system operation and maintenance manual".
11. The contractor shall provide test results and settings for all equipment and systems to the Commissioner at least three business days prior to scheduled acceptance testing.
12. The contractor shall notify the Commissioner, in writing, that the work is complete and ready for acceptance testing by the Commissioner.
    a. The work shall be considered ready for acceptance testing when the contractor notifies Commissioner, in writing, that the following conditions are met:

1) The contractor has pre-tested all systems such that all sub- systems, functions, software and equipment are properly installed, set-up, configured, de-bugged and fully operational as specified.
2) The contractor has supplied the Commissioner with the written test results and documentation as listed above, for all rooms and systems.
3) The contractor has supplied the Commissioner with manuals, instruction materials and all other required as-built documentation, revised to reflect comments and or revisions arising from the review cycles listed elsewhere within this document.

13. Should the systems not be ready for testing by the Commissioner at the date and times indicated by the contractor, system acceptance testing may be rescheduled at the sole discretion of the Commissioner

3.4 GROUNDING

A. All grounding shall conform to all applicable national electric code requirements including, but not limited to article 250. See 1.16

B. The contractor shall be solely responsible for ensuring all work provided under this scope is free of crosstalk, hum, buzz and or other defects or anomalies resulting from improper grounding.

C. A single, primary "system ground" shall be established for each system. All grounding conductors shall connect to this primary system ground.
1. The system ground shall be provided in the equipment racks and shall consist of a copper bar of sufficient size to accommodate all secondary grounding conductors.

D. Under no condition and in no circumstance, shall the ac neutral conductor, either in the power panel or in a receptacle outlet, be used for a system ground.

E. It shall be the responsibility of the contractor to follow good engineering practices, as outlined above, and to deviate from these practices only when necessary to minimize crosstalk and to maximize signal-to-noise ratios in the audio, video, and control systems.

3.5 CABLE INSTALLATION

A. Special conditions
1. Furnish and install communications cables per the drawings and specifications provided by the Commissioner and per the manufacturer's recommendations.
2. Install each station cable as an uninterrupted conductor section from the IDF closet to the user-end termination point, as indicated on the drawings, without splices or mechanical couplers between the points of origin and termination.
3. Where horizontal cables exit trays to run to device locations, contractor shall furnish and install any additional j-hooks with the appropriate mounting hardware every 5-feet of cable maximum for open cable runs. J-hooks shall not be fastened to suspended ceiling support structures, electrical or plumbing piping or any other trade work.
4. Provide all other outlet configurations in accordance with the drawings and manufacturers recommendations.

5. All wall, ceiling, outdoor and indoor cameras shall have a 2 gang back box that is protected from weather, vandalism etc, installed prior to security contractors final connection.
6. Unless otherwise noted, route all intra-building station cables above the finished ceilings, transitioning vertically to wall mounted back boxes and/or surface-mounted wiring channels via conduit stub-ups into the ceiling void or to floor boxes or poke-thru fittings to the floor above, as required.
7. Label each outlet and each cable with an appropriate id number.
8. Do not exceed a pulling tension of 25 lbs. On 4-pair UTP cables.
9. To limit the incidence of micro-bending of the individual fiber strands, use mesh-type, swivel-eye pulling grips for all fiber optic cable pulling. This type of pulling grip is also recommended for all other building cable, as required.
10. Door locations will be installed in various configurations as noted on the drawings. All cables will be plenum rated. Station locations are indicated on the plans using a unique designation as defined on the drawing symbol legend. All locations and mounting heights must be confirmed with the drawings.

3.6 IDF CLOSETS

A. All cables, after entry into the equipment rooms must be secured to backboards and dressed into supports. The general/electrical contractor shall attach the cables where required to plywood backboards using Velcro-type re-enterable cable ties at spacing of approximately 12 inches. Velcro cable ties shall be secured to backboards using #10 machine screws and metallic washers, or rigid tabs.

B. Support all cables mounted onto patch panels with strain management bars on rear of rack.

C. Route cables from work locations into equipment rooms via overhead distribution. Maintain overhead distribution wherever possible within equipment rooms.

3.7 TEST EQUIPMENT

A. The contractor shall provide all appropriate test equipment as. Equipment shall be factory calibrated and fully operational for acceptance testing;

B. Test equipment minimum requires are as follows;
   1. Metallic cable pair tester: independent technologies, test-all iv or 25, Siemon Company multi-test mt-5000 or equivalent
   2. 4-pair UTP automated cable tester: tester shall be compliant with ANSI/TIA/EIA-568 provide bi-directional testing and test in excess of category 6 permanent link and channel requirements. Test equipment must be approved by the Commissioner prior to use on the job. Agilent Wire scope 350, Micro test Omni scanner, Fluke DSP 4000 or approved equal my be used.

3.8 CABLE TESTING

A. Test all cables installed.

B. Pre-installation inspection.

1. Visually inspect all cables, cable reels and shipping cartons for shipping damage. Return visibly damaged items to the manufacturer.
2. Perform an end-to-end test for continuity, ground fault, shorts and crossed pairs for each cable pair/conductor.

C. Post installation testing
1. Test only completed systems. Partial or statistically sampled testing is not acceptable, except by prior, written approval from the Commissioner
2. Perform an end-to-end test for continuity, ground fault, shorts and crossed pairs for each cable pair/conductor including tie cable to fire alarm system.
   a. Test cable pairs from the work area outlet, through all conductors, patches and cross connects, to the equipment room
   b. Test horizontal cable pairs not cross-connected to backbone from their furthest termination point to the work area outlet.
   c. Test backbone cable pairs not cross-connected to horizontal cables from their furthest termination point to the equipment room,
3. Any Required 4-pair CAT 6 and CAT 6a UTP: in addition to end-to-end tests listed above
   a. Conduct a permanent link test of each cable including: wire map, length, insertion loss, next loss, psnext loss, elfext loss, pselfext loss, propagation delay, and delay skew with injected standard signals, utilizing automated test equipment. Record all results. Test bi-directionally in accordance with ANSI/TIA/EIA-568 and compare results with the performance requirements of ANSI/TIA/EIA-568-b.1 and/or b.2-1 respectively.
   b. Test cabling not cross connected or patched within the closet as a permanent link.
4. Remove all defective cables from cable pathways. Do not abandon cables in place.
5. The Commissioner and reserves the right to observe the conduct of any or all portions of the testing process and to conduct, and to require the contractor, using the contractor's equipment and labor, a random re-test of up to five percent of the cable plant to confirm documented test results.
6. Document all test results and corrective procedures and submit to the consultant within ten working days of test completion.
7. In addition to the actions specified above, the contractor may be required to be present while the performance tests of the transport electronics connected to the cabling system.

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SECTION 283111
Digital, Addressable Fire-Alarm System

PART 1 - GENERAL

1.1. RELATED DOCUMENTS

A. The following documents apply to all required work for the Project: (1) the Contract Drawings, (2) the Specifications, (3) the General Conditions, (4) the Addendum and (5) the Contract (City of New York Standard Construction Contract).

B. LEED / Environmentally Preferable Purchase (EPP) General Requirements:

1. Refer to DDC General Conditions and the Addendum to the General Conditions.
2. LEED requirements apply to all Phase II work with the exception of the Existing Building scope. EPP requirements apply to the project's Existing Building scope only.

1.2. SUMMARY

A. Section Includes:

1. Fire-alarm control unit.
2. Manual fire-alarm boxes.
3. System smoke detectors.
4. Nonsystem smoke detectors.
5. Heat detectors.
6. Notification appliances.
7. Remote annunciator.
8. Addressable interface device.
9. Digital alarm communicator transmitter.

1.3. DEFINITIONS

A. LED: Light-emitting diode.

B. NICET: National Institute for Certification in Engineering Technologies.

1.4. SYSTEM DESCRIPTION

A. Descriptions in this article are examples only.

B. Noncoded, UL-certified addressable system, with multiplexed signal transmission, dedicated to fire-alarm service only.

C. Noncoded addressable system, with automatic sensitivity control of certain smoke detectors and multiplexed signal transmission, dedicated to fire-alarm service only.

1.5. PERFORMANCE REQUIREMENTS

A. Seismic Performance: Fire-alarm control unit and raceways shall withstand the effects of earthquake motions determined according to SEI/ASCE 7.
   1. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified."

1.6. SUBMITTALS

A. Refer to DDC General Conditions Section 01 33 00 "Submittal Procedures."

B. General Submittal Requirements:
   1. Shop Drawings shall be prepared by installers with the following qualifications:
      a) Properly trained by manufacturer in fire-alarm system design.
      b) NICET-certified fire-alarm technician.

C. Product Data: For each type of product indicated.

D. Shop Drawings: For fire-alarm system. Include plans, elevations, sections, details, and attachments to other work.
   1. Comply with recommendations in the "Documentation" Section of the "Fundamentals of Fire Alarm Systems" Chapter in NFPA 72.
   2. Include voltage drop calculations for notification appliance circuits.
   3. Include battery-size calculations.
   4. Include performance parameters and installation details for each detector, verifying that each detector is listed for complete range of air velocity, temperature, and humidity possible when air-handling system is operating.
   5. Include plans, sections, and elevations of heating, ventilating, and air-conditioning ducts, drawn to scale and coordinating installation of duct smoke detectors and access to them. Show critical dimensions that relate to placement and support of sampling tubes, detector housing, and remote status and alarm indicators. Locate detectors according to manufacturer's written recommendations.
   6. Include voice/alarm signaling-service equipment rack or console layout, grounding schematic, amplifier power calculation, and single-line connection diagram.
   7. Include floor plans to indicate final outlet locations showing address of each addressable device. Show size and route of cable and conduits.

E. Engineering Submittal: For smoke and heat detectors indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the New York State licensed professional engineer responsible for their preparation.
   1. Drawings showing the location of each smoke and heat detector, ratings of each, and installation details as needed to comply with listing conditions of the detector.
   2. Calculations: Calculate requirements for selecting the spacing and sensitivity of detection, complying with NFPA 72.

F. Qualification Data: For qualified Installer.

G. Seismic Qualification Certificates: For fire-alarm control unit, accessories, and components, from manufacturer.

1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

H. Field quality-control reports.

I. Operation and Maintenance Data: For fire-alarm systems and components to include in emergency, operation, and maintenance manuals. In addition to items specified in DDC General Conditions include the following:

1. Comply with the "Records" Section of the "Inspection, Testing and Maintenance" Chapter in NFPA 72.
2. Provide "Record of Completion Documents" according to NFPA 72 article "Permanent Records" in the "Records" Section of the "Inspection, Testing and Maintenance" Chapter.
3. Record copy of site-specific software.
4. Provide "Maintenance, Inspection and Testing Records" according to NFPA 72 article of the same name and include the following:
   a. Frequency of testing of installed components.
   b. Frequency of inspection of installed components.
   c. Requirements and recommendations related to results of maintenance.
   d. Manufacturer's user instruction manuals.
5. Manufacturer's required maintenance related to system warranty requirements.
6. Abbreviated operating instructions for mounting at fire-alarm control unit.
7. Copy of NFPA 25.

1.7. QUALITY ASSURANCE

A. Refer to DDC General Conditions Section 01 40 00 "Quality Requirements."

B. Installer Qualifications properly trained by manufacturer for installation of units required for this Project.

C. Source Limitations for Fire-Alarm System and Components: Obtain fire-alarm system from single source from single manufacturer. Components shall be compatible with, and operate as, an extension of existing system.

D. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

E. NFPA Certification: Obtain certification according to NFPA 72 by an NRTL.

F. NFPA Certification: Obtain certification according to NFPA 72 by a UL-listed alarm company.

G. NFPA Certification: Obtain certification according to NFPA 72 in the form of a placard by an FMG-approved alarm company.

H. NFPA Certification: Obtain certification according to NFPA 72.

1.8. PROJECT CONDITIONS

A. Interruption of Existing Fire-Alarm Service: Do not interrupt fire-alarm service to facilities occupied by the City of New York unless permitted under the following conditions and then only after arranging to provide temporary guard service according to requirements indicated:

1. Notify Commissioner no fewer than two days in advance of proposed interruption of fire-alarm service.
2. Do not proceed with interruption of fire-alarm service without Commissioner's written permission.

1.9. SEQUENCING AND SCHEDULING

A. Existing Fire-Alarm Equipment: Maintain existing equipment fully operational until new equipment has been tested and accepted. As new equipment is installed, label it "NOT IN SERVICE" until it is accepted. Remove labels from new equipment when put into service and label existing fire-alarm equipment "NOT IN SERVICE" until removed from the building.

B. Equipment Removal: After acceptance of new fire-alarm system, remove existing disconnected fire-alarm equipment and wiring.

PART 2 - PRODUCTS

2.1. MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide:

1. Edwards
2. Faraday; Siemens Building Technologies, Inc.
3. Federal Signal Corporation.
4. Fire Control Instruments, Inc.; a Honeywell company.
5. Gamewell; a Honeywell company.
6. NOTIFIER; a Honeywell company.
7. Siemens Building Technologies, Inc.; Fire Safety Division.
8. Or Approved Equal

2.2. SYSTEMS OPERATIONAL DESCRIPTION

A. Fire-alarm signal initiation shall be by one or more of the following devices and systems:

1. Manual stations.
2. Heat detectors.
3. Carbon Monoxide Detectors.
4. Smoke detectors.
5. Duct smoke detectors.
6. Verified automatic alarm operation of smoke detectors.
7. Automatic sprinkler system water flow and tamper switches.
8. Heat detectors in elevator shaft and pit.

9. Audible Devices (Horn Type).
10. Visual Devices (Strobe lights).

B. Fire-alarm signal shall initiate the following actions:

1. Continuously operate alarm notification appliances.
2. Identify alarm at fire-alarm control unit and remote annunciators.
3. Transmit an alarm signal to the remote alarm receiving station.
4. Unlock electric door locks in designated egress paths.
5. Activate alarm communication system.
6. Switch heating, ventilating, and air-conditioning equipment controls to fire-alarm mode.
7. Close smoke dampers in air ducts of designated air-conditioning duct systems if required.
8. Recall elevators to primary or alternate recall floors.
9. Activate emergency shutoffs for gas and fuel supplies.
10. Record events in the system memory.

C. Supervisory signal initiation shall be by one or more of the following devices and actions:

1. Valve supervisory switch.
2. Low-air-pressure switch of a dry-pipe sprinkler system.
3. Elevator shunt-trip supervision.

D. System trouble signal initiation shall be by one or more of the following devices and actions:

1. Open circuits, shorts, and grounds in designated circuits.
2. Loss of primary power at fire-alarm control unit.
3. Ground or a single break in fire-alarm control unit internal circuits.
4. Abnormal ac voltage at fire-alarm control unit.
5. Break in standby battery circuitry.
6. Failure of battery charging.
7. Abnormal position of any switch at fire-alarm control unit or annunciator.
8. Fire-pump power failure, including a dead-phase or phase-reversal condition.

E. System Trouble and Supervisory Signal Actions: Initiate notification appliance and annunciate at fire-alarm control unit and remote annunciators. Record the event on system printer.

2.3. FIRE-ALARM CONTROL UNIT

A. General Requirements for Fire-Alarm Control Unit:

1. Field-programmable, microprocessor-based, modular, power-limited design with electronic modules, complying with UL 864 and listed and labeled by an NRTL.
2. System software and programs shall be held in flash electrically erasable programmable read-only memory (EEPROM), retaining the information through failure of primary and secondary power supplies.
3. Include a real-time clock for time annotation of events on the event recorder and printer.
4. Addressable initiation devices that communicate device identity and status.
5. Smoke sensors shall additionally communicate sensitivity setting and allow for adjustment of sensitivity at fire-alarm control unit.
6. Temperature sensors shall additionally test for and communicate the sensitivity range of the device.
7. Addressable control circuits for operation of mechanical equipment.

B. Alphanumeric Display and System Controls: Arranged for interface between human operator at fire-alarm control unit and addressable system components including annunciation and supervision. Display alarm, supervisory, and component status messages and the programming and control menu.

1. Some systems have 40-character display unit that may be adequate for small projects.
2. Annunciator and Display: Liquid-crystal type, 3 line(s) of 80 characters, minimum.
3. Keypad: Arranged to permit entry and execution of programming, display, and control commands and to indicate control commands to be entered into the system for control of smoke-detector sensitivity and other parameters.

C. Circuits:

1. Initiating Device, Notification Appliance, and Signaling Line Circuits: NFPA 72, Class A and B.
2. Initiating Device Circuits:
3. Notification Appliance Circuits:
4. Signaling Line Circuits:
5. Install no more than 50 addressable devices on each signaling line circuit.
6. Serial Interfaces: Two RS-232 ports for printers.

D. Stairwell Pressurization: Provide an output signal using an addressable relay to start the stairwell pressurization system. Signal shall remain on until alarm conditions are cleared and fire-alarm system is reset. Signal shall not stop in response to alarm acknowledge or signal silence commands.

1. Pressurization starts when any alarm is received at fire-alarm control unit.
2. Alarm signals from smoke detectors at pressurization air supplies have a higher priority than other alarm signals that start the system.

E. Smoke-Alarm Verification:

1. Initiate audible and visible indication of an "alarm-verification" signal at fire-alarm control unit.
2. Activate an NRTL-listed and -approved "alarm-verification" sequence at fire-alarm control unit and detector.
3. Record events by the system printer.
4. Sound general alarm if the alarm is verified.
5. Cancel fire-alarm control unit indication and system reset if the alarm is not verified.

F. Notification Appliance Circuit: Operation shall sound in a Bell/Horn.

G. Elevator Recall:

1. Smoke detectors at the following locations shall initiate automatic elevator recall. Alarm-initiating devices, except those listed, shall not start elevator recall.
2. Elevator lobby detectors except the lobby detector on the designated floor.
3. Smoke detector in elevator machine room.
4. Smoke detectors in elevator hoistway.
5. Elevator lobby detectors located on the designated recall floors shall be programmed to move the cars to the alternate recall floor.

H. Transmission to Remote Alarm Receiving Station: Automatically transmit alarm, supervisory, and trouble signals to a remote alarm station.

I. Alarm Signaling Service: Central emergency communication system with redundant preamplifiers, amplifiers, and tone generators provided in a separate cabinet located in the as a special module that is part of fire-alarm control unit.

1. Indicated number of alarm channels for automatic, simultaneous transmission of different announcements to different zones or for manual transmission of announcements by use of the central-control microphone. Amplifiers shall comply with UL 1711 and be listed by an NRTL.
2. Allow the application of and evacuation signal to indicated number of zones and, at same time, allow voice paging to the other zones selectively or in any combination.
3. Programmable tone and message sequence selection.
4. Standard digitally recorded messages for "Evacuation" and "All Clear."
5. Generate tones to be sequenced with audio messages of type recommended by NFPA 72 and that are compatible with tone patterns of notification appliance circuits of fire-alarm control unit.
6. Status Annunciator: Indicate the status of various alarms.
7. Preamplifiers, amplifiers, and tone generators shall automatically transfer to backup units, on primary equipment failure.

J. Primary Power: 24-V dc obtained from 120-V ac service and a power-supply module. Initiating devices, notification appliances, signaling lines, trouble signals, supervisory and digital alarm communicator transmitters shall be powered by 24-V dc source.

1. Alarm current draw of entire fire-alarm system shall not exceed 80 percent of the power-supply module rating.

K. Secondary Power: 24-V dc supply system with batteries, automatic battery charger, and automatic transfer switch, emergency generator.

1. Batteries: Sealed lead calcium.

L. Instructions: Include interpretation and describe appropriate response for displays and signals. Briefly describe the functional operation of the system under normal, alarm, and trouble conditions.

2.4. MANUAL FIRE-ALARM BOXES

A. General Requirements for Manual Fire-Alarm Boxes: Comply with UL 38. Boxes shall be finished in red with molded, raised-letter operating instructions in contrasting color; shall show visible indication of operation; and shall be mounted on recessed outlet box. If indicated as surface mounted, provide manufacturer's surface back box.

1. Single-action mechanism, pull-lever type; with integral addressable module arranged to communicate manual-station status (normal, alarm, or trouble) to fire-alarm control unit.
2. Double-action mechanism requiring two actions to initiate an alarm, pull-lever type; with integral addressable module arranged to communicate manual-station status (normal, alarm, or trouble) to fire-alarm control unit.
3. Station Reset: Key- or wrench-operated switch.
4. Indoor Protective Shield: Factory-fabricated clear plastic enclosure hinged at the top to permit lifting for access to initiate an alarm. Lifting the cover actuates an integral battery-powered audible horn intended to discourage false-alarm operation.
5. Weatherproof Protective Shield: Factory-fabricated clear plastic enclosure hinged at the top to permit lifting for access to initiate an alarm.

2.5. SYSTEM SMOKE DETECTORS

A. General Requirements for System Smoke Detectors:

1. Comply with UL 268; operating at 24-V dc, nominal.
2. Detectors shall be four wire types.
3. Integral Addressable Module: Arranged to communicate detector status (normal, alarm, or trouble) to fire-alarm control unit.
4. Base Mounting: Detector and associated electronic components shall be mounted in a twist-lock module that connects to a fixed base. Provide terminals in the fixed base for connection to building wiring.
5. Self-Restoring: Detectors do not require resetting or readjustment after actuation to restore them to normal operation.
6. Integral Visual-Indicating Light: LED type indicating detector has operated and power-on status.
7. Remote Control: Unless otherwise indicated, detectors shall be analog-addressable type, individually monitored at fire-alarm control unit for calibration, sensitivity, and alarm condition and individually adjustable for sensitivity by fire-alarm control unit.
8. Rate-of-rise temperature characteristic shall be selectable at fire-alarm control unit for 15 or 20 deg F (8 or 11 deg C) per minute.
9. Fixed-temperature sensing shall be independent of rate-of-rise sensing and shall be settable at fire-alarm control unit to operate at 135 or 155 deg F (57 or 68 deg C).
10. Provide multiple levels of detection sensitivity for each sensor.

B. Ionization Smoke Detector:

1. Detector address shall be accessible from fire-alarm control unit and shall be able to identify the detector's location within the system and its sensitivity setting.
2. An operator at fire-alarm control unit, having the designated access level, shall be able to manually access the following for each detector:
   a. Primary status.
   b. Device type.
   c. Present average value.
   d. Present sensitivity selected.
   e. Sensor range (normal, dirty, etc.).

C. Duct Smoke Detectors: Photoelectric type complying with UL 268A.

1. Detector address shall be accessible from fire-alarm control unit and shall be able to identify the detector's location within the system and its sensitivity setting.
2. An operator at fire-alarm control unit, having the designated access level, shall be able to manually access the following for each detector:
   a. Primary status.
   b. Device type.
   c. Present average value.
   d. Present sensitivity selected.
   e. Sensor range (normal, dirty, etc.).
3. Weatherproof Duct Housing Enclosure: NEMA 250, Type 4X; NRTL listed for use with the supplied detector.
4. Each sensor shall have multiple levels of detection sensitivity.

5. Sampling Tubes: Design and dimensions as recommended by manufacturer for specific duct size, air velocity, and installation conditions where applied.
6. Relay Fan Shutdown: Rated to interrupt fan motor-control circuit.

2.6. HEAT DETECTORS

A. General Requirements for Heat Detectors: Comply with UL 521.

B. Heat Detector, Combination Type: Actuated by either a fixed temperature of 135 deg F (57 deg C) or a rate of rise that exceeds 15 deg F (8 deg C) per minute unless otherwise indicated.

1. Mounting: Adapter plate for outlet box mounting.
2. Integral Addressable Module: Arranged to communicate detector status (normal, alarm, or trouble) to fire-alarm control unit.

C. Heat Detector, Fixed-Temperature Type: Actuated by temperature that exceeds a fixed temperature of 190 deg F (88 deg C).

1. Mounting: Adapter plate for outlet box mounting.
2. Integral Addressable Module: Arranged to communicate detector status (normal, alarm, or trouble) to fire-alarm control unit.

D. Continuous Linear Heat-Detector System:

1. Detector Cable: Rated detection temperature 155 deg F (68 deg C). NRTL listed for "regular" service and a standard environment. Cable includes two steel actuator wires twisted together with spring pressure, wrapped with protective tape, and finished with PVC outer sheath. Each actuator wire is insulated with heat-sensitive material that reacts with heat to allow the cable twist pressure to short- circuit wires at the location of elevated temperature.
2. Control Unit: Two-zone or multizone unit as indicated. Provide same system power supply, supervision, and alarm features as specified for fire-alarm control unit.
3. Signals to Fire-Alarm Control Unit: Any type of local system trouble shall be reported to fire-alarm control unit as a composite "trouble" signal. Alarms on each detection zone shall be individually reported to central fire-alarm control unit as separately identified zones.
4. Integral Addressable Module: Arranged to communicate detector status (normal, alarm, or trouble) to fire-alarm control unit.

2.7. NOTIFICATION APPLIANCES

A. General Requirements for Notification Appliances: Individually addressed, connected to a signaling line circuit, equipped for mounting as indicated and with screw terminals for system connections.

B. Chimes, Low-Level Output: Vibrating type, 75-dBA minimum rated output.

C. Horns: Electric-vibrating-polarized type, 24-V dc; with provision for housing the operating mechanism behind a grille. Comply with UL 464. Horns shall produce a sound-pressure level of 90 DBA, measured 10 feet (3 m) from the horn, using the coded signal prescribed in UL 464 test protocol.

D. Visible Notification Appliances: Xenon strobe lights comply with UL 1971, with clear or nominal white polycarbonate lens mounted on an aluminum faceplate. The word "FIRE" is engraved in minimum 1-inch-(25-mm-) high letters on the lens.

1. Rated Light Output:
   a. 177 cd.
   b. 15/30/75/110 cd, selectable in the field.
2. Mounting: Wall mounted unless otherwise indicated.
3. For units with guards to prevent physical damage, light output ratings shall be determined with guards in place.
4. Flashing shall be in a temporal pattern, synchronized with other units.
5. Strobe Leads: Factory connected to screw terminals.
6. Mounting Faceplate: Factory finished, red.

E. Tone Notification Appliances:

1. Appliances shall comply with UL 1480 and shall be listed and labeled by an NRTL.
2. High-Range Units: Rated 2 to 15 W.
3. Low-Range Units: Rated 1 to 2 W.
4. Mounting: Flush.
5. Matching Transformers: Tap range matched to acoustical environment of speaker location.

2.8. REMOTE ANNUNCIATOR

A. Description: Annunciator functions shall match those of fire-alarm control unit for alarm, supervisory, and trouble indications. Manual switching functions shall match those of fire-alarm control unit, including acknowledging, silencing, resetting, and testing.

1. Mounting: Flush cabinet, NEMA 250, Type 1.

B. Display Type and Functional Performance: Alphanumeric display and LED indicating lights shall match those of fire-alarm control unit. Provide controls to acknowledge, silence, reset, and test functions for alarm, supervisory, and trouble signals.

2.9. ADDRESSABLE INTERFACE DEVICE

A. Description: Microelectronic monitor module, NRTL listed for use in providing a system address for alarm-initiating devices for wired applications with normally open contacts.

B. Integral Relay: Capable of providing a direct signal to elevator controller to initiate elevator recall.

2.10. DIGITAL ALARM COMMUNICATOR TRANSMITTER

A. Digital alarm communicator transmitter shall be acceptable to the remote central station and shall comply with UL 632 and be listed and labeled by an NRTL.

B. Functional Performance: Unit shall receive an alarm, supervisory, or trouble signal from fire-alarm control unit and automatically capture one telephone line(s) and dial a preset number for a remote central station. When contact is made with central station(s), signals shall be transmitted. If service on line is interrupted for longer than 45 seconds, transmitter shall initiate a local trouble signal and transmit the signal indicating loss of telephone line to the remote alarm receiving station over the remaining line. Transmitter shall automatically report telephone service restoration to the central station. If service is lost on both telephone lines, transmitter shall initiate the local trouble signal.

C. Local functions and display at the digital alarm communicator transmitter shall include the following:

1. Verification that both telephone lines are available.
2. Programming device.
3. LED display.
4. Manual test report function and manual transmission clear indication.
5. Communications failure with the central station or fire-alarm control unit.

D. Digital data transmission shall include the following:

1. Address of the alarm-initiating device.
2. Address Zone of the supervisory signal.
3. Address Zone of the trouble-initiating device.
4. Loss of ac supply or loss of power.
5. Low battery.
6. Abnormal test signal.
7. Communication bus failure.

E. Secondary Power: Integral rechargeable battery and automatic charger.

F. Self-Test: Conducted automatically every 24 hours with report transmitted to central station.

PART 3 - EXECUTION

3.1. EXECUTION REQUIREMENTS

A. Refer to DDC General Conditions for execution requirements.

3.2. EQUIPMENT INSTALLATION

A. Comply with NFPA 72 for installation of fire-alarm equipment.

B. Equipment Mounting: Install fire-alarm control unit on concrete base with tops of cabinets not more than 72 inches (1830 mm) above the finished floor. Comply with requirements for concrete base specified in concrete specification sections.

1. Install seismic bracing. Comply with requirements in 260548 Section "Vibration and Seismic Controls for Electrical Systems."
2. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch (450-mm) centers around the full perimeter of concrete base.
3. For supported equipment, install epoxy-coated anchor bolts that extend through concrete base and anchor into structural concrete floor.
4. Place and secure anchorage devices. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
5. Install anchor bolts to elevations required for proper attachment to supported equipment.

C. Equipment Mounting: Install fire-alarm control unit on finished floor with tops of cabinets not more than 72 inches (1830 mm) above the finished floor.

1. Comply with requirements for seismic-restraint devices specified in 260548 Section "Vibration and Seismic Controls for Electrical Systems."

D. Smoke- or Heat-Detector Spacing:

1. Comply with NFPA 72, "Smoke-Sensing Fire Detectors" Section in the "Initiating Devices" Chapter, for smoke-detector spacing.
2. Comply with NFPA 72, "Heat-Sensing Fire Detectors" Section in the "Initiating Devices" Chapter, for heat-detector spacing.
3. Smooth ceiling spacing shall not exceed 30 feet (9 m).
4. Spacing of detectors for irregular areas, for irregular ceiling construction, and for high ceiling areas shall be determined according to Appendix A or Appendix B in NFPA 72.
5. HVAC: Locate detectors not closer than 3 feet (1 m) 5 feet (1.5 m) from air-supply diffuser or return-air opening.
6. Lighting Fixtures: Locate detectors not closer than 12 inches (300 mm) from any part of a lighting fixture.

E. Duct Smoke Detectors: Comply with NFPA 72 and NFPA 90A. Install sampling tubes so they extend the full width of duct.

F. Heat Detectors in Elevator Shafts: Coordinate temperature rating and location with sprinkler rating and location.

G. Single-Station Smoke Detectors: Where more than one smoke alarm is installed within a dwelling or suite, they shall be connected so that the operation of any smoke alarm causes the alarm in all smoke alarms to sound.

H. Remote Status and Alarm Indicators: Install near each smoke detector and each sprinkler water-flow switch and valve-tamper switch that is not readily visible from normal viewing position.

I. Audible Alarm-Indicating Devices: Install not less than 6 inches (150 mm) below the ceiling. Install bells and horns on flush-mounted back boxes with the device-operating mechanism concealed behind a grille.

J. Visible Alarm-Indicating Devices: Install adjacent to each alarm bell or alarm horn and at least 6 inches (150 mm) below the ceiling.

K. Device Location-Indicating Lights: Locate in public space near the device they monitor.

L. Fire-Alarm Control Unit: Surface mounted, with tops of cabinets not more than 72 inches (1830 mm) above the finished floor.

M. Annunciator: Install with top of panel not more than 72 inches (1830 mm) above the finished floor.

3.3. CONNECTIONS

A. For fire-protection systems related to doors in fire-rated walls and partitions and to doors in smoke partitions, comply with requirements in 087100 Section "Door Hardware." Connect hardware and devices to fire-alarm system.

1. Verify that hardware and devices are NRTL listed for use with fire-alarm system in this Section before making connections.

B. Make addressable connections with a supervised interface device to the following devices and systems. Install the interface device less than 3 feet (1 m) from the device controlled. Make an addressable confirmation connection when such feedback is available at the device or system being controlled.

1. Alarm-initiating connection to smoke-control system (smoke management) at firefighter smoke-control system panel.
2. Alarm-initiating connection to stairwell and elevator-shaft pressurization systems.
3. Smoke dampers in air ducts of designated air-conditioning duct systems.
4. Alarm-initiating connection to elevator recall system and components.
5. Alarm-initiating connection to activate emergency lighting control.
6. Alarm-initiating connection to activate emergency shutoffs for gas and fuel supplies.
7. Supervisory connections at valve supervisory switches.
8. Supervisory connections at low-air-pressure switch of each dry-pipe sprinkler system.
9. Supervisory connections at elevator shunt trip breaker.
10. Supervisory connections at fire-pump power failure including a dead-phase or phase-reversal condition.
11. Supervisory connections at fire-pump engine control panel.

3.4. IDENTIFICATION

A. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in 260553 Section "Identification for Electrical Systems."

B. Install framed instructions in a location visible from fire-alarm control unit.

3.5. GROUNDING

A. Ground fire-alarm control unit and associated circuits; comply with IEEE 1100. Install a ground wire from main service ground to fire-alarm control unit.

3.6. FIELD QUALITY CONTROL

A. Field tests shall be witnessed by NYC Department of Building as required.

B. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections.

C. Perform tests and inspections.

1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.

D. Tests and Inspections:

1. Visual Inspection: Conduct visual inspection prior to testing.

2. Inspection shall be based on completed Record Drawings and system documentation that is required by NFPA 72 in its "Completion Documents, Preparation" Table in the "Documentation" Section of the "Fundamentals of Fire Alarm Systems" Chapter.
3. Comply with "Visual Inspection Frequencies" Table in the "Inspection" Section of the "Inspection, Testing and Maintenance" Chapter in NFPA 72; retain the "Initial/Reacceptance" column and list only the installed components.
4. System Testing: Comply with "Test Methods" Table in the "Testing" Section of the "Inspection, Testing and Maintenance" Chapter in NFPA 72.
5. Test audible appliances for the public operating mode according to manufacturer's written instructions. Perform the test using a portable sound-level meter complying with Type 2 requirements in ANSI S1.4.
6. Test audible appliances for the private operating mode according to manufacturer's written instructions.
7. Factory-authorized service representative shall prepare the "Fire Alarm System Record of Completion" in the "Documentation" Section of the "Fundamentals of Fire Alarm Systems" Chapter in NFPA 72 and the "Inspection and Testing Form" in the "Records" Section of the "Inspection, Testing and Maintenance" Chapter in NFPA 72.

E. Reacceptance Testing: Perform reacceptance testing to verify the proper operation of added or replaced devices and appliances.

F. Fire-alarm system will be considered defective if it does not pass tests and inspections.

G. Prepare test and inspection reports.

H. Maintenance Test and Inspection: Perform tests and inspections listed for weekly, monthly, quarterly, and semiannual periods. Use forms developed for initial tests and inspections.

I. Annual Test and Inspection: One year after date of Substantial Completion, test fire-alarm system complying with visual and testing inspection requirements in NFPA 72. Use forms developed for initial tests and inspections.

3.7. INSTRUCTION

A. Instruct operating personnel to adjust, operate, and maintain fire-alarm system.

B. Provide the services of the manufacturer's trained representative for two (2) separate calendar days for a period of hour (4) hours per day to instruct the City of New York's designed personnel on the operation and maintenance of the entire system.

END OF SECTION 283111

SECTION 31 00 00
Earthwork

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The following documents apply to all required work for the Project: (1) the Contract Drawings, (2) the Specifications, (3) the General Conditions, (4) the Addendum and (5) the Contract (City of New York Standard Construction Contract).

B. LEED / Environmentally Preferable Purchase (EPP) General Requirements:

1. Refer to DDC General Conditions and the Addendum to the General Conditions

2. LEED requirements apply to all Phase II work with the exception of the Existing Building scope. EPP requirements apply to the project's Existing Building scope only.

1.2 SUMMARY

A. Work of this Section includes all labor, materials, equipment, and services necessary to complete the excavation, foundation construction, ground improvement, filling and grading as shown on the Drawings and specified herein including, but not limited to the following:

1. Removal of existing pavements, curbs, utilities, and former foundations, etc., designated for removal; relocation of fence and fence posts when necessary and other structures encountered or left by wreckers, old walls, rubble, etc.

2. All excavation of earth, concrete, construction debris, uncontrolled fill, remnants of foundations, and other materials to the bottom of foundation subgrades, pits and slabs as required and indicated on drawings.

3. Excavation, filling and rough grading of site area at adjacent structures and roadways as required and within the Contract Limit Line.

4. Excavation, filling, grading and compacting to required elevations for the slab and foundation.

5. Excavation, filling, grading and compacting to required elevations for appurtenances and site work.

6. Excavation and trenching for mechanical trades, including but not limited to all plumbing, heating, water, gas, and electric within the buildings as shown or required by the drawings; backfilling same with clean fill as described hereinafter, and thoroughly compacting to "Rough Grading" elevations.

7. Providing additional approved suitable material for filling and rough grading.

8. Legal off-site disposing of surplus excavated materials unsuitable for filling or backfilling. Refer to Section 02 61 13 - Excavation and Handling of Contaminated Materials.

9. Other labor and materials as may be reasonably inferred to be required to make the work under this Section complete.

B. Related Sections

1. Section 02 61 13 - Excavation and Handling of Contaminated Materials

1.3 REFERENCES

A. All work and materials under this section shall conform to the latest revision of the following standard specifications, where not otherwise required by the Contract Documents.

B. The following publications form a part of this Specification to the extent indicated by the specific citations in other paragraphs of this Specification. In case of conflict, the particular requirements of this Specification shall govern, unless indicated otherwise.

1. American Society for Testing and Materials (ASTM) and American Association of State and Highway Transportation Officials (AASHTO) Publications.

2. New York City Building Code, 2014.

3. Geotechnical Engineering Report for DSNY Staten Island District 1&3 Garage Staten Island, New York prepared by Langan Engineering, Environmental, Surveying, Landscape Architecture, and Geology, D.P.C., dated 22 October 2018.

1.4 SUBMITTALS

A. Refer to DDC General Conditions Section 01 33 00 "Submittal Procedures."

B. Test Reports: Submit the following information for each source of each material submitted for review and comment by the Commissioner:

1. Test reports on borrow material as follows:

a. Particle size analysis in accordance with ASTM D 422 (sieve only).

b. Soil classification in accordance with ASTM D 2487

c. Moisture content in accordance with ASTM D 2216

d. Modified Compaction Curve in accordance with ASTM D 1557.

2. Include data for all samples indicating the exact location and methods of transportation and placement of all materials.

3. Include verification that borrowed material is not contaminated.

4. Submit a 5-lb (minimum) sample of each borrow material proposed for use as general fill, drainage fill and controlled fill.

C. Method Statement: Submit a detailed method statement, drawings, and calculations to be reviewed by the Commissioner. The method statement, drawings, and calculations shall be prepared by a Professional Engineer licensed in the State of New York. The submittals shall include but not limited to the following:

1. Earth excavation procedures.

2. Backfilling and compacting material, equipment, and procedures.

3. Sequences of work for walls, bracing, construction of the first floor, backfill procedure, etc.

D. Catalog Cuts: Submit catalog cuts and manufacturer's literature for compaction equipment, and waterproofing.

E. Certification For Examination of Site and Records: Before proceeding with the Work, submit certification in an acceptable form, signed by the Contractor, stating that careful examination has been made of the site, existing structures, existing adjacent structures, records of utility lines, test boring records, soil samples, subsurface exploration reports by the subsoil exploration consultant, the Drawings, and all other Contract Documents.

1.5 QUALITY ASSURANCE

A. Refer to DDC General Conditions Section 01 40 00 "Quality Requirements."

B. Codes and Permits:

1. All work shall comply with the requirements of the 2014 NYC Building Code, requirements of the New York State Department of Labor, requirements of Occupational Safety and Health Administration (OSHA), requirements of New York State Department of Health (NYSDOH), requirements of the New York State Department of Environmental Conservation (NYSDEC), requirements of the New York City Department of Environmental Protection (NYCDEP), requirements of the New York State Department of Transportation (NYSDOT), requirements of New York City Department of Transportation (NYCDOT), and with applicable requirements of all code requirements.

C. Special Inspection:

1. Before commencing work of this Section, meet with Construction Manager, Commissioner, and other concerned entities. Review the excavation and earthwork procedures and responsibilities including testing and inspection procedures and requirements. Notify participants at least three working days before the convening conference. Record discussions and agreements and furnish a copy to each participant.

1.6 PROJECT CONDITIONS

A. The Contractor, by careful examination, shall inform himself as to the nature and location of the work; the confirmation of the ground, the nature of the subsurface conditions; the locations of the groundwater table; the character, quality and quantity of the materials to be encountered; the character of the equipment and facilities needed preliminary to and during the execution of the work; and all other matters which can be in any way affect the work.

B. The Contractor shall be held to have visited the site and to have familiarized himself with the existing conditions of adjoining properties, utilities, and buildings.

C. Borings are available for the Contractor's review. The Commissioner makes no predictions or representations regarding the character or extent of soil, rock, or other subsurface conditions to be encountered during the work. The Contractor shall make his deductions of the subsurface conditions which may affect the methods or expense of construction of the work hereunder. Additional borings and other exploratory operations may be performed by the Contractor, at the Contractor's option and following the Commissioner's approval. No change in the Contract Sum will be authorized for such additional exploration undertaken by the Contractor.

D. Soil samples taken from the borings are available for the Contractor's inspection from the boring inspector.

E. The Contractor shall investigate the conditions of public thoroughfares and roads as to availability, clearances, loads, limits, restrictions, and other limitations affecting transportation to, ingress and egress of the site of the work. The Contractor shall conform to all New York City and State, and Federal regulations regarding the transportation of materials to and from and at the job site and shall secure in advance such permits as may be required.

F. The Contractor shall locate existing underground utilities in and beyond the areas of work. If utilities are indicated to remain in place, the Contractor shall provide adequate means of support and protection during the work.

1. Should uncharted, or incorrectly charted, piping or other utilities are encountered during excavation, consult utility owner immediately for directions. Cooperate with the City of New York and utility companies in keeping respective services and facilities in operation. Repair damaged utilities to the satisfaction of the utility owner.

2. Do not interrupt existing utilities serving facilities occupied by the City of New York or others, during occupied hours, except when permitted in writing by the Commissioner and then only after acceptable temporary utility services have been provided. Provide a minimum of 48-hour notice to the Commissioner, and receive written notice to proceed before interrupting any utility.

3. Demolish and completely remove from site existing underground utilities indicated to be removed. Coordinate with utility companies for shutoff of services if lines are active.

G. The Contractor shall examine drawings to determine the sequence of operations, and relation to work of other trades. The start of work will signify acceptance of field conditions and will acknowledge coordination with other trades.

1.7 PROTECTION

A. The work shall be executed so that no damage or injury will occur to the existing public and adjacent structures, streets, paving, sewers, gas, water, electric or any other pipes. Should any damage or injury caused by the Contractor, or anyone in Contractor's employ, or by the work under this Contract occur, the Contractor shall, at own expense, repair such damage and shall assume all responsibility for such injury.

B. The above shall also include the protection of all existing utilities (including sewers, water lines, electrical lines and telecommunication lines) to remain in use within and adjacent to the area affected by the work of this project.

C. Monuments, benchmarks and other reference features on streets bounding this project, shall be protected. Should these be disturbed in any manner, replace them at no expense to the City of New York.

1.8 SUBSURFACE STRUCTURES AND UTILITIES

A. The Contractor shall become acquainted with the existence and location of all surface and subsurface structures and utilities within the project area and beneath the surrounding streets. Do not damage any of those that are to remain and shall leave them accessible and make the necessary provision by sheeting, hanging, supporting or other means necessary to obtain this result, subject to the approval of the Commissioner, New York City Department of Buildings and Department of Transportation, and the utility companies involved.

1.9 ERRORS IN DEPTH

A. In the event that any part of the excavation is carried, through error, beyond the depth and the dimensions indicated on the drawings or called for in the specifications, then the Contractor, at his own expense, shall furnish and install gravel, stone, or concrete fill with which to fill to the required level at all locations, subject to approval of the Commissioner.

1.10 DEFINITIONS

A. Wherever the word "excavating", "excavate", "excavation", "carried down", "remove", etc., are used, they shall be taken to include the removal of all existing work, including brickwork, rubble work, former foundation remnants rubbish, earth, as well as rock, boulders, steel grillages and concrete, and all other materials and obstructions encountered; they shall also be taken to include all sheet piling, bracing, pumping, and all operations and items needed for the proper execution of the work. Excavation is considered unclassified.

B. Where the words "finished grades," "finished grade lines," or "future finished grades," appear in these specifications, they shall be taken to mean the finished elevations as indicated on the drawings.

C. Rough grading consists of cutting or filling to the elevation established on the Contract Drawings.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Site soils may be re-used provided they meet the environmental criteria provided in Section 02 61 13 - Excavation and Handling of Contaminated Materials, and the criteria provide in this section.

B. All fill and backfill shall be material classified as controlled fill by the 2014 New York City Building Code. Composition shall consist of angular sands and gravels. Flat structured material such as mica (the main component of "mole" rock) falling into the acceptable gradation or other material affecting the permeability and structural characteristics of sand material shall not be permitted.

C. Controlled Fill: Controlled-fill material shall consist of well-graded sand, gravel, crushed rock, or a mixture of these, or equivalent materials with a maximum of 10 percent passing the #200 sieve, as determined from the percent passing the #4 sieve.

D. Drainage Fill: Clean natural ¾-inch crushed stone (recycled concrete shall not be used as drainage fill) having the following gradations:

Sieve Size	% Passing by Weight
2 inch	100
¼ inch	25 to 60
No. 40	5 to 40
No. 200	0 to 5

E. General Fill: Shall be no more than 20% by weight of stones or masonry debris, containing no stones or other materials greater than 4 inches in any dimension and contain less than 50% by weight materials finer than No. 200 mesh sieve.

F. Fill for utility trenches shall meet the criteria given for structural fill and shall not contain sharp, angular pieces and pieces larger than 2 inches in any dimension.

G. Before bringing any fill to the site, submit the source for approval by the Commissioner, in accordance with Section 1.4 of this specification.

H. All fill materials (structural, granular, and general fill) required shall be free from wood, debris, combustible materials, vegetable matter or any material subject to decay or disintegration. Fill material shall not be contaminated.

PART 3 - EXECUTION

3.1 EXECUTION REQUIREMENTS

A. Refer to DDC General Conditions for execution requirements.

3.2 PREPARATION OF PROJECT SITE

A. Notify the Commissioner before the start of work. The notifications are to be in accordance with the Contract drawings.

B. Install all necessary protection equipment, structures such as fences, signs, scaffolding, etc. before the start of work.

C. Remove all existing structures, utilities, pavement in accordance with the Contract Documents.

D. Protect all utility lines, which are not to be abandoned. Contractor shall be responsible for any damage to utilities that may occur.

E. Perform test pits alongside each of the adjacent buildings to determine the extent and depth of the below-grade space and the foundation type.

3.3 PROTECTION AND MONITORING OF ADJACENT STRUCTURES, STREETS AND UTILITIES

A. The work shall be executed so that no damage or injury will occur to the existing public and adjoining or adjacent structures, streets, pavements, sewers, or utilities. Should any damage or injury caused by the Contractor, or anyone in Contractor's employ, or by the work under this Contract occur, the Contractor shall repair such damage and shall assume all responsibility for such injury.

B. The adjacent and surrounding structures, streets, and utilities shall be protected during the work described herein. Excavation work shall be restricted to hours indicated by the Commissioner.

C. The Contractor shall restore, to the satisfaction of Commissioner, by repair or otherwise, the portions of buildings, or their contents, altered by the Contractor in furtherance of his sheeting, and bracing work. Restoration shall be completed to the conditions, which existed before the start of work.

3.4 SITE DRAINAGE, PUMPING, AND DEWATERING

A. The Contractor shall assume the responsibility for site drainage and shall maintain such drainage during the life of this contract in a manner so as not to adversely affect adjacent areas and structures.

B. Provide adequate pumps, or other equipment, appurtenances, power, drains, materials and labor necessary to excavation continuously dry during excavation, foundation construction, and backfilling and at such other times as the progress of the work may demand or as necessary to ensure safety to the structure shall be provided.

C. All pumping both inside and outside the areas of the building shall be performed, continued and maintained as required for the completion of all work, including the work of the mechanical trades, throughout the period of the contract.

D. Manage runoff to limit the impact on construction.

E. The dewatering system or systems shall be installed and operated in such a manner as to avoid the movement of fines or loss of ground from below the bearing level and shall not influence the stability of surrounding areas. The facilities needed to eliminate loss of ground shall be included.

F. Do not use any portion of the building foundation units or any part thereof as a sump for drainage resulting from pumping in any other area. Do not conduct water to privately owned properties.

3.5 GENERAL EXCAVATION

A. The excavation shall be unclassified and shall comprise and include the satisfactory removal and legal disposal of all materials encountered regardless of the nature of the materials and shall be understood to include, boulders, earth, hardpan, miscellaneous fill, foundations, demolition debris from on-site buildings, structures, slabs, walls, utilities, pavements, curbs, piping and debris and shall comply with the environmental requirements in accordance with Section 02 61 13.

B. All excavation shall extend to the depths of the form and size required for the installation of the work as indicated on the drawings.

C. Excavation shall be to required elevations for the bottom of the foundation, cut-and-fill, etc. Excavation shall be made to a depth that will allow installation of the full depth of the raft, sub-base, and as shown on drawings with a 1-inch tolerance. Excavation lines shall provide sufficient clearance for the proper execution of all concrete work including allowances for formwork, shoring, and inspection.

D. A 3-inch-thick concrete mud-slab shall be required on all surfaces that will require horizontal waterproofing. All vertical surfaces to receive "blind-side" waterproofing shall require a flat/rigid substrate.

E. The bottom of excavations shall be leveled off and graded to receive foundations, slabs, pits, trenches, and grade beams.

3.6 EXCAVATION FOR BUILDING SLABS AND STRUCTURAL MEMBERS

A. Subgrades of building slabs and structural members including framed slabs and grade beams shall be approved by the Commissioner before proceeding with their construction. Subgrades resulting from excavation shall be free of unsuitable material (fill, loose rock pieces, organics, debris, etc.) as judged by the Commissioner.

B. Unauthorized Excavation: Excavations performed below the elevations shown or specified, shall be filled and compacted as hereinafter specified, at no additional expense.

C. Authorized Additional Excavation: Where the Commissioner determines that the bearing material encountered is unsuitable, remove the unsuitable bearing material. The removed material shall be replaced with controlled fill or concrete as directed by the Commissioner.

3.7 PROOFROLLING

A. Before backfilling, all excavations should be proofrolled using a minimum 5-ton roller. Any loose areas identified by proofrolling should be removed and replaced with controlled fill in accordance with Section 3.8.

3.8 FILLING, GRADING, AND COMPACTING

A. Filling and backfilling shall not be performed until work has been accepted by the Commissioner. All wood, paper, and other deleterious materials shall be cleaned out from excavations before backfilling.

B. The filling or backfilling within the area of the building shall be done so that there will be no void spaces below floors and bottoms of pits and trenches, unless otherwise noted

C. General: Material for fill and backfill shall be Controlled Fill as herein specified under Part 2 of these specifications. The material may be obtained from borrow sources and shall be free of any contamination.

D. Placing: Place fill in horizontal 12-inch-thick maximum loose layers to produce a uniform thickness of the material. Start placement in the deepest area and progress approximately parallel to the finished grade. Do not place fill where free water is standing, on frozen subsoil or on surfaces that have not been approved.

E. Compacting: Compact each layer of fill with the appropriate equipment listed below in this Article to achieve as a minimum the following percentages of maximum density at optimum moisture when tested in accordance with ASTM D1557:

LOCATION	% MAX. DENSITY
Under Building Slab-on-Grade	95
Under Paved Areas	95
Under Structural Members and Structural Slabs	92
Behind Foundation Walls	95

F. Under Slabs and Utilities - Compact each 12-inch-thick lift of the general fill with a minimum six overlapping passed with a 5-ton vibratory roller compactor in open areas. Use a 1-ton walk behind roller compactor to the extent possible in areas that preclude access by a 5-ton compactor. Use a plate tamper in and around penetrations, small restrictive areas, or any other areas not accessible to the 1-ton roller compactor.

G. Compaction Equipment: Granular fills (sand, gravel, friable earth) shall be compacted with a vibratory plate compactor not less than 0.5 ton in static weight to the extent possible. A jumping jack shall be used in and around penetrations, small restrictive areas, or any other areas not accessible to the roller or heavy plate compactor.

H. Backfilling against Foundation Walls: After completion of foundation walls and removal of forms, clean the excavation of all trash and debris before application of waterproofing and/or vapor barrier and placement of backfill.

I. Backfilling at the Cut-off wall: After completion of the utility line through the penetration at the soil-bentonite cut-off wall, install 4.5-foot-wide anti-seep collars with band clamps to the casing on either side of the cut-off wall. Backfill with a minimum of 1.5 feet of cement-bentonite seal all around the pipe to seal any penetrations through the sheet-piles and the cut-off wall. Backfill and compact the rest of the pit to existing grade with the controlled fill.

J. Do not backfill against foundation or basement walls until completion of supporting floor construction to the top of backfill or first level above the top of backfill, unless adequate temporary shoring is provided.

K. If Contractor elects to backfill against foundation or basement walls before completion of supporting floor slabs, these walls shall be shored. Temporary shoring shall be designed by a professional engineer licensed in the State of New York, retained by the Contractor. Shoring design and calculations shall be submitted to the Commissioner for their review and approval.

L. In placing backfill, take special care to prevent wedge action, eccentric loading or overloading of the structure by equipment used for compacting backfill material, and to prevent damage to waterproofing on walls. Where subsoil drainage systems are installed, place backfill to prevent any damage to the systems. Any damage to waterproofing or drainage systems caused by backfilling or excavation operations shall be corrected or replaced by the Contractor at his expense.

M. Additional backfilling required to bring fill to the finished subgrades shown shall be done by the Contractor only after the concrete walls or piers, against which the backfilling is done, have attained their full design

strength, have been braced, and the written permission to backfill is obtained from the Commissioner. If fill is required on both sides of a wall, it shall be brought up simultaneously and evenly on both sides.

N. Do all filling necessary to bring the ground surfaces to the required levels for floors, pits, and areaways as shown on the drawings.

O. Any surplus materials shall be removed from the site and legally disposed of. Should additional material be required for the placing of backfill, other than material obtained from the site, the Contractor shall obtain, and deliver and place accepted backfill material as required.

3.9 FIELD QUALITY CONTROL

A. The Commissioner shall review all laboratory test results and submitted reports specified in this Section.

B. The Commissioner will interpret the tests, state in each report whether or not the test specimens and results comply with all requirements of the Contract Documents and note any deviations.

C. The Commissioner will identify when and where samples are to be obtained for testing.

D. Collect samples and forward them to a Testing Laboratory. Testing Laboratory will submit the following laboratory test reports to the Commissioner.

1. Laboratory results conducted on each type of borrow and fill material:

   a. Gradation Analysis – ASTM D 422.

   b. Atterberg Limits – ASTM D 4318.

   c. Modified Moisture Density Curve Determination – ASTM D 1557.

2. The Commissioner will review for conformance of materials to be used for fills, based on the gradations given in these specifications.

E. Engineering Inspection:

1. All engineering inspections shall comply with the requirements of the 2014 New York City Building Code.

2. Building Slab Subgrades: The Special Inspector shall inspect subgrades for all building slabs and footing elements. No pavement, slab, or footing shall be constructed unless the subgrade is approved by the Special Inspector.

3. Proofrolling: Proofrolling operations shall be inspected by the Special Inspector.

4. Backfilling and Compaction: The City of New York shall hire a Special Inspector to verify the densities of the fill placed. The Special Inspector shall take field density tests of the fill placed and shall report to the Commissioner. No fill shall be placed without inspection and approval of the Commissioner. The Special Inspector will conduct field tests (in accordance with ASTM D 2922) of the subgrade for every 2,500 sq-ft, but not less than three tests per lift in each area, and a minimum of three tests for every compacted soil lift behind foundation walls.

3.10 CLEAN-UP AND DISPOSAL

A. All excess material including, earth, rock, fill, shall be removed from the site and legally disposed of in accordance with the DDC General Guidelines.

B. All lumber, forms and metalwork shall be removed immediately after completion of local areas. Remove all debris produced by work to this section from the site.

C. Sidewalk and streets adjoining the property shall be broom cleaned and free of debris, rubbish, trash and obstructions of any kind caused by the work of this Section.

D. The removal and disposal shall be in accordance with Section 02 61 13 - Excavation and Handling of Contaminated Materials and Section 31 10 00 – Site Clearing, Removals and Preparation.

3.11 MONITORING EXISTING STRUCTURES

A. Before starting work, the Contractor's Professional Engineer licensed in the state of New York and Land Surveyor licensed in the state of New York shall check and verify governing dimensions and elevations, survey existing conditions, and record any prior settlement or cracking of structures, pavements, and other improvements. Document with photos and videos all adjacent structures prior to the beginning of any construction activities.

B. The monitoring points shall be established by the monitoring company employing a Professional Land Surveyor licensed in the State of New York, and referenced to a fixed off-site benchmark.

C. Monitoring of Excavation Support System: Install reference points at a maximum spacing of 24-ft on-center around the entire perimeter of the excavation to properly monitor the ground movements behind the excavation support system. As the excavation proceeds, install points on the soldier pile to measure potential lateral deflection at about 24-ft on-center. These locations shall be subject to review by the Commissioner.

D. Monitoring of Adjacent Buildings: Install a minimum of 4 reference points on the upper third and the lower third of the adjacent building face abutting the excavation. The monitoring company will also conduct crack monitoring of the adjacent building.

E. Ground Vibrations: The vibration monitoring locations shall be selected by the Commissioner.

1. The seismographs will be provided by, and the monitoring performed by the Testing Agency.

2. Monitoring shall be performed before the start of work to obtain ambient levels, and daily during excavation and foundation construction work.

F. Crack Gauges: Monitoring points shall be installed at cracks observed during the execution of Preconstruction-Conditions Documentation and as required as the work progresses, as determined by the Contractor, and as directed the Commissioner.

G. Frequency and Reporting

1. Vertical and Lateral Displacements - Monitoring shall be performed twice on a weekly basis during any excavation support or foundation work. Readings shall be taken to nearest 0.005 ft. Written

reports summarizing the monitoring results shall be submitted by the Contractor's Professional engineer licensed in the State of New York to the Commissioner for review on a weekly basis. The reports shall be submitted in both electronic copies and hard copies. The reports shall include the raw data points as well as graphs and tables summarizing the monitoring data.

2. Ground Vibrations – The ground vibrations caused by the foundation work, bracing and foundation installation operations shall be monitored continuously with threshold-type seismographs capable of measuring ground movements to 0.02 in/sec. Written reports summarizing the monitoring results shall be submitted by the Contractor's Professional engineer licensed in the State of New York to the Commissioner for review on a weekly basis.

3. Crack Gauges: At a minimum, crack gauges shall be measured on a weekly basis. The frequency of monitoring shall be increased as directed by the Commissioner.

H. Alert levels: Should any of the following magnitudes of movement be detected, the contractor shall immediately take remedial action and advise the Commissioner.

1. Vibration Monitoring: Peak particle velocities

   a. Threshold Level: 0.5 inches per second for all buildings, and other structures.

   b. Limit Level: 2.0 inches per second for all buildings, and other structures.

2. Crack Gauge Monitoring: Cumulative movement in any direction

   a. Threshold Level – 1/16 inch in any direction

   b. Limit Level – 1/8 inch in any direction

3. Survey Monitoring:

   a. Threshold Level:

      i) Vertical or horizontal movement of buildings: 1/4-inch total movement, or 3/16-inch between two consecutive readings.

      ii) Vertical or horizontal movement of SOE Wall: 3/4 inch total movement, or 1/4-inch between two consecutive readings.

   b. Limit Level:

      i) Vertical or horizontal movement of buildings: 3/4-inch total movement, or 3/8-inch between two consecutive readings.

      ii) Horizontal movement of building or other surface structures: 1.5-inch total movement, or 1/2-inch between two consecutive readings.

4. Groundwater Monitoring:

a. Threshold Level – 1-foot increase or decrease in any measurement after pumping has stabilized at any temporary subgrade during excavation

b. Limit Level – 2 feet increase or decrease in any measurement after pumping has stabilized at any temporary subgrade during excavation.

3.12 ACTION ITEMS

A. Any movement or vibration exceeding the criteria outlined in 3.11 above shall be reported immediately to the Commissioner. Work in the immediate area shall be suspended, unless directed otherwise by the Commissioner. Corrective measures to ensure integrity and stability of adjacent structures shall be the responsibility of the Contractor.

B. In the event that a Threshold Level is reached the following shall be required:

1. The Commissioner shall be notified of the exceedance.
2. The exceedance shall be investigated to identify potential correlation to construction activities.
3. Contractor shall meet with the Commissioner and DOB to discuss the need for a response to mitigate the potential for readings exceeding the Threshold Level.
4. Where required, submit a detailed plan of action to mitigate the potential for additional movement or vibration.
5. Install additional instruments as required evaluate the need for any action necessary to prevent reaching the Threshold Level.

C. In the event that a Limit Level is reached the following shall be required:

1. The Commissioner shall be notified of the exceedance.
2. Construction shall be suspended. The exceedance shall be investigated to identify potential correlation to construction activities.
3. Inspect the building (or portions thereof) for potential damage. Inspections shall be made by the Special Inspector for structural stability, the Contractor's Engineer, and the Commissioner.
4. Immediately notify to DOB and the Commissioner in case of damage or unsafe condition.
5. Excavation and foundation construction procedures shall be re-assessed as necessary to maintain vibration levels and movements within acceptable limits.
6. Work stoppage to assess excavation methods and to inspect the buildings identified herein for damage is at the Commissioner's discretion.
7. Develop alternate methods and procedures, subject to the review and approval of the Commissioner.
8. Resume work using the agreed upon alternative method.

9. Notify DOB of events that exceed allowable limits and of corrective measures implemented to maintain acceptable limits.

D. Restore, to the satisfaction of the Commissioner, the portions of buildings, or their contents, altered by the Contractor in furtherance of his sheeting, and bracing work. Restoration shall be completed to the conditions, which existed before the start of work.

END OF SECTION 31 00 00

SECTION 31 10 00
Site Clearing, Removals and Preparation

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The following documents apply to all required work for the Project: (1) the Contract Drawings, (2) the Specifications, (3) the General Conditions, (4) the Addendum and (5) the Contract (City of New York Standard Construction Contract).

B. LEED / Environmentally Preferable Purchase (EPP) General Requirements:
   1. Refer to DDC General Conditions and the Addendum to the General Conditions
   2. LEED requirements apply to all Phase II work with the exception of the Existing Building scope. EPP requirements apply to the project's Existing Building scope only.

1.2 SUMMARY

A. Work includes:
   1. Miscellaneous site clearing including removal of trees, asphalt, concrete, curbs, rails, fences, storage containers, and mobile trailers in preparation for site improvements.
   2. Protection of existing utilities.
   3. Disconnection and capping or removal of identified utilities and in-service unidentified utilities encountered.
   4. Backfilling voids in subgrade created as a result of removals.

B. Related Sections
   1. Section 02 61 13 – Excavation and Handling of Contaminated Materials
   2. Section 31 00 00 – Earthwork
   3. Section 31 25 00 - Soil Erosion and Sediment Control
   4. Section 33 02 00 - Protection of Existing Utilities

1.3 SUBMITTAL PROCEDURES

A. Refer to DDC General Conditions Section 01 33 00 "Submittal Procedures".

1.4 ENVIRONMENTAL REQUIREMENTS

A. Construct erosion control systems as shown on the plans or as directed by the Commissioner to protect adjacent properties and water resources from erosion and sedimentation.

1.5 QUALITY ASSURANCE

A. Refer to DDC General Conditions Section 01 40 00 "Quality Requirements".

PART 2 - PRODUCTS

PART 3 - EXECUTION

3.1 EXECUTION REQUIREMENTS

A. Refer to DDC General Conditions for execution requirements.

3.2 PREPARATION

A. Verify that construction phasing and clearing limits are clearly tagged, identified and marked.

3.3 PROTECTION

A. Locate and identify existing utilities that are to remain and protect them from damage as indicated on the Contract Drawings.

B. Conduct operations with minimum interference to public or private access ways and facilities. Maintain access and egress at all times and clean or sweep any roadways daily or as required by the 2014 New York City Construction Codes and the New York City Department of Transportation. At such times as deemed necessary by the Commissioner, dust control shall be provided in accordance with specification Section 31 25 00 – Soil Erosion and Sediment Control.

C. Protect benchmarks, property corners and all other survey monuments from damage or displacement. If a marker needs to be removed it shall be referenced by a Land Surveyor registered in the State of New York and replaced, as necessary, by the same at no additional expense to the City of New York.

D. Provide traffic control as required, in accordance with the U.S. Department of Transportation "Manual of Uniform Traffic Control Devices" and New York City Department of Transportation requirements.

3.4 CLEARING AND REMOVAL

A. Clear areas required for access to site and execution of work.

B. Unless otherwise indicated on the Contract Drawings, improvements or obstructions interfering with installation of new construction shall be removed completely. Backfill shall be conducted with suitable on-site fill material or suitable imported material placed and compacted as per Section 31 00 00 - Earthwork.

C. Existing utilities to be removed/abandoned shall be properly disconnected in accordance with the applicable utility. Contractor shall provide the utility two week prior notice, in writing, to the Commissioner before the work is to commence to schedule and coordinate disconnect of utility with other surrounding functions.
   1. Utilities indicated to be removed shall be removed completely including all pipe and structures foundations. Trenches shall be backfilled and compacted in accordance with the specifications or as directed by the Commissioner.
   2. Utilities indicated to be abandoned shall be left in place unless directed otherwise by the Commissioner.

3.5 DISPOSAL OF MATERIALS

A. No burning of any material, debris or trash on site or off site will be allowed.

B. Transport site debris, rubbish and other materials with appropriate vehicles, and legally dispose of off-site to areas approved by the Commissioner.

END OF SECTION 31 10 00

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SECTION 31 21 16
Sub-Membrane Depressurization System

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The Following Documents Apply To All Required Work For The Project: (1) The Contract Drawings, (2) The Specifications, (3) The General Conditions, (4) The Addendum and (5) The Contract [City Of New York Standard Construction Contract].

B. LEED / Environmentally Preferable Purchase (EPP) General Requirements:

1. Refer to DDC General Conditions and the Addendum to the General Conditions
2. LEED requirements apply to all Phase II work with the exception of the Existing Building scope. EPP requirements apply to the project's Existing Building scope only.

C. The following documents have been prepared for the rehabilitation project and are included with the Contract Documents:

1. 22 June 2018 Phase I Environmental Site Assessment (ESA), prepared by Louis Berger & Associates., P.C. (Louis Berger).
2. 12 October 2018 Phase II Environmental Site Investigation (ESI) Report, prepared by Louis Berger.
3. 09 September 2019 DSNY Landfill Infrastructure Modifications, prepared by Langan Engineering, Environmental, Surveying, Landscape Architecture and Geology, D.P.C. (Langan).
4. 22 October 2018 Geotechnical Engineering Report, prepared by Langan.

D. Related Sections:

Sections containing requirements related to this Section include, but are not limited to:

1. Section 01 91 00 – General Commissioning Requirements
2. Section 02 01 02 – Vapor Barrier Installation
3. Section 02 61 13 – Excavation, Handling, Transportation, And Disposal Of Contaminated Materials
4. Section 33 49 10 – Other Utilities
5. Section 31 00 00 – Earthwork
6. Division 22 – Plumbing
7. Division 26 - Electrical

1.2 GENERAL REQUIREMENTS

A. The Contractor is responsible for the proper and complete installation of a hybrid sub-membrane depressurization (SMD) system and the requirement accessories in accordance with the Contract Documents and Design Drawings.

B. The Contractor shall furnish all labor, materials, equipment, and incidentals required to conduct the work of this Section.

C. The Contractor shall accept the site "as-is" and shall be deemed to have reviewed all drawings, reports and documents applicable to this work prior to submitting a bid.

D. Where there is discrepancy between this specification and the other Contract Documents, the most stringent requirements shall be followed by the Contractor.

1.3 SCOPE OF WORK

A. This Section provides requirements for the installation of a SMD system under the footprint of the new building foundation slab, as shown on the Contract Drawings. The SMD system is designed as a hybrid passive system with automated transition to an active system based on field conditions. Once installed, the SMD system must comply with post-installation start-up testing and remain in continuous operation.

B. Provide all labor, materials, equipment, and services to furnish, install, inspect, test, and startup the SMD system in accordance with the New York City Building Codes, this Section, all requirements of the Contract Documents, and as indicated on Design Drawings N-200 through N-203 provided.

C. Failure to comply with these requirements will be considered a failure of materials and workmanship.

D. Section includes furnishing and installation of SMD system consisting of:

1. Geotextile fabric
2. Clean crushed stone layer (air-permeable aggregate)
3. Perforated sub-membrane vapor collection piping
4. Metal riser, vent piping, and associated valves (details provided in other Sections)
5. Methane sensor/transmitters
6. Roof-top wind turbines and active blower systems
7. Exhaust piping
8. Control panel station (details provided in other Sections)
9. Electrical runs and alarm system (details provided in other Sections)

E. Prepare an as-built drawing of the installed components, below the slab, within the building, and at the roof.

F. No work shall be performed under this specification section without oversight by the Commissioner.

G. Worker health and safety monitoring is the responsibility of the Contractor.

1.4 REFERENCE STANDARDS

All work and materials under this Section shall conform to the latest revision of the following standard specifications and project documents, where not otherwise required by the Contract Documents:

A. New York City Building Code, including, but not limited to:

1. 2014 New York City Mechanical Code, Chapter 5, Section MC 512 - Subslab Exhaust Systems.
2. 2014 New York City Plumbing Code, Chapter 7, Section PC 702 - Materials.

B. Final Guidance for Evaluating Soil Vapor Intrusion in the State of New York prepared by New York State Department of Health (NYSDOH), dated October 2006 and subsequent amendments.

1.5 QUALIFICATIONS

A. Vapor Collection Pipe Qualifications:

1. All fittings and connections for the vapor collection pipe shall be made by the same manufacturer.
2. Contractor installing the vapor collection piping below the slab shall have reviewed the Contract Drawings before beginning installation.

B. Blower Assembly Manufacturer Qualifications:

1. The manufacturer providing the blower assemblies specified in this Section must have been regularly engaged in the manufacture of material or equipment similar in type and application to that required for this Project.
2. Obtain all components of blower assembly from a single Manufacturer.
3. All components shall be compatible with volatile organic compounds (VOCs) and landfill gases, particularly methane.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Conform to the manufacturer's requirements to prevent damage to materials.

B. Delivery:

1. Deliver materials to the site only after the Commissioner has reviewed and approved the required submittals.
2. Deliver materials to site in original unbroken packages bearing manufacturer's label showing brand, weight, volume, and batch number.
3. Deliver materials to site properly protected and undamaged. Replace any damaged materials at no cost to the Commissioner/City of New York unless the damaged material can be repaired per the manufacturer's requirements and to the satisfaction of the Commissioner/City of New York and such that the integrity of the SMD system is not compromised.
4. Provide the following documentation for all delivered materials, as applicable:
   a. Manufacturers Identification
   b. Product Identification
   c. Lot Number

C. On-Site Storage and Handling:

1. Store materials at site in strict compliance with manufacturer's instructions.
2. Store in allocated spaces on a level surface.
3. Protect from puncture, dirt, grease, moisture, mud, mechanical abrasions, excessive heat, ultra-violet light, freezing, or other damage.
4. Use handling equipment to load, move, or deploy materials that will not cause any damage to the materials.

1.7 PROJECT CONDITIONS

A. The Department of Sanitation garage rehabilitation project (site) is located at the northwest corner of Muldoon Avenue (private) and West Shore Expressway service road in Staten Island, New York (the Site) and is identified as Block 5900, Lot 500 on the Staten Island Tax Map. The Site occupies an area of approximately 680,000 square feet and is improved with the existing Staten Island District 3 repair garage, recycling area, wastewater treatment facility, and asphalt-paved and gravel-topped parking lots. According to the 29 March 2018 topographical survey prepared by Langan, the grade fronting the Site along Muldoon Avenue slopes down from about el. 23 feet (north) to el. 10 feet (south), and the grade in front of the site along the West Service Road slopes down from about el. 32 feet (northeast) to el. 10 feet (south). All elevations are referenced to the North American Vertical Datum of 1988 (NAVD88).

B. Based on the findings of the 12 October 2018 Phase II ESI prepared by Louis Berger, the Site contains chlorinated VOCs at concentrations for which the NYSDOH Guidance for Soil Vapor Intrusion in the State of New York recommends mitigation as the recommended remedial action. Concentrations of methane were also detected above background concentrations that would be mitigated from intruding into the new building via the remedial action.

C. The City of New York and Commissioner make no predictions or representations regarding the available information. No information derived from the referenced documents will, in any way, relieve the Contractor from the responsibility of making its own evaluations, inspections, and determinations with respect to the vapor barrier installation.

D. The Contractor shall investigate the conditions of public thoroughfares and roads as to availability, clearances, loads, limits, restrictions, and other limitations affecting transportation to, ingress and egress of the Work Site. The Contractor shall conform to NYSDOT, USEPA, and NYSDEC regulations in regard to the transportation of materials to and from and at the job site.

E. Examine all Contract Documents and drawings to determine the sequence of operations in relation to the work of other trades, if they are present. Start of work will signify acceptance of field conditions and will acknowledge coordination with other trades.

1.8 QUALITY ASSURANCE

A. Refer to DDC General Conditions Section 01 40 00 "Quality Requirements".

1.9 SUBMITTAL PROCEDURES

A. Refer to DDC General Conditions Section 01 33 00 "Submittal Procedures".

1.10 SUBMITTALS

A. Coordinate all submittals to comply with the requirements of the Contract Documents, as well as the requirements of this Section.

B. Provide the manufacturer's information, including detailed technical product data sheets, specifications, installation instructions, catalog cuts, material certificates, and/or material samples, as applicable, for the materials specified in Part 2 of this Section. Provide the manufacturer's information to the Commissioner for review at least 14 days before initiating work.

C. Submit Shop Drawings depicting the proposed vapor collection pipe layouts and any proposed changes, including vapor collection pipe locations, riser locations at the foundation slab and through the building,

sleeve locations, etc., for Commissioner review at least 14 days before initiating work.

D. Submit the source type and gradation of the aggregate for approval by the Commissioner at least 14 days before initiating work.

E. Upon completing installation, testing, and startup of the SMD system, provide any and all documents related to the SMD system including, but not limited to, manufacturer's manuals, complete as-built drawings (to scale), and testing reports, when requested by the Commissioner and City of New York and at no additional cost.

PART 2 - PRODUCTS

2.1 SUBSLAB MATERIALS

A. General:

1. Furnish only new materials and equipment that are in first-class condition and supplied directly from the manufacturer.

2. Provide additional installation accessories as necessary for a complete SMD system, ready for use. Ensure accessories are from same manufacturers as products. Furnish all manufacturer recommended accessories.

B. Geotextile: Non-woven, polypropylene geotextile fabric having the following properties:

Property	Test Method	Value (Minimum Average Roll Values)	Units
Grab Tensile Strength	ASTM D 4632	0.40 (90)	kN (lbs)
Grab Tensile Elongation	ASTM D 4632	50	%
Mullen Burst Strength	ASTM D 3786	1205 (175)	kPa (psi)
Trapezoidal Tear Strength	ASTM D 4533	0.18 (40)	kN (lbs)
Puncture Strength	ASTM D 4833	0.2 (55)	kN (lbs)
UV Resistance at 500 hrs.	ASTM D 4355	70	% Strength Retained
Apparent Opening Size	ASTM D 4751	0.25 (60)	mm (US Sieve)
Permittivity	ASTM D 4491	2.0	sec^{-1}
Flow Rate	ASTM D 4491	5907 (145)	$L/min/m^2$ ($gal/min/ft^2$)

C. Pervious Stone Aggregate Layer:

1. Furnish clean, coarse, natural, angular, washed ¾-inch stone aggregate with the following gradation:

Sieve Size	% Passing By Weight
1 ½"	100
1"	90 – 100
½"	0 – 5
#200	< 1

2. Recycled concrete aggregate or a stone that will crush into smaller pieces (e.g. schist) shall not be permitted for installation in the SMD system.

3. Provide materials free from wood, debris, combustible materials, vegetable matter, any material subject to decay or disintegration, brick, concrete, and glass.

D. Perforated Vapor Collection Piping:

1. 4-inch-diameter, double-walled (smooth-interior), corrugated, perforated, high density polyethylene (HDPE) pipe with a minimum pipe stiffness of 35 pounds per square inch (psi) at 5% deflection.

2. Perforations shall be slot-type. There shall be, at a minimum, three equally spaced perforations per groove (i.e. depressed section of the corrugated pipe) of the corrugated pipe. Perforations on alternating grooves shall be off-set.

3. 4-inch-diameter HDPE fittings and couplings, including elbows, cross fittings, and tees, to connect pipe sections shall be snap type. Provide fittings and couplings made by the same manufacturer as the 4-inch-diameter pipe, of the type recommended by the manufacturer for use with the pipe.

4. Use 2-inch-wide tile tape to secure fittings, couplings and connections in place.

5. Polyester filter sleeves shall be provided to wrap around perforated vapor collection piping. Polyester filter sleeves shall have a minimum air permeability of 700 $ft^3/ft^2/min$.

E. Slab Penetration Pipe Sleeve and Seals:

1. Furnish pipe sleeves and modular seals for vent and riser pipe penetrations through the concrete slab.

2. Furnish appropriately sized pipe sleeves for 4-inch-diameter metal riser and vent pipe. Pipe sleeves shall be molded non-metallic, HDPE sleeves with integral hollow, molded water-stop ring 2 inches larger than the outside diameter of the sleeve itself.

3. Seal shall be a modular, mechanical seal consisting of rubber links shaped to continuously fill the annular space between the pipe and the sleeve. Seal pressure plates shall be molded of glass reinforced nylon. Seal hardware shall be mild steel with a 60,000 psi minimum tensile strength and 2-part zinc dichromate coating per ASTM B-633, and have organic coating tested in accordance with ASTM B-117 to pass a 1,500-hour salt spray test, or be 316 stainless steel. Coloration shall be throughout elastomer for positive field inspection. Each link shall have permanent identification of the size and manufacturer's name molded into the pressure plate and sealing element.

4. For any wet, curing sealants which are field-applied on the interior of the building (inside the weatherproofing barrier), the maximum VOC content shall be 250 grams per Liter (g/L). The above criteria do not apply to solid sealant products.

2.2 ABOVE-SLAB MATERIALS

A. Metal Riser and Vent Piping (Details provided in other Sections):

1. Furnish metal riser and vent piping in accordance with the requirements of Division 22- Plumbing in the Contract Documents.
2. Metal riser and vent piping shall be in accordance with New York City Building Code, including but not limited to:
   a. 2014 New York City Mechanical Code, Chapter 5, Section MC 512 – Subslab Exhaust Systems.
   b. 2014 New York City Plumbing Code, Chapter 7, Section PC 702 – Materials.
3. Metal riser piping shall be connected and secured directly to the sub-membrane fitting (i.e., HDPE elbow/tee) at each riser location through the concrete slab.

B. Electrical Connections (Details provided in other Sections):

1. Furnish electrical connections to blower assembly, including blower, control panel, and remote visual alarm.
2. Furnish electrical connections to solenoid valves and control panels
3. Electrical connections shall be in accordance with applicable Contract Documents and Specifications, including but not limited to Division 26 - Electrical.

C. Wind Turbine – Passive Ventilation:

1. Passive ventilation will be provided by a stainless-steel, wind-driven, rotary turbine ventilator consisting of a 12-inch-diameter base and rated for an airflow of 440 cubic feet per minute (cfm) with a 4 mile per hour (mph) wind speed.
2. Wind turbine shall be installed at least 4 feet above the base of the roof, measured from the roof surface to the base of the rotary turbine.

D. Blower Assembly – Active Ventilation:

1. Provide six blower assemblies, including one spare blower assembly, fully constructed by the manufacturer. Each blower assembly shall include a vacuum blower, blower motor, baseplate, electrical control panel, valves, vacuum gauges, air filters, explosion-proof enclosures, flexible hose, and remote visual alarm.
2. Blower assemblies shall be fireproof, spark resistant, and corrosion resistant.
3. Blower assemblies shall be designed and manufactured for outdoor continuous service and shall be all-weather resistant.
4. Blower assemblies (six to be installed plus one spare) shall provide, at continuous operation:
   a. A minimum of 115 cfm flow rate at 35 inches of water column (inches WC) vacuum at each blower installed at risers located between grid lines.
   b. A minimum of 115 cfm flow rate at 35 inches WC vacuum for the spare blower to be provided to the Commissioner and City of New York.
5. Blowers shall be able to remain in continuous operation at a vacuum of up to 80 inches WC.
6. Blowers will require a three-phase, 60 Hz, 230 volt power supply. Power requirements may vary

depending on the blower manufacturer and model selected by the Contractor.

7. Vacuum blowers shall have non-contacting impellers.
8. Blower motors shall be totally enclosed, fan-cooled (TEFC) motors of rugged die cast aluminum construction. Blower motors shall be rated as explosion-proof.
9. Control panel housed in a weather-proof enclosure rated as explosion-proof.
10. Vacuum gauges shall have a range between 0 to 80 inches WC.
11. Sound enclosures shall be weather-proof and rated as explosion proof.
12. The remote visual alarm shall be labeled as follows:

SUB-SLAB VAPOR VENTING SYSTEM ALARM BLOWER MALFUNCTION IF LIT SERVICE BLOWER IMMEDIATELY

E. Exhaust Stack:

1. Furnish 2-inch-diameter metal pipe for exhaust stack connecting to the blower exhaust. Metal piping shall be in accordance with the requirements of Division 22- Plumbing.
2. Furnish appropriate fittings and couplings, including reducer if necessary, to connect exhaust stack to blower assembly, between pipe sections.
3. Furnish compatible metal rain guard or rain cap to be installed at end of exhaust stack. The guard or cap shall be designed to not produce back pressure on the blower.
4. Point of exhaust shall be at least 2 feet above the highest elevation roof line of building.

F. Methane Sensors

1. Methane gas sensors/transmitters shall provide continuous monitoring for methane gas in riser pipes connected to the vapor collection pipe and at indoor locations mounted within the building as shown on the Contract Documents and drawings.
2. Sensors/transmitters shall feature a non-dispersive, infrared (IR) sensor, backlighted graphics display, four-button (magnetic-switch) panel, onboard CPU, and integrated alarm system.
3. Sensors shall be constructed in an explosion proof, stainless steel housing.
4. Power requirements for each sensor will be 12 to 30 volt DC power.

G. Control Panels (Designed by Others – Details Provided in Other Sections)

1. Blowers for active ventilation, sensor/transmitters, and motorized solenoid valves will be powered by a control panel.
2. The control panel will contain the methane sensor transmitters, main power disconnect switch, 24 volt DC power supply, and relays for motorized solenoid valves.

PART 3 - EXECUTION

3.1 EXECUTION REQUIREMENTS

A. Refer to DDC General Conditions for execution requirements.

3.2 GENERAL

A. Prior to installation, schedule a meeting at the project site to be attended by all involved parties (i.e., the persons implementing this Section and the Commissioner). The purpose of this meeting is to review materials, applications, and procedures to be followed during installation of the SMD system.

B. Coordinate installation of the SMD system with the installation of other utilities and structural components.

C. Install all components of the SMD system in accordance with all applicable New York City Building Codes, all requirements of the Contract Documents, this Section, as indicated on the Contract Documents design drawings (N-200 through N-203) and as directed by the Commissioner.

3.3 SUBGRADE CONSTRUCTION

A. Subgrade Preparation:

1. Excavate the subgrade to the depth required to install the pervious stone layer below the elevation of the bottom of the floor slab, as shown on the Design Drawings N-200 through N-203.
2. Prepare the subgrade in accordance with Section 026113 – Excavation, Handling, Transportation, and Disposal of Contaminated Materials.
    a. Remove any rocks, stones, sticks, roots, sharp objects, or construction debris of any kind prior to placement of the geotextile fabric.
    b. Do not place geotextile on standing water, ground with excessive moisture, or frozen ground.
    c. The Commissioner shall approve the subgrade prior to initiating work.
3. Place geotextile fabric on the prepared subgrade across the entire footprint of the areas designated for depressurization. Overlap and secure geotextile per the manufacturer's recommendations.

B. Pervious Stone Aggregate Layer:

1. Place a minimum 8-inch-thick layer of the ¾-inch aggregate on top of the geotextile fabric. Install this layer as shown on Design Drawings N-200 through N-203.
2. At locations of perforated vapor collection piping, a minimum 2-inch-layer of the clean, coarse, natural, angular ¾-inch aggregate must overlie the perforated pipe and a minimum 2-inch layer of the aggregate must underlie the perforated pipe. Where the aggregate layer is thicker than 8 inches, the vapor collection pipe shall maintain an elevation of 2 inches below the bottom of the concrete slab, where possible.
3. Maintain the gradation (cleanliness, absence of fines) of the pervious stone layer throughout construction. Replace any stone that is not properly protected or maintained at no additional charge to the project.

C. Perforated Vapor Collection Piping:

1. Place perforated vapor collection piping at locations and in the configuration shown on Design

Drawings N-200 through N-203.

2. Join perforated vapor collection piping sections with compatible, flexible 4-inch-diameter fittings and couplings.
3. Secure all fittings, couplings, and pipe ends to perforated vapor collection piping with two layers of 2-inch-wide tile tape. Duct Tape shall not be used.
4. If not prefabricated, install one layer of polyester filter sleeves/socks to wrap all perforated vapor collection pipe.

3.4 SLAB PENETRATIONS

A. Sleeve and seal all pipe and conduit penetrations (including metal riser and vent pipe, mechanical, electrical, plumbing, etc.) through concrete slab as shown on Design Drawings N-200 through N-203.

B. All penetrations through the concrete slab shall be air tight.

C. Penetrations through the vapor barrier membrane shall be performed in accordance with the vapor barrier manufacturer recommendations and Specification 02 01 02 Vapor Barrier Installation.

3.5 METAL RISER AND VENT PIPING INSTALLATION:

A. As shown on Design Drawings N-200 through N-203, connect metal riser and vent piping to perforated vapor collection pipe system using compatible fittings.

B. Make riser connection to compatible fitting beneath the concrete slab penetration and pipe sleeve so that only the metal riser pipe is penetrating the concrete slab, as shown on the Design Drawings.

C. Route metal riser and vent piping from the slab penetration and pipe sleeve, through the building, to the roof-top wind turbine and mounted blowers, as shown on the MEP Drawings.

D. Install pipe cleanout, vacuum gauges, sampling port, and manual gate valve at an accessible height near the slab riser slab penetration point.

E. Manifold for the passive and active riser pipe shall be in an accessible location. Motorized solenoid installed on the riser piping shall be connected to electrical power and the system control panel as shown on the MEP Drawings.

F. Secure and support metal riser and vent piping as shown on the MEP Drawings.

G. Clearly label metal riser and vent piping in each accessible area, at a minimum of every 10-linear-feet of accessible/visible pipe run. Label the metal riser and vent piping to read:

CAUTION: DO NOT ALTER SUB-SLAB VAPOR VENT PIPE

3.6 INSTALLATION OF WIND TURBINES AND BLOWER ASSEMBLIES

A. Install each wind-driven rotary turbine at the locations shown on the MEP Drawings.

B. Wind turbines shall be installed at least 4 feet above the roof, measured from the roof surface to the base of the turbine.

C. Install each blower assembly on building roof-tops, at locations shown on MEP Drawings.

D. Install each blower assembly as per manufacturer's recommendations.

E. Supply power supply to each blower assembly, including blower, control panel, and remote alarm, in accordance with Division 26 – Electrical.

3.7 HYBRID SYSTEM OPERATION

A. The passive risers will be operational at all times, except when the inline methane sensor detects methane gas concentrations above the set-point. When the methane concentration set-point is triggered, the motorized solenoid valve on the active riser will automatically open and the motorized solenoid valve on the passive riser will close.

B. The methane gas sensor/transmitter units will contain integral display, single alarm set points, and alarm relays to turn the blower and motorized solenoid valve(s) on or off (open or closed). The inline methane sensors will continuously monitor the potential build-up of methane gas inside the riser pipe and indoor methane sensors will be installed to monitor methane concentrations inside of the building. All wiring will be installed in a suitable explosion-proof conduit in accordance with all applicable electrical codes and Division 22 – Electrical.

C. The methane gas mitigation blower(s), sensors/transmitters, and motorized solenoid valves will be powered by a control panel. The control panel will contain methane gas transmitter units, the main power disconnect switch, and relays for the blower(s) and solenoid valve(s). The control panel will be equipped with an auto-dialer for alarm communication.

D. When methane gas concentrations in the manifold piping reaches 20% of the methane lower explosive limit (LEL) (1% methane gas concentration by volume) and stay at or above this level, the solenoid valve on the active riser pipe (after the manifold) will open and the blower will turn on, and the solenoid valve on the passive riser pipe will close. The active blower will remain operational until the inline methane sensor detects methane gas concentrations consistently below 20% LEL over a minimum 24-hour duration.

E. If the methane concentration inside of the building reaches 5% of the LEL (0.25% methane gas concentration by volume), the visual alarm (red warning light) will be turned on to alert facility personnel to vacate the premises. The auto-dialer will call out and notify the necessary parties about the alarm and active ventilation will be turned on. In such an event, a confirmatory methane gas survey of the rooms will be conducted where methane gas was detected at or above 5% of the LEL. Corrective action will be taken, as needed. When indoor methane concentrations return to below set points, the active blower will be shut off and the associated motorized solenoid will close, and passive ventilation will resume.

3.8 EXHAUST STACK:

A. Route exhaust stack as shown on the MEP Drawings. The exhaust stack shall be located above the highest eave of the roof and at minimum 10 feet away from any adjoining or adjacent buildings or heating, ventilation, and air conditioning (HVAC) intakes or supply registers as specified in the New York City Mechanical Code, Chapter 5, Section MC 512 - Subslab Exhaust Systems and the NYSDOH Soil Vapor

Intrusion Guidance, dated October 2006.

B. Secure and support exhaust stack as shown on the MEP Drawings.

C. Place rain guard or cap at the end of the exhaust stack. Point of exhaust shall be at least 2 feet above roof.

D. Clearly label exhaust stack in each accessible area, at a minimum of every 10 linear feet of accessible/visible pipe run. Label the exhaust stack to read:

CAUTION: DO NOT ALTER SUB-SLAB VAPOR VENT PIPE

3.9 SYSTEM TESTING AND STARTUP

A. After installation of the SMD system, re-examine and verify the integrity of all seals and all joints in the vent piping and at the riser penetrations through the concrete slab.

B. Following pipe/fittings assembly, demonstrate all above-slab connections at pipe fittings are leak free by performing a 5 psi minimum air pressure test, or equivalent test approved by the Commissioner or City of New York.

C. Verify motorized solenoid valves are operational and responding to commands from the control panel.

D. Perform any necessary calibrations of the methane sensors. Using a known concentration of methane gas, verify that the methane sensors/transmitters are measuring methane gas and transmitting data/alarms as designed.

E. Confirm the alarm systems are operational, including visual alarms and auto-dialers and perform an alarm test to verify the designated parties are receiving notifications.

F. Conduct an air-flow smoke test of the SMD system, as described in the "Post-mitigation or confirmation testing - Sub-membrane Depressurization (SMD) systems with soil vapor retarder" section of the NYSDOH Soil Vapor Intrusion Guidance, dated October 2006.

G. Verify free, unobstructed operation of the wind turbines.

H. Sample ports will be located at the bottom of each riser pipe and portable pressure gauges which are compatible with the sample ports will be provided (details provided in other sections). The commissioning agent shall perform a reading at each sample port during commissioning to confirm negative pressure.

I. Collect readings from vacuum gauges and active blower exhaust points to verify the blowers are operating with design requirements.

J. All manufacturer operating manuals, shall be maintained on site for review or use in digital or hard copy format.

END OF SECTION 31 21 16

SECTION 31 25 00
Soil Erosion and Sediment Control

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The following documents apply to all required work for the Project: (1) the Contract Drawings, (2) the Specifications, (3) the General Conditions, (4) the Addendum and (5) the Contract (City of New York Standard Construction Contract).

B. LEED / Environmentally Preferable Purchase (EPP) General Requirements:
   1. Refer to DDC General Conditions and the Addendum to the General Conditions
   2. LEED requirements apply to all Phase II work with the exception of the Existing Building scope. EPP requirements apply to the project's Existing Building scope only.

C. Storm Water Pollution Prevention Plan (SWPPP) prepared by Langan Engineering, Surveying, Landscape Architecture, and Geology, D.P.C.

1.2 SUMMARY

A. Work includes:
   1. Provide all labor, materials, equipment and services to implement all erosion and sediment control practices and procedures as indicated in the Contract Documents.
   2. Inspect and maintain all erosion and sediment control practices weekly, prior to anticipated rainfall events, and after rainfall events. Needed restorations shall be made immediately.

B. Related Sections
   1. Section 31 10 00 – Site Clearing, Removals and Preparation
   2. Section 31 00 00 – Earthwork

1.3 SUBMITTAL PROCEDURES

A. Refer to DDC General Conditions Section 01 33 00 "Submittal Procedures".

B. All calculations and shop drawings shall be signed and sealed by a Professional Engineer licensed in the State of New York and submitted to the Commissioner for review

1.4 ENVIRONMENTAL REQUIREMENTS

A. Protect adjacent properties and water resources from erosion and sediment damage throughout construction in accordance with the Soil Erosion and Sediment Control Plan and NYSDEC standards. The Contractor shall be responsible for administering the Plan.

B. Discharge from dewatering operations shall not be directed to surface waters. Discharge from dewatering operations shall be per DDC General Conditions.

1.5 QUALITY ASSURANCE

A. Refer to DDC General Conditions Section 01 40 00 "Quality Requirements".

1.6 REFERENCES

A. New York State Department of Environmental Conservation (NYSDEC) Standards and Specifications for Erosion and Sediment Control, latest revision.

B. United States Department of Environmental Protection Agency (EPA) Document No. EPA 832/R-92-005, "Storm Water Management for Construction Activities", Chapter 3, latest revision.

C. New York City Building Code, 2014 edition.

1.7 DELIVERY, STORAGE AND HANDLING

A. Store materials in designated areas and as recommended by the manufacturer to protect against the elements, direct exposures, and damage.

B. Furnish erosion control blankets, jute mesh and geotextile fabric in rolls with suitable wrapping to protect against moisture and extended ultraviolet exposure prior to placement.

1.8 WARRANTY

A. Erosion control material shall have a warranty for use and durable condition for project specific installations.

B. Temporary erosion control materials shall carry a minimum eighteen (18) month Manufacturer's warranty from date of substantial completion.

C. Permanent erosion control materials shall carry a minimum three (3) year Manufacturer's warranty from date of substantial completion.

PART 2 - PRODUCTS

2.1 SILT FENCE

A. Silt fence posts: wood, steel, or an approved synthetic material, with a minimum length of three (3) feet. Hardwood posts shall have a minimum cross sectional area of 3.5 square inches. Steel posts shall be standard T and U sections weighing not less than 1.00 pounds per linear foot.

B. Silt fence fabric: Fabric shall meet or exceed the following specifications:

PROPERTY	UNIT	TEST METHOD	MIN. ACCEPTABLE VALUES
Grab Tensile Strength	lbs.	ASTM D4632	110
Elongation at Failure	%	ASTM D4632	20
Puncture Strength	lbs.	ASTM D4833	60
Mullen Burst Strength	PSI	ASTM D 3786	300
Flow Through rate	(gal./min.sf)	ASTM D 4491	25
Equivalent Opening Size		US Std. Sieve ASTM D 4751	40-80
Ultraviolet Radiation Stability	%	ASTM D 4355	70

C. Wire Fence: Minimum 14 gage with a maximum six inch mesh opening.

2.2 STRAW BALE DIKE

A. Hay or straw bales: New straw that shall be either wire bound or nylon string tied.

B. Bale stakes: Rebar, steel pickets, or 2-inch x 2-inch hardwood stakes.

2.3 STABILIZED CONSTRUCTION ENTRANCE

A. Stone aggregate: 1-inch to 4-inch clean stone or reclaimed or recycled concrete.

B. Geotextile: woven or non-woven fabric consisting only of continuous chain polymeric filaments or yarns of polyester. The fabric shall be inert to commonly encountered chemicals, hydro-carbons, mildew, rot resistant, and conform to the fabric properties shown:

PROPERTY	UNIT	TEST METHOD	Light duty(1) Roads Grade Subgrade	Heavy duty(2) Haul Roads Rough Graded
Grab Tensile Strength	lbs.	ASTM D1682	200	220
Elongation at Failure	%	ASTM D1682	50	60
Puncture Strength	lbs.	ASTM D751	40	125
Mullen Burst Strength	PSI	ASTM D3786	190	430
Equivalent Opening Size		US Std. Sieve CW-02215	40-80	40-80
Aggregate Depth	(inches)	-	6	10

(1)light duty roads: Area sites that have been graded to subgrade and where most travel would be single axle vehicles and an occasional multiaxle truck. Subject to compliance with requirements, products that may be incorporated into the Work include the following:

1. Trivera Spunbound 1115
2. Mirafi 100X
3. Typar 3401
4. Or approved equal.

(2)heavy duty roads: Area sites with only rough grading, and where most travel would be multi-axle vehicles. Subject to compliance with requirements, products that may be incorporated into the Work include the following:

1. Trevira Spunbound 1135
2. Mirafi 600X
3. Typar 3801
4. Or approved equal.

2.4 FILTER FABRIC INLET PROTECTION

A. Filter Fabric: Fabric shall be a woven polypropylene geotextile and sewn by a double needle machine using a high strength nylon thread. Fabric shall be manufactured to fit the drainage inlet.

PROPERTY	UNIT	TEST METHOD	MIN. ACCEPTABLE VALUES
Grab Tensile Strength	lbs.	ASTM D4632	110
Grab Elongation	%	ASTM D4632	10-15
Puncture Strength	lbs.	ASTM D4533	900
Trapezoidal Tear	lbs.	ASTM D4533	65-90
Flow Through rate	(gal./min.sf)	ASTM D 4491	66
Equivalent Opening Size	US Sieve	ASTM D 4751	30
Ultraviolet Radiation Stability	%	ASTM D 4355	96
Permittivity	sec-1	ASTM D-4491	0.862

PART 3 - EXECUTION

3.1 EXECUTION REQUIREMENTS

A. Refer to DDC General Conditions for execution requirements.

3.2 PREPARATION

A. Review site conditions and Contract Drawings prior to the commencement of demolition, earth moving activities or excavation.

B. The Contractor shall notify the Commissioner prior to the commencement of work. Any proposed deviation from the Contract Drawings must be submitted to the Commissioner in writing 72 hours prior to commencing work.

C. Install erosion and sediment controls for each work area prior to commencement of work within that work area. Comply with NYSDEC standards and specifications.

D. Perform all erosion and sediment controls in accordance with the Contract Drawings.

3.3 SILT FENCE

A. Silt Fence shall be placed as close to disturbed area as possible, but at least 10 feet from the toe of a slope steeper than 3H:1V. The area beyond the fence must be undisturbed or stabilized. The type of silt fence specified for each location on the plan shall not exceed the maximum slope length and maximum fence length requirements shown in the following table:

Slope	Steepness	Slope Length/Fence Length (ft.)		
		Standard	Reinforced	Super
<2%	< 50:1	300/1500	N/A	N/A
2-10%	50:1 to 10:1	125/1000	250/2000	300/2500
10-20%	10:1 to 5:1	100/750	150/1000	200/1000
20-33%	5:1 to 3:1	60/500	80/750	100/1000
33-50%	3:1 to 2:1	40/250	70/350	100/500
>50%	> 2:1	20/125	30/175	50/250

B. Maximum allowable slope length and fence length will not exceed the limits shown in the Design Criteria for the specific type of silt fence used; Maximum allowable ponding depth of 1.5 feet behind the fence. Given that erosion would occur in the form of sheet erosion and there is no concentration of water flowing to the barrier; Soil conditions allow for proper keying of fabric, or other anchorage, to prevent blowouts.

C. Locate silt fence at the toe of slopes and at ground level throughout its length. Drive posts securely at least 16-inches into the ground on the down slope side of the trench. Set post spacing a maximum of ten (10) feet apart. Adjust spacing to place posts at low points along fence line.

D. Fasten support wire fence to upslope side of posts, extending six inches below grade. Attach continuous length of fabric to upslope side of fence posts. Avoid joints, particularly at low points in the fence line. Fasten fabric securely to support posts where joints are necessary and overlap to the next post. Place the fabric in the trench so the bottom folds across the bottom of the trench.

E. Inspect silt fences weekly and after each rainfall event. Remove any sediment deposits found promptly to provide adequate storage volume for the next rain and reduce pressure on the fence. Do not undermine the silt fence during clean out. Replace fabric that is torn, decomposed, or in any way becomes ineffective, immediately without additional expense to the City of New York.

F. In addition to procedure summarized above, refer to installation and service requirements outlined in the Contract Drawings.

3.4 STRAW BALE DIKE

A. Use straw bale dikes subject to the following conditions:

Slope Steepness	Maximum Length (ft.)
2H:1V	25
3H:1V	50
4H:1V	75
5H:1V or flatter	100

B. Do not exceed ¼ acre drainage area for overland flow per 100-feet of straw bale dike with silt fence, with maximum ponding depth of 1.5 feet behind the fence. Given that erosion would occur in the form of sheet erosion and that there is no concentration of water flowing to the barrier.

C. Excavate the area to accommodate placement of straw bales which are to be embedded in the soil a minimum of four inches, and placed so the string or wire is horizontal. Place bales in a row with ends tightly abutting the adjacent bale. Anchor the bales securely by driving two stakes or rebar through each bale to a minimum depth of 1.5 to 2 feet into the ground. Drive the first stake in each bale toward the previously laid bale to force the bales together. Drive stakes flush with the top of the bale.

D. Inspect straw bales weekly and after each rainfall event, restore or replace promptly as needed. Remove accumulations of sediment trapped by straw bale filters regularly. Remove temporary straw bales from the site at the conclusion of construction. Restore the areas where the straw bales were installed to match the surrounding area. Restoration may include, but is not limited to, seeding and establishing the lawn area.

E. In addition to procedure summarized above, refer to installation and maintenance requirements outlined in the SWPPP and on the Contract Drawings.

3.5 STABILIZED CONSTRUCTION ENTRANCE

A. Install stabilized construction entrances at any point where traffic will be entering or leaving a construction site to or from a public-right-of–way, street, alley, sidewalk, or parking area.

B. Install and maintain a minimum stone thickness of 6-inches.

C. The stabilized construction entrance width shall be twelve feet minimum but not less than the full width of points of where ingress or egress occurs. The stabilized construction entrance shall be a minimum width of 24-feet if there is only one entrance to the site.

D. The length of the stabilized construction entrance shall be 50-feet minimum.

E. Place geotextile over the entire area to be covered with aggregate.

F. Provide piping of surface water under entrance as required. If piping is impossible, a mountable berm with 5:1 slopes will be permitted.

G. Maintain the entrance in a condition which will prevent tracking of sediment onto public-right-of-way or streets. This may require periodic top dressing with additional aggregate. Remove all sediment spilled, dropped, or washed onto public right-of-way immediately.

H. Clean wheels, when required, to remove sediment prior to entrance onto public right-of-way. Perform washing, when required, on an area stabilized with aggregate, which drains into an approved sediment trapping device. Prevent all sediment from entering storm drains, ditches and watercourses.

I. In addition to procedure summarized above, refer to installation and maintenance requirements outlined in the SWPPP and on the Contract Drawings.

3.6 FILTER FABRIC INLET PROTECTION

A. Install inlet protection at all existing, temporary, and new catch basins located within the disturbed work area.

B. Space support stakes evenly around the inlet a maximum of three (3) feet apart. Drive support stakes a minimum of 18-inches below grade. Bridge spans greater than three (3) feet with the use of wire mesh behind the filter fabric for support.

C. Drive support stakes close to the inlet so any overflow drops into the inlet and not on the unprotected soil.

D. Cut filter fabric from a continuous roll to eliminate joints. Overlap joints, if needed, to the next stake. Extend filter fabric a minimum of one (1) foot below grade and backfill. Securely fasten fabric to the support stakes and frame.

E. Do not extend filter fabric more than 1.5 feet above the inlet crest unless reinforced.

F. Install wooden frame completely around the crest of the fabric for overflow stability.

G. Inspect the fabric barrier after each rain event and restore as needed. Remove sediment from the pool area as necessary with care not to undercut or damage the filter fabric.

H. In addition to procedure summarized above, refer to installation and maintenance requirements outlined in the SWPPP and on the Contract Drawings.

3.7 EROSION CONTROL BLANKET

A. Place erosion control blankets on any disturbed slopes with grades from 1H:1V to 3H:1V.

B. Excavate and grade the areas to receive the erosion control blanket. Install seed per the manufacturer's recommendation.

C. Roll blankets down or horizontally across the slope. Unroll blanket with the appropriate side against the soil surface.

D. Secure all blankets to the soil surface by placing staples in appropriate locations as shown in the staple pattern guide provided by the manufacturer.

E. Staple the edge of parallel blankets with a four (4) inch overlap.

F. Splice consecutive blankets, if necessary, across the slope and place over end (shingle style) with a three (3) inch overlap.

G. Anchor the blankets as follows:
   1. Anchor the blanket at the top of the slope in a 6-inch deep x 6-inch wide trench with approximately twelve (12) inches of blanket extended beyond the upslope portion of the trench.
   2. Backfill and compact the trench after stapling.
   3. Apply seed to compacted soil and fold the remaining twelve (12) inch portion of the blanket back over seeded and compacted soil.

H. Maintain and inspect the erosion control blankets per the manufacturer's recommendations.

I. In addition to procedure summarized above, refer to installation and maintenance requirements outlined in the SWPPP and on the Contract Drawings

3.8 TEMPORARY STOCKPILE

A. Secure PVC sheeting in place with tie downs and/or weights such as sand bags at the end of each workday and during adverse weather conditions.

B. Construct stockpiles so that the height does not exceed fifteen (15) feet. Side slopes shall not be steeper than 2H:1V.

C. Contain all stockpiles with hay bales and silt fence placed continuously around the perimeter.

D. Apply temporary seeding to all stockpiles which will be inactive for twenty (20) days or longer.

E. Maintain stockpiles in accordance with DDC General Conditions and NYCDEP regulations.

F. In addition to procedure summarized above, refer to installation and maintenance requirements outlined in the SWPPP and on the Contract Drawings.

3.9 EROSION CONTROL IMPLEMENTATION

A. Place erosion control systems in accordance with the staging and features outlined in the Contract Drawings.

B. Follow construction phasing in the sediment control plans to limit the surface area of erodible earth material exposed by clearing and grubbing, excavation, borrow and embankment operations.

C. Incorporate all permanent erosion control features into the project at the earliest practical time to minimize the need for temporary controls.

D. Properly construct, stabilize, and maintain all temporary and permanent erosion and sedimentation control measures and related items.
   1. Perform general inspection of sediment and erosion controls at end of each work day, and assure that controls are in good condition before leaving.
   2. Perform detailed inspection of all sediment and erosion controls at least once every seven days and within 24 hours after each rainfall of more than one half (0.5) inch.
   3. Perform any needed maintenance and restorations, and add measures as needed to control erosion and sediments.
   4. Remove accumulated sediments from sediment traps and behind silt fences before they reach 50% of capacity. Dispose of sediments in upland area, stabilized to prevent further erosion or sedimentation.
   5. Maintain written records of all inspections, maintenance and restorations, and submit copies of the written reports to the Commissioner at the end of each month of work.

E. Replace at own expense any control measure that is not functioning properly as directed by the Commissioner.

F. Install inlet protection on all new catch basins immediately upon construction of catch basins.

G. Implement dust control measures during construction. Minimize dust clouds by watering down construction area or other approved methods as required.

H. Secure a tarp over materials in all construction vehicles hauling materials either into or out of the construction area to prevent sediment pollution of public roadways.

I. Design erosion and sediment controls specific to the site in accordance with the NYSDEC Standards, which are more stringent than the EPA Standards.

3.10 NON-STORMWATER DISCHARGE CONTROLS

A. Groundwater encountered within excavations shall be disposed per DDC General Conditions.

B. Cleaning water for construction vehicles and equipment shall be diverted to the temporary and approved erosion and sediment control measures. Chemicals and detergents shall not to be used.

C. Coordinate with the Commissioner to identify areas on-site for construction vehicle transit (i.e. – haul roads, contractor trailers and parking areas, etc.) or equipment staging which shall be monitored and where runoff can be controlled.

D. Water used for dust control measures shall be applied using appropriate quantities and equipment. No chemical additives shall be used.

E. Water main flushings, hydrostatic test water, fire test water, and chlorination test water shall be directed to the control measures on the site. Turbid water is to be detained to allow sufficient sedimentation time (minimum of 24 hours). Chlorinated water is to be detained until the water is de-chlorinated (minimum of 24 hours).

F. Concrete trucks shall be washed out in an area approved of by the Commissioner. Designate wash-out areas with proper signage. Locate a concrete wash-out box near the concrete trucks to prevent concrete residue from being washed off-site. Wash-out containers can be pre-fabricated or constructed on-site out of plywood and plastic sheeting. All runoff from wash-out activities shall be directed to the on-site control measures. Discarded cementitious materials shall be removed and disposed off-site.

G. Building washing or parking lot cleaning water (where no spills or leaks of toxic or hazardous materials have occurred) that may enter the storm drainage system shall not contain chemicals or detergents.

3.11 REMOVALS

A. Maintain erosion and sediment control devices within each work area until final stabilization of that work area.

B. "Final stabilization" shall mean that all soil disturbance activities have ceased and a uniform, perennial vegetative cover with a density of eighty (80) percent over the entire pervious surface has been established; or other equivalent stabilization measures, such as permanent landscape mulches, rock rip-rap or washed/crushed stone have been applied on all disturbed areas that are not covered by permanent structures, concrete or pavement.

C. Remove erosion and sediment control devices in accordance with the DDC General Conditions.

END OF SECTION 31 25 00

SECTION 31 50 00
Excavation Support and Protection

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

A. The following documents apply to all required work for the Project: (1) the Contract Drawings, (2) the Specifications, (3) the General Conditions, (4) the Addendum and (5) the Contract (City of New York Standard Construction Contract).

B. LEED / Environmentally Preferable Purchase (EPP) General Requirements:

1. Refer to DDC General Conditions and the Addendum to the General Conditions

2. LEED requirements apply to all Phase II work with the exception of the Existing Building scope. EPP requirements apply to the project's Existing Building scope only.

1.2 GENERAL REQUIREMENTS

A. Provide excavation support in accordance with the requirements of the Contract Documents and the 2014 New York City Building Code.

B. The City of New York retained a Geotechnical Engineer to prepare and obtain New York City Department of Buildings (DOB) Approval for Support of Excavation (SOE) design drawings for the project. The Contractor shall retain a Professional Engineer licensed in the State of New York to replace the Geotechnical Engineer as design applicant in DOB TR-1 forms for the SOE work. The Contractor's licensed Professional Engineer shall prepare signed and sealed SOE design drawings necessary to facilitate the proposed new construction and to properly support all adjacent buildings, structures, sidewalks, streets, yards, and utilities. The Contractor shall not be allowed to commence any SOE work, nor the excavation requiring SOE to be in place, prior to receipt of the DOB approval for his submitted SOE drawings.

1.3 SUMMARY

A. Work of this Section includes all labor, materials, equipment, and services necessary to complete the design and installation of excavation support and protection as shown on the contract documents for the microtunneling entry and receiving pits, and specified herein including, but not limited to the following:

1. Design and installation of sheet piling, soldier piles, and bracing of all excavation sides to prevent any damage to existing structures, street paving, utilities adjacent to new construction and in the vicinity of the new construction.

2. Perform exploratory test pits to determine the locations and conditions of existing adjacent utilities.

3. Protection and monitoring of streets and utilities.

4. Other labor and materials as may be reasonably inferred to be required to make the work under this Section complete.

5. Removal of sheet piling, soldier piles, and bracing, if required.

B. Related Sections

1. Section 31 00 00 – Earthwork

1.4 REFERENCES

A. Latest revision of the following standard specifications, where not otherwise required by the Contract Documents:

1. ASTM A36 Standard Specification for Carbon Structural Steel.
2. ASTM A252 Standard Specification for Welded and Seamless Steel Pile Piles.
3. American Welding Code (AWS) D1.1 Structural Welding Code
4. 2014 New York City Building Code.

B. Geotechnical Engineering Report for DSNY Staten Island District 1&3 Garage Staten Island, New York prepared by Langan Engineering, Environmental, Surveying, Landscape Architecture, and Geology, D.P.C., dated 22 October 2018.

C. "Support of Excavation" Drawings, prepared by Langan, dated 8 August 2019.

D. American Association of State and Highway Transportation Officials (AASHTO) Publications.

1.5 SUBMITTALS PROCEDURE

A. Refer to DDC General Conditions Section 01 33 00 "Submittal Procedures."

B. Unless otherwise indicated, transmit all submittals to the Commissioner for review and acceptance before proceeding with ordering, fabricating, or any other work of this Section. Submittal review will be of the concept only and shall not in any way diminish or limit the Contractor's responsibility for the performance and quality of the work of this Section and the protection of existing structures.

C. The Contractor's Professional Engineer licensed in the State of New York shall prepare an outline of the Contractor's construction methods and step-by-step procedures together with plans and details of the excavation support system to satisfy the 2014 New York City Building Code requirements and approved drawings. This shall be coordinated with the relevant submittals identified in Section 31 00 00 "Earthwork" and shall be submitted and reviewed by the Commissioner for the concept before submittal of the shop drawings.

D. Plans and Shop Drawings: Support of Excavation (SOE) plans have been prepared for soil. Support of Excavation Drawings provided to date are for filing and have been provided for reference only. The Contractor must prepare and submit plans and shop drawings for all items in this Section. The plans and shop drawings shall be submitted signed and sealed by the Contractor's Professional Engineer licensed in the State of New York. Contractor shall obtain DOB approval of these plans.

1. Excavation Support – Provide calculations, plans, and shop drawings that show the limits and layout of the excavation support system. Provide representative sections for each side of the excavation that include calculations, structural details of the cutoff wall, embedment depth, and bracing elements.

Provide elevations that give the location and identification of all lateral bracing elements. Provide a schedule that gives design load in each brace, proof test load, and lock-off load.

a. Excavation side stabilization plan, details and calculations including but not limited to sheeting, shoring, and bracing.

b. Adjacent structures, street, and utility protection and monitoring plan. Show in a detailed and scaled plan locations of survey control point locations.

c. Submit original manufacturer's certificates for all materials as specified herein.

E. Monitoring of Existing Structures: Submit the monitoring plan specified herein at least two weeks before proceeding with the work. Submit monitoring results as specified herein within two days after completing the monitoring work.

F. Certification For Examination of Site and Records: Before proceeding with the Work, submit certification in an acceptable form, signed by the Contractor, stating that careful examination has been made of the site, existing structures, existing adjacent structures, records of utility lines, test boring records, soil samples, subsurface exploration reports, the Drawings, and all other Contract Documents.

G. Procedures and methods to be used to ensure safety and stability of all adjacent structures, as well as identification of the entity that will sign the DOB TR-forms as the responsible party for the Structural Stability of the adjacent buildings.

1.6 QUALITY ASSURANCE

A. Refer to DDC General Conditions Section 01 40 00 "Quality Requirements".

B. Codes and Permits:

1. All work shall comply with the requirements of the 2014 Building Code of the City of New York, requirements of the New York State Department of Labor, requirements of Occupational Safety and Health Administration (OSHA), requirements of New York State Department of Health (NYSDOH), requirements of the New York State Department of Environmental Conservation (NYSDEC), requirements of the New York City Department of Environmental Protection (NYCDEP), requirements of the New York State Department of Transportation (NYSDOT), requirements of New York City Department of Transportation (NYCDOT), requirements and drawings approved by the New York City Transit (NYCT).

2. The Contractor shall procure and pay for all permits and licenses required to complete the work of this Section.

C. Engineering Supervision: For support of excavation, retain the services of a Licensed Professional Engineer licensed in the State of New York who shall design and supervise installation of all work of this Section. The Contractor's Professional Engineer shall sign, seal and submit all relevant New York City Building Department Technical Report forms.

D. Special Engineering Inspection:

1. The Special Inspector, hired by the City of New York, shall be responsible for the inspection for all sheeting, shoring, and bracing work.

2. Before commencing work of this Section, meet with the Construction Manager, the Commissioner, and other concerned entities. Review the sheeting and bracing procedures and responsibilities including testing and inspection procedures and requirements. Notify participants at least three working days before the convening conference. Record discussions and agreements and furnish a copy to each participant.

1.7 PROJECT CONDITIONS

A. The Contractor, by careful examination, shall inform himself as to the nature and location of the work; the confirmation of the ground, the nature of the subsurface conditions; the locations of the groundwater table; the character, quality, and quantity of the materials to be encountered; the character of the equipment and facilities needed preliminary to and during the execution of the work; and all other matters which can in any way affect the work.

B. The Contractor shall be held to have visited the site and to have familiarized himself with the existing conditions of adjoining properties, utilities, and buildings.

C. Borings are available for the Contractor's review. The City of New York makes no predictions or representations regarding the character or extent of soil, or other subsurface conditions to be encountered during the work. The Contractor shall make his own deductions of the subsurface conditions which may affect the methods or cost of construction of the work hereunder. Additional borings and other exploratory operations may be performed by Contractor, at the Contractor's option, and following the Commissioner's approval. No change in the Contract Sum will be authorized for such additional exploration undertaken by the Contractor.

D. The Contractor shall note that obstructions, such as boulders or large pieces of debris, were encountered in the fill material.

E. The Contractor shall investigate the conditions of public thoroughfares and roads as to availability, clearances, loads, limits, restrictions, and other limitations affecting transportation to, ingress and egress of the site of the work. The Contractor shall conform to all New York City and State, and Federal regulations regarding the transportation of materials to and from and at the job site and shall secure in advance such permits as may be required.

F. The Contractor shall locate existing underground utilities in and beyond the areas of work. If utilities are indicated to remain in place, the Contractor shall provide adequate means of support and protection during the work.

1. Should uncharted, or incorrectly charted, piping or other utilities be encountered during excavation, consult utility owner immediately for directions. Cooperate with the City of New York and utility companies in keeping respective services and facilities in operation. Restore damaged utilities to the satisfaction of the utility owner.

2. Do not interrupt existing utilities serving facilities occupied by the City of New York, during occupied hours, except when permitted in writing by the Construction Manager and then only after acceptable temporary utility services have been provided. Provide a minimum of 48-hour notice to the Construction Manager, and receive written notice to proceed before interrupting any utility.

3. Remove or relocate the existing underground utilities indicated to be removed or relocated. Coordinate with utility companies for shutoff of services if lines are active.

G. The Contractor shall examine drawings to determine the sequence of operations, and relation to work of other trades. The start of work will signify acceptance of field conditions and will acknowledge coordination with other trades.

1.8 SUBSURFACE STRUCTURES AND UTILITIES

A. The Contractor shall become acquainted with the existence and location of all surface and subsurface structures and utilities within the project area and beneath the surrounding streets. Contractor shall not damage any of those that are to remain and shall leave them accessible and make the necessary provision by sheeting, hanging, supporting or other means necessary to obtain this result, subject to the approval of the Commisioner, New York City Department of Buildings and Department of Transportation, and the utility companies involved.

1.9 ERRORS IN DEPTH

A. In the event that any part of the excavation is carried, through error, beyond the depth and the dimensions indicated on the drawings or called for in the specifications, then the Contractor, at his own expense, shall furnish and install gravel, stone, or concrete fill with which to fill to the required level at all locations, subject to approval of the Commissioner.

1.10 PROTECTION

A. The work shall be executed so that no damage or injury will occur to the existing public and adjacent structures, streets, paving, sewers, gas, water, electric or any other pipes. Should any damage or injury caused by the Contractor, or anyone in Contractor's employ, or by the work under this Contract occur, the Contractor shall, at own expense, restore such damage and shall assume all responsibility for such injury.

B. The above shall also include the protection of all existing utilities (including sewers, water lines, electrical lines, and telecommunication lines) to remain in use within and adjacent to the area affected by the work of this project.

C. Monuments, benchmarks and other reference features on streets bounding this project, shall be protected. Should these be disturbed in any manner, replace them at no additional expense to the City of New York.

1.11 PRECONSTRUCTION-CONDITIONS DOCUMENTATION

A. The City of New York shall hire an independent third-party consultant to perform a pre-construction conditions documentation of the adjacent structures.

B. The Contractor may perform, if he wishes, his own conditions-verification survey and shall submit any findings that differ from the Commissioner's documentation as specified herein at least 15 days before beginning the work.

PART 2 – PRODUCTS

2.1 MATERIALS

A. Provide suitable sheeting, shoring, bracing, and soil support materials which will withstand loads imposed without movement. Materials shall be kept in serviceable condition at all times. The contractor should refer to the support of excavation drawings for the sizes of the elements.

B. Driven sheet piles and soldier piles shall conform to ASTM A-572 Grade 50.

C. Steel cross struts and wales shall conform to ASTM A-992 Grade 50.

D. Miscellaneous Steel shall conform to ASTM A-572 Grade 50.

E. Plates: Structural steel plates shall conform to ASTM A36 (AASHTO M183) or ASTM A572 Grade 50 (AASHTO M183).

2.2 DELIVERY, STORAGE, AND HANDLING

A. Materials ordered or delivered to the project site, before verification of sheet-pile and soldier-pile length, will be at the Contractor's risk.

B. After pile lengths are verified, the Contractor shall deliver materials to the project site in such quantities and at such times to assure continuity of operations to maintain the project schedule.

C. Materials shall be stored in orderly groups above ground and blocked during storage to minimize possible distortion of members.

PART 3 – EXECUTION

3.1 EXECUTION REQUIREMENTS

A. Refer to DDC General Conditions for execution requirements.

3.2 GENERAL

A. Excavation support and bracing shall be constructed in accordance with the 2014 New York City Building Code requirements.

B. Notify the Commissioner before the start of work. The notifications are to be in accordance with the Contract Drawings.

C. Install sheeting, shoring, and bracing to permit excavation to the required foundation subgrade as required to install the slab.

D. Excavation support shall be adequate to resist earth and hydrostatic pressures and lateral pressures due to surcharge loads, to prevent displacement of the adjacent ground; and to prevent loss of support or damage to buildings, utilities, sidewalks, and streets. Lateral loads created from adjacent buildings, cranes and/or street loads shall be included.

E. During the excavation work specified in Section 31 00 00 - Earthwork, if additional locations may require sheeting and bracing based on the Contractor's construction methods and procedures, then provide such additional supports at no additional cost to the City of New York. Such additional supports shall be designed and constructed in accordance with the requirements of this Section, as per the Contract Documents.

F. All the above work shall be carried on in such a manner as not to interfere with the progress of the work under this Contract.

G. Excavation support and bracing may be removed, left in place, or cut as approved and directed by the Commissioner. Any material that affects finished construction shall be removed. Carefully remove materials such that no loss of support occurs beneath areas adjacent to the sheeting. Any material left in place must be removed not less than four-ft below finish grade. Sheeting and bracing material removed from the excavation shall be immediately removed from the site and properly disposed of in accordance with Section 02 61 13 - Excavation and Handling of Contaminated Materials.

3.3 SOIL EXCAVATION SUPPORT

A. Temporary excavation walls shall be provided along the sides of excavations in the soil where the overburden exceeds 4 feet, and any other material not self-supporting as defined by the plans or an alternate design by the Contractor's Professional Engineer licensed in the State of New York.

B. Excavation adjacent to the temporary wall shall not exceed a depth of 2 feet below the point of lateral support to be installed. Lateral support shall be installed and preloaded before continuing excavation.

C. Provide and install all support system components needed to ensure the proper installation of work and to protect adjacent structures, streets, paving, utilities, etc.

D. Sides of the site shall be protected against cave-in and movement of soil at all times.

E. The above work shall be carried out in such a manner as not to interfere with the progress of the work under this Contract. If it is found necessary to change the position of the shoring, bracing, walers, or other items to permit the construction work to proceed, do this work at no extra charge.

F. At the completion of the work, remove all shoring, bracing, rakers and other items and remove same from the project premises when directed by the Commissioner.

G. Where temporary bracing is required to withstand earth pressures, the backfill shall not be placed until after temporary bracing has been installed. If portions of the ground floor must be placed and have reached sufficient strength for the design of any portion of the foundation to withstand their required lateral load, backfilling shall not be placed until this work has been performed and the concrete reaches its necessary strength.

3.4 PROTECTION OF ADJACENT STRUCTURES, STREETS, AND UTILITIES

A. The adjacent and surrounding structures, streets, utilities shall be protected during the work described herein. Excavation work shall be restricted to hours indicated by the Commissioner.

B. The Contractor shall restore, to the satisfaction of the Commsioner, by repair or otherwise, the portions of buildings, or their contents, altered by the Contractor in furtherance of his sheeting, and bracing work. Restoration shall be completed to the conditions, which existed before the start of work.

3.5 MONITORING

A. Before starting work, the Contractor's Professional Engineer licensed in the state of New York and Land Surveyor licensed in the state of New York shall check and verify governing dimensions and elevations,

survey existing conditions, and record any prior settlement or cracking of structures, pavements, and other improvements. Document with photos and videos all adjacent structures prior to the beginning of any construction activities.

B. The monitoring points shall be established by the monitoring company employing a Professional Land Surveyor licensed in the State of New York, and referenced to a fixed off-site benchmark.

C. Monitoring of Excavation Support System: Install reference points at a maximum spacing of 24-ft on-center around the entire perimeter of the excavation to properly monitor the ground movements behind the excavation support system. As the excavation proceeds, install points on the soldier pile to measure potential lateral deflection at about 24-ft on-center. These locations shall be subject to review by the Commissioner.

D. Monitoring of Adjacent Buildings: Install a minimum of 4 reference points on the upper third and the lower third of the adjacent building face abutting the excavation. The monitoring company will also conduct crack monitoring of the adjacent building.

E. Ground Vibrations: The vibration monitoring locations shall be selected by the Commissioner.

1. The seismographs will be provided by, and the monitoring performed by the Testing Agency.

2. Monitoring shall be performed before the start of work to obtain ambient levels, and daily during excavation and foundation construction work.

F. Crack Gauges: Monitoring points shall be installed at cracks observed during the execution of Preconstruction-Conditions Documentation and as required as the work progresses, as determined by the Contractor, and as directed the Commissoner.

G. Frequency and Reporting

1. Vertical and Lateral Displacements - Monitoring shall be performed twice on a weekly basis during any excavation support or foundation work. Readings shall be taken to nearest 0.005 ft. Written reports summarizing the monitoring results shall be submitted by the Contractor's Professional engineer licensed in the State of New York to the Commissioner for review on a weekly basis. The reports shall be submitted in both electronic copies and hard copies. The reports shall include the raw data points as well as graphs and tables summarizing the monitoring data.

2. Ground Vibrations – The ground vibrations caused by the foundation work, bracing and foundation installation operations shall be monitored continuously with threshold-type seismographs capable of measuring ground movements to 0.02 in/sec. Written reports summarizing the monitoring results shall be submitted by the Contractor's Professional engineer licensed in the State of New York to the Commissioner for review on a weekly basis.

3. Crack Guages: At a minimum, crack gauges shall be measured on a weekly basis. The frequency of monitoring shall be increased as directed by the Commissoner.

H. Alert levels: Should any of the following magnitudes of movement be detected, the contractor shall immediately take remedial action and advise the Commissioner.

1. Vibration Monitoring: Peak particle velocities

a. Threshold Level: 0.5 inches per second for all buildings, and other structures.

b. Limit Level: 2.0 inches per second for all buildings, and other structures.

2. Crack Gauge Monitoring: Cumulative movement in any direction

a. Threshold Level – 1/16 inch in any direction

b. Limit Level – 1/8 inch in any direction

3. Survey Monitoring:

a. Threshold Level:

i) Vertical or horizontal movement of buildings: 1/4-inch total movement, or 3/16-inch between two consecutive readings.

ii) Vertical or horizontal movement of SOE Wall: 3/4 inch total movement, or 1/4-inch between two consecutive readings.

b. Limit Level:

i) Vertical or horizontal movement of buildings: 3/4-inch total movement, or 3/8-inch between two consecutive readings.

ii) Horizontal movement of building or other surface structures: 1.5-inch total movement, or 1/2-inch between two consecutive readings.

4. Groundwater Monitoring:

a. Threshold Level – 1-foot increase or decrease in any measurement after pumping has stabilized at any temporary subgrade during excavation

b. Limit Level – 2 feet increase or decrease in any measurement after pumping has stabilized at any temporary subgrade during excavation.

3.6 ACTION ITEMS

A. Any movement or vibration exceeding the criteria outlined in 3.5 above shall be reported immediately to the Commissoner. Work in the immediate area shall be suspended, unless directed otherwise by the Commissoner. Corrective measures to ensure integrity and stability of adjacent structures shall be the responsibility of the Contractor.

B. In the event that a Threshold Level is reached the following shall be required:

1. The Commissoner shall be notified of the exceedance.

2. The exceedance shall be investigated to identify potential correlation to construction activities.

3. Contractor shall meet with the Comissoner and DOB to discuss the need for a response to mitigate the potential for readings exceeding the Threshold Level.

4. Where required, submit a detailed plan of action to mitigate the potential for additional movement or vibration.

5. Install additional instruments as required evaluate the need for any action necessary to prevent reaching the Threshold Level.

C. In the event that a Limit Level is reached the following shall be required:

1. The Commissioner shall be notified of the exceedance.

2. Construction shall be suspended. The exceedance shall be investigated to identify potential correlation to construction activities.

3. Inspect the building (or portions thereof) for potential damage. Inspections shall be made by the Special Inspector for structural stability, the Contractor's Engineer, and the Commissioner.

4. Immediately notify to DOB and the Commissioner in case of damage or unsafe condition.

5. Excavation and foundation construction procedures shall be re-assessed as necessary to maintain vibration levels and movements within acceptable limits.

6. Work stoppage to assess excavation methods and to inspect the buildings identified herein for damage is at the Commissioner's discretion.

7. Develop alternate methods and procedures, subject to the review and approval of the Commissioner.

8. Resume work using the agreed upon alternative method.

9. Notify DOB of events that exceed allowable limits and of corrective measures implemented to maintain acceptable limits.

D. Restore, to the satisfaction of the Commissioner, the portions of buildings, or their contents, altered by the Contractor in furtherance of his sheeting, and bracing work. Restoration shall be completed to the conditions which existed before the start of work.

3.7 FIELD QUALITY CONTROL

A. Concrete: The Contractor shall retain a certified testing agency to take samples of the concrete. A minimum of six grout cylinders per batch shall be taken to determine the compressive strength of the concrete.

B. Excavation Support: The Contractor is responsible for the installation, monitoring, and maintenance of all excavation supports.

3.8 CLEAN-UP

A. All excess material shall be removed from the site and legally disposed of per Section 02 61 13 - Excavation and Handling of Contaminated Materials.

B. All lumber, forms and metal work shall be removed immediately after completion of local areas. The Contractor shall be responsible for removal of all debris produced by work to this section from the site.

C. Sidewalk and streets adjoining the property shall be broom cleaned and free of debris, rubbish, trash and obstructions of any kind caused by the work of this Section.

END OF SECTION 31 50 00

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SECTION 31 62 19
Timber Piles

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The following documents apply to all required work for the Project: (1) the Contract Drawings, (2) the Specifications, (3) the General Conditions, (4) the Addendum and (5) the Contract (City of New York Standard Construction Contract).

B. LEED / Environmentally Preferable Purchase (EPP) General Requirements:

1. Refer to DDC General Conditions and the Addendum to the General Conditions

2. LEED requirements apply to all Phase II work with the exception of the Existing Building scope. EPP requirements apply to the project's Existing Building scope only.

1.2 GENERAL REQUIREMENTS

A. The provisions of the 2014 New York City Building Code Chapter 17 and Chapter 18 relating to pile foundations shall govern the work of this section.

1.3 SUMMARY

A. Work of this Section consists of installing driven timber piles, and includes but is not limited to the following:

1. Furnish and install driven piles having design capacities, and at the locations, shown on the Contract Drawings and as directed.

2. Provide all labor, materials, equipment, and services to install all piles (including index piles).

3. Provide all required survey and layout.

4. Drive piles to the specified bearing stratum and to the required penetration resistance to achieve the specified design loads.

5. Cut and clean all piles to the required levels on the Contract Drawings. Disposal of pile cut-offs.

6. Provide as-built pile location survey and identification plan, provide all data in excel table format.

B. Related Sections:

1. 31 00 00 – Earthwork

2. 31 50 00 – Excavation Support and Protection

C. Related Documents:

1. Install piles having allowable compressive, lateral, and tensile load capacities, and at the locations, shown on the Contract Drawings. The Contract drawings shall be assumed to govern, unless otherwise directed by the Commissioner.

1.4 REFERENCES, STANDARDS, AND REGULATORY REQUIREMENTS

A. All work and materials under this section shall conform to the latest revision of the following standard specifications, where not otherwise required by the Contract Documents:

1. Where there are in existence American Society for Testing and Materials (ASTM) Standards applicable to this work, the recommendations and requirements of the latest version of such Standards shall be considered a minimum for the work described and must be complied with.

2. Where there are in existence American Welding Society (AWS) Standards applicable to this work, the recommendations and requirements of the latest version of such Standards shall be considered a minimum for the work described and must be complied with, the recommendations and requirements of the latest version of such Standards shall be considered a minimum for the work described and must be complied with.

3. Where they are in existence American Wood Preservers Association (AWPA) standards applicable to this work,

   a. AWPA C1 Timber Products - Preservative Treatment by Pressure Processes

   b. AWPA C3 Piles - Preservative Treatment by Pressure Processes

   c. AWPA C18 Pressure Treated Piles and Timber in Marine Construction

   d. AWPCA M4 Standard for the Care of Preservative Treated Wood Products

4. ACI-318 – Building Code Requirements for Structural Concrete (latest edition).

5. ACI-299R – Controlled Low Strength Materials (latest edition).

6. New York City Fire Code (latest edition).

7. 2014 New York City Building Code

B. The Contractor shall procure and pay for all permits and licenses required to complete the work of this Section.

C. Geotechnical Engineering Report for DSNY Staten Island District 1&3 Garage Staten Island, New York prepared by Langan Engineering, Environmental, Surveying, Landscape Architecture and Geology, D.P.C., dated 5 March 2019.

1.5 SUBMITTAL PROCEDURES

A. Refer to DDC General Conditions Section 01 33 00 "Submittal Procedures".

B. The Contractor shall prepare and submit the following items to the Commissioner for review and approval at least 15 days before the start of said work. All calculations and shop drawings shall be signed and sealed by a Professional Engineer licensed in the State of New York.

1. Driven Piles:

a. Pile manufacturers and or suppliers certificate certifying pile materials conform to the requirements specified herein. For timber piles, include timber type, class, treatment, and preservative.

b. Driving Equipment: Submit for approval, the type, size and configuration of the driving hammer, helmet, and cushion to be used. Acceptance of the pile hammer and driving equipment will not relieve the Contractor's responsibility for properly driving piles, in satisfactory condition, to the driving criteria indicated.

c. Provide installation procedures for the driven piles, including pile installation program giving the amount and character of equipment to be used in the work, schedule for performing the work, and method and sequence of pile driving.

d. Submit proposed final driving criteria to achieve the specified design load (i.e. WEAP analysis or equivalent).

e. Timber piles shall not be spliced.

f. Submit manufacturer's data for all pile installation and support equipment.

g. Submit estimated static pile load capacity using the Case Method and the CAPWAP Method.

h. If the Contractor plans to re-tap the index or production piles to achieve design capacity, then the Contractor must submit equipment data sheets and procedures for re-tapping piles.

2. Pile Identification Plan:

a. Submit plan clearly showing the designation and location of all piles by an identifying system, including the cut-off elevations for all piles. The plan shall include the location of the centerline of each pile group by a coordinate system from an approved reference working point. All detailed records for individual piles shall bear identification corresponding to that shown on this plan. A copy of this plan shall also be available at the site for inspection at all times. Electronic copies shall be provided.

C. As-Built Pile Survey

1. The Contractor shall provide the Commissioner with a survey prepared by a Professional Surveyor, licensed in the State of New York, showing the completed locations of the piles at cut-off elevation

with respect to the proposed locations. The survey shall include elevations of the tops and batters of the piles. Piles that exceed location tolerances shall be highlighted and offset dimensions provided. Any abandoned piles shall be included in the survey. Piles that exceed location tolerances shall be highlighted and offset dimensions provided.

2. After the one-quarter, one-half, three-quarters, and at completion of the pile driving, the Contractor shall submit the survey plan showing all numbered pile locations, including locations of all abandoned piles and their replacements, if any. The Contractor shall provide additional surveys of a pile or pile groups, at no extra cost to the City of New York, if required by the Commissioner.

3. Provide tabulated data in MS-Excel format for each pile driven. Provide deviation relative to Northing and Easting position of each pile relative to intended location per the Contract Drawings. Provide data for inclination in each axis of pile and cut-off elevation for each pile.

1.6 QUALITY ASSURANCE

A. Refer to DDC General Conditions Section 01 40 00 "Quality Requirements".

B. Materials and work shall conform to the latest edition of reference standards specified herein.

C. Certifications:

1. Structural steel shall conform to the material acceptance, certification, and inspection required by the 2014 New York City Building Code.

2. Structural timber shall conform to the material acceptance, certification, and inspection required by the 2014 New York City Building Code.

3. Structural concrete shall conform to the material acceptance, certification, and inspection required by the 2014 New York City Building Code.

4. Qualify welding processes and welding operators in accordance with AWS "Standard Qualification Procedure, and conform to inspection required by the 2014 New York City Building Code.

D. Contractor's Responsibilities:

1. The Contractor performing the work specified herein shall have at least 3 years of experience installing driven piles. The Contractor's Professional Engineer and Professional Land Surveyor shall be licensed in the State of New York.

2. The Contractor shall accurately mark 1-foot intervals on each pile and shall number these marks at 5-foot intervals starting from the pile tip. The upper portion of the pile or a sufficient portion of the leads shall be marked at 1-inch intervals as necessary to determine the final driving resistance.

3. The contractor shall engage the services of a Professional Engineer licensed in the State of New York to provide a WEAP analysis prior to installing index piles.

4. The Contractor shall cooperate with the Commissioner to facilitate the progress of the work.

E. Codes and Permits:

1. Comply with the 2014 New York City Building Code.

2. All labor, materials, equipment and services necessary to make the work comply with such requirements shall be provided without additional cost to the City of New York.

3. The Contractor shall procure and pay for all permits and licenses required to complete the work of this Section.

1.7 SPECIAL INSPECTION AND MATERIALS TESTING

A. The City of New York shall engage, under the requirements of Section 1704.1 of the Building Code, one or more Special Inspection Agencies to observe installation and provide all necessary material testing related to the work of this Section.

B. Observation of driven pile installation, and all necessary materials testing shall be by Special Inspectors meeting the minimum qualifications outlined in RCNY 101-06.

C. The Special Inspector for driven pile installation shall be present on a full-time basis during pile driving. The Special Inspector shall log the installation of each pile and determine when it has attained the required depth and driving resistance as established by Contractor's WEAP analysis and Index Pile Program. This shall not relieve the Contractor's responsibility to provide piles of required capacity outlined in the Contract Documents.

D. The Special Inspector shall prepare and submit daily reports summarizing pile installation and/or material testing activities. The Contractor shall cooperate and assist the Special Inspector(s) in the making of these records.

E. The Contractor shall have the sole responsibility for coordinating his work with the Special Inspector(s) to assure that all tests and inspection procedures required by the NYCBC and Contract Documents are property provided. The Contractor shall cooperate fully with the Special Inspector(s) in the performance of their work.

F. The Special Inspector(s) shall promptly notify the Commissioner of any nonconformances and shall submit all field logs and reports necessary to facilitate any corrective design requirements.

G. The Special Inspector(s) shall provide all necessary certifications of the work in compliance with Building Code requirements.

H. The Special Inspector(s) shall notify the Commissioner promptly of any part of the work of this section not in compliance with the Contract Documents.

1.8 PROJECT CONDITIONS

A. Borings are available for the Contractor's review. The Commissioner makes no predictions or representations regarding the character or extent of soil, or other subsurface conditions to be encountered during the work. The Contractor shall make his own deductions of the subsurface conditions which may

affect the methods or cost of construction of the work hereunder. Additional borings and other exploratory operations may be performed by Contractor, at the Contractor's option, and following the Commissioner's approval. No change in the Contract Sum will be authorized for such additional exploration undertaken by the Contractor.

B. The Contractor, by careful examination, shall inform himself as to the nature and location of the work; the conformation of the ground, the nature of the subsurface conditions; the locations of the groundwater table; the character, quality and quantity of the materials to be encountered; the character of the equipment and facilities needed preliminary to and during the execution of the work; and all other matters which can be in any way effect the work.

C. The Contractor shall be held to have visited the site and to have familiarized himself with the existing conditions of adjoining properties, utilities, and buildings.

D. The Contractor shall investigate the conditions of public thoroughfares and roads as to availability, clearances, loads, limits, restrictions, and other limitations affecting transportation to, ingress and egress of the site of the work. The Contractor shall conform to all New York City and State, and Federal regulations regarding the transportation of materials to and from and at the job site and shall secure in advance such permits as may be required.

E. The Contractor shall locate existing underground utilities in and beyond the areas of work. If utilities are indicated to remain in place, the Contractor shall provide adequate means of support and protection during the work.

1. Should uncharted, or incorrectly charted, piping or other utilities be encountered during excavation, consult utility owner immediately for directions. Cooperate with the City of New York and utility companies in keeping respective services and facilities in operation. Repair damaged utilities to the satisfaction of the utility owner.

2. Do not interrupt existing utilities serving facilities occupied by the City of New York or others, during occupied hours, except when permitted in writing by the Commissioner and then only after acceptable temporary utility services have been provided. Provide a minimum of 48-hour notice to the Commissioner, and receive written notice to proceed before interrupting any utility.

3. Remove or relocate the existing underground utilities indicated to be removed or relocated. Coordinate with utility companies for shutoff of services if lines are active.

F. The Contractor shall examine drawings to determine the sequence of operations, and relation to work of other trades. The start of work will signify acceptance of field conditions and will acknowledge coordination with the Commissioner.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to the project site in such quantities and at such times to assure the continuity of pile driving operations, and to maintain the project schedule. Carefully handle piles by means of rope slings or other means so as not to damage piles; do not use peavies, cant hooks or other sharp tools.

B. Piles shall be stored in orderly groups above ground, sufficiently blocked to minimize bending stresses. Piles exhibiting variations beyond specified limits will be considered distorted and shall not be used in the work.

C. Concentrated loads, which occur during stacking or lifting, shall be kept below the level that would produce permanent deformation or overstress of the material. Damaged piles will be rejected from use in the performance of the work and shall be removed from the site.

PART 2 - PRODUCTS

2.1 MATERIALS FOR DRIVEN PILES

A. The timber materials shall be in accordance with the Contract Documents.

B. Pile Material: The timber pile shall be Class A Southern Pine, Douglas Fir or approved equal, and shall conform with the requirements of ASTM D25. The piles shall have a circular cross-section, a minimum diameter of 8-inch at the tip with uniform taper, and the corresponding butt diameter specified in ASTM D 25.

C. Pile Section Sizes: 14-inch-butt-diameter timber piles with an 8-inch-tip-diameter are recommended to be driven to 40 feet below the bottom of pile caps. The calculated allowable axial capacity of this timber pile is 30 tons.

D. The pile shall be of adequate size and strength to withstand driving stresses to achieve the specified allowable design loads without creating stresses exceeding 1,200 psi.

E. Timber piles shall be in perfect condition free of cracks, voids, decay, marine borer attack, insect attack and Limnoria damage. All knots and rims shall be trimmed or smoothly cut flush with the surface of the pile or swell surrounding the knot. Unsound or cluster knots, splits and shakes are prohibited.

F. Piles shall be straight. The center axis of piles shall not deviate from a straight line more than 1 inch for each 10 feet of length. Short crooks shall not deviate more than 2.5 inches from straightness in any 5 feet. Spiral grain shall not exceed 0.5 of a complete twist in any 20 feet of length.

G. Splicing: All piles shall be driven in one piece. Splicing of the timber piles is not permitted.

H. Treatment: Timber piles shall be pressure-treated either with CCA or ACZA in accordance with AWPA specifications and Timber Pile Design and Construction Manual. The retention of CCA or ACZA preservative shall not be less than 0.8 pounds per cubic foot for Southern Pine or 1.0 pounds per cubic foot for Douglas Fir as specified in AWPA specifications. Tops of the piles after cut-off shall be treated in accordance with AWPA M4. They shall be treated with three coats of the selected preservative and the cut-off shall be made in sound wood.

1. Certification: Upon delivery, but before unloading piles from the truck, the Contractor shall furnish the Commissioner three (3) copies of a certificate of inspection, issued by an approved independent testing laboratory, certifying that the piles were free of decay, were properly peeled and otherwise prepared before treatment, and that the method of treatment, the chemical composition and the

amount of retention of the preservative conform to the requirements of this Section. Material inspection and certifications cost shall be borne by the Contractor.

I. Protective Tip: When necessary, to ease driving through upper fill, the contractor may elect to drive the piles with a protective driving-boot tip such as T-8316 Rival Boot as manufactured by Associated Pile and Fitting Corporation, TP 337 Timber Pile Point by DFP Foundation Products, LLC, Timber Boot by Nucor Skyline, or other approved equal.

2.2 EQUIPMENT FOR DRIVEN PILES

A. General:

1. Furnish pile-driving equipment of a type generally used in standard pile driving practice, operated at the manufacturer's specified rate, to develop the required rated energy per blow to drive and achieve specified capacity.

2. In driving all piles in the work, including index piles, the same make and model of pile hammer shall be used throughout; the operation of hammers with regard to speed, height of fall or stroke, pressure and all other variable factors must be the same; and the methods used in driving piles shall be substantially the same.

B. Hammer:

1. Furnish pile-driving hammers of a size and type able to deliver consistently effective dynamic energy, suitable to the piles to be driven and to the subsurface materials into which they are to be driven.

2. The hammer shall be in first-class operating condition having a minimum energy capable of driving the pile to the required capacity. The valve mechanism shall be serviced and kept in first-class condition so that the length of stroke will be accurately maintained at all times during driving. The capblock material shall have uniform elastic properties during driving, providing superior energy transmission, and shall be replaced if crushed, burned or damaged. Any hammer not operating in accordance with the manufacturer's specifications shall be deemed unsatisfactory by the Commissioner and shall be replaced immediately by the Contractor.

3. The pile cushion shall be 9-inch thick aluminum and micarta, or approved substitute cushion. Scrap timber shall not be used as cushion material.

C. Leads:

1. All piles shall be driven using fixed leads constructed in such a manner as to afford freedom of movement to the hammer, and capable of holding the pile firmly in correct position and alignment as well as in axial alignment with the hammer.

2. Use fixed rigid type pile driver leads that will hold the pile firmly in position and in axial alignment with the hammer to ensure support of the pile during driving. Free-swinging leads will not be permitted. Extend leads to within 2 feet of the elevation at which the pile enters the ground.

3. Leads shall be of sufficient length so that the use of a follower will not be necessary.

4. Suitable anvils or cushions shall be used to prevent undue damage of the pile butts.

D. Pre-Drilling Equipment

1. Pre-drilling equipment and/or spudding shall be adequate to pass the specified pile through all obstructions encountered.

2. Pre-drilling will be required for all piles located within 25 feet of adjacent buildings or other sensitive structures.

PART 3 - EXECUTION

3.1 EXECUTION REQUIREMENTS

A. Refer to DDC General Conditions for execution requirements.

3.2 PRE-CONSTRUCTION MEETING

A. A pre-construction meeting shall be held and attended the Commissioner, Construction Manager, Contractor, and Special Inspector. The Contractor's proposed and submitted pile installation means and methods shall be presented and discussed at this meeting. The Commissioner will document the meeting and any modifications to the submitted procedures agreed upon. If the waterfront area timber piles are to be installed at a different stage of construction, an additional pre-construction meeting shall be held prior to commencement of construction.

3.3 SITE PREPARATION

A. The Contractor shall perform his work so as not to cause harmful effects to any adjacent structures and utilities. Should damage to adjacent structures and utilities occur, all costs in connection with the repair of such damage and the restoration of damaged construction to its original condition shall be borne by the Contractor.

B. The Contractor shall lay-out the pile locations referencing the pre-approved pile identification plan.

C. The Contractor shall mark out the locations of the installed, sheet piles, tie rods and utilities. These markouts shall be a different color than the planned waterfront pile locations.

D. Pile Length Markings: Mark each pile's length by painting a horizontal line, at 1'-0" intervals. Mark the number of feet from the pile point in 5'-0" intervals. Mark piles at every inch for the last 5 feet of driving.

E. The Contractor shall be prepared to spud or pre-drill through any obstructions in the fill zone to facilitate subsequent pile installation.

3.4 INDEX PILES

A. Prior to the start of production pile installation, install driven index piles in accordance with the amount required in the Contract Documents that are the same in every way as the production piles, or as directed by the Commissioner. A minimum of 2 percent of total piles should be index piles, and they should be located evenly across the building built-over area.

B. Prior to the start of index pile installation, a WEAP Analysis shall be completed and submitted to the Commissioner.

C. The location of the index piles shall be submitted to the Commissioner for review.

D. Driven index piles shall be installed to final resistance. Hammer energy being transferred to the top of the pile shall be continuously recorded during the driving of the pile

E. Index piles shall be installed to the final driving resistance needed to achieve an ultimate pile capacity.

3.5 DRIVEN PILES

A. General

1. Piles shall not be driven in the absence of the Special Inspector.

2. A surveyor shall maintain accurate layouts and levels for all work. Up-to-date reproducible records showing as-built pile locations, tip elevation, cut-off elevation and plumbness shall be maintained.

3. All piles shall be driven by such methods and equipment as not to impair their strength and as to ensure pile shafts retain the initial driving resistance and lateral support of the soil.

4. Continuously drive each pile at the locations indicated, to the required driving criteria and depths established by the driving of index piles.

5. The Contractor shall demonstrate that the hammer energy is being transferred to the top of the pile. The capblock and cushion assembly shall be the same as was used for the index pile driving.

6. The Contractor shall coordinate the work such that pile driving shall be continuous once the pile reaches the bearing stratum; necessary lengths of pipe and splicing shall be considered and coordinated so that this requirement is satisfied. Pile splices in the upper 10 feet shall not be permitted. Contractor shall establish qualification of welders in accordance with the AWS code.

7. Carefully maintain the center of gravity for each group or cluster of piles to conform to the locations shown on the drawings. Where piles are driven out of location, the Commissioner may require that an additional pile or piles be driven at a location and in a manner that he may specify. The unacceptable pile may be left in place or may be pulled, as the Commissioner directs, without additional payment to the Contractor for driving or pulling.

8. Carefully plumb the leads and the pile before driving. Take care during driving to prevent and to correct any tendency of piles to twist or rotate.

9. If, during the driving of any piles, any of the piles previously driven show signs of heaving or lifting, the Contractor shall re-drive such piles to the required load-bearing capacity without additional cost to the City of New York.

10. When handling and driving long piles, take special precautions to ensure against overstress or leading away from a true position when driving. Spud piles may be used to minimize hard driving of long piles through obstructions near the surface.

B. Final Driving Criteria:

1. Continuously drive each pile at the locations indicated to final bearing within the Contract Documents.

2. The penetration resistances in the bearing stratum shall be adjusted by the Special Inspector to account for any penetration resistance measured in the overlying strata.

C. Driving Tolerances: Drive piles within the following maximum tolerances:

1. Location: Within 3 inches from the location indicated for the center of gravity of each single pile or pile group.

2. Plumbness: Within 5 inches in 10 feet (4 percent) from vertical following driving, and a maximum of 1 inch in 10 feet, measured when the pile is being driven and is in the leads above ground.

D. Heaved Piles: Compile recorded instrument observations made during pile driving to determine whether a driven pile has lifted from its original seat during the driving of adjacent piles. If uplift occurs, re-drive the affected piles to a point elevation at least as deep as the original point elevation with a driving resistance at least as great as the original driving resistance.

E. Special Inspection of Driven Piles:

1. Installation of the index and production pile shall be subject to New York City Building Code Special Inspection Section. All inspections shall be performed by a Special Inspector retained by the City of New York.

2. The Special Inspector shall log the driving of each pile and determine when the pile has reached the specified depth and driving resistance.

3. No pile shall be installed without the presence of the Special Inspector.

F. Cutting-Off: After each pile has been driven and accepted, cut the pile off at the required top elevation. Make cut perpendicular to axis of pile. The cut-off ends become the property of the Contractor, who is responsible for their removal and disposal.

3.6 OBSTRUCTIONS

A. If a production pile encounters an obstruction which will damage the pile tip or cause the pile to drift off location, the pile shall be pulled and the obstruction removed by spudding, augering, drilling or other approved methods, and the pile shall be re-driven.

B. Replacement of piles damaged by obstructions shall be the responsibility of the Contractor.

3.7 DAMAGED OR DISPLACED PILES

A. In the event any pile be damaged during installation and not satisfactorily repaired, or be driven out of design position sufficiently to result in a loading in excess of that allowed, or be rejected for any reason, remove or abandon and cut-off the pile.

1. Solidly fill spaces that are left by withdrawn piles that will not be filled by new piles, using cohesionless soil material such as gravel or gravel-sand mixtures. Place and compact throughout the length of the space.

B. Drive an additional pile or piles and make such changes in pile caps or other construction necessary to provide for proper load distribution.

C. The location of any additional or replacement piles or redesign shall be subject to the approval of the Commissioner.

D. Provide and pay for work of any nature (including cost of redesign) required on account of rejected, damaged, or displaced piles.

E. If during the driving of any piles any of the previously driven piles heave or lift, re-drive such heaved or lifted piles to the required load bearing capacity and without additional cost to the City of New York.

F. Drive an additional pile or piles where the centerline deviation exceeds 3 inches and an analytical determination indicates the load on any pile exceeds 110 percent of the design load.

3.8 FIELD QUALITY CONTROL

A. Special Inspection

1. The Special Inspector shall be on-site full-time during pile installation.

2. The Special Inspector shall prepare and submit to the Commissioner for review a report and log of the pile driving.

3. The Special Inspector shall submit full data to the Commissioner for review to facilitate the corrective design requirements. The Commissioner will confirm the piles, as driven in the corrective design, comply with the Design and Code requirements.

4. Upon completion and approval of all pile driving, the Special Inspector shall deliver to the Commissioner original pile driving logs and reports for review.

5. The Special Inspector shall prepare all documents necessary for filing as-built conditions with the Building Department. Besides indicating the location of all piles including the obstructed, damaged, and compensating piles, the report will include percentage out-of-plumb, final blow count, cut-off elevation, and length below cut-off of each pile.

B. Contractor's Responsibility

1. The Contractor shall notify the Commissioner at least 72 hours prior to each day of pile driving to allow the appropriate personnel to be on the site.

2. The Contractor shall prepare and periodically submit to the Commissioner for review partial area surveys to permit pile cap work to proceed and to facilitate the design of corrective measures.

C. Licensed Surveyor: Engage the services of a Licensed Land Surveyor registered in the State of New York and approved by the Commissioner for the performance of the survey work called for herein, as per New York City Building Code. The installed location of each pile shall be established by survey and shown on drawings, in accordance with the provisions of the New York City Building Code.

D. Pile Review and Corrective Measures

1. Review: The Commissioner, upon receiving the as driven pile survey, will perform a complete pile review to determine the true loading on the piles due to pile group eccentricities, including a review of the pile cap design. The pile review will determine if pile corrective measures are required.

2. Design of Corrective Measure: The Commissioner will perform all necessary design and filing to obtain Building Department Approval of all necessary corrective measures required due to pile driving operations as required by New York City Building Code.

3.9 WASTE MANAGEMENT

A. Separate and dispose of waste in accordance with the Project's Waste Management Plan.

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SECTION 32 12 16
Asphaltic Paving

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The following documents apply to all required work for the Project: (1) the Contract Drawings, (2) the Specifications, (3) the General Conditions, (4) the Addendum and (5) the Contract (City of New York Standard Construction Contract).

B. LEED / Environmentally Preferable Purchase (EPP) General Requirements:
   1. Refer to DDC General Conditions and the Addendum to the General Conditions
   2. LEED requirements apply to all Phase II work with the exception of the Existing Building scope. EPP requirements apply to the project's Existing Building scope only.

1.2 SUMMARY

A. Work includes:
   1. Provide material, labor, equipment, and services required to install asphaltic concrete paving and related work within the lot lines as shown on Drawings.

B. Related Sections
   1. Section 32 13 15 - Concrete Curbs and Pavement

1.3 SUBMITTAL PROCEDURES

A. Refer to DDC General Conditions Section 01 33 00 "Submittal Procedures".

1.4 QUALITY ASSURANCE

A. Refer to DDC General Conditions Section 01 40 00 "Quality Requirements".

B. Regulatory Requirements
   1. Work of this Section shall comply with the requirements of the 2014 NYC Building Code, the NYC Department of Buildings, the NYC Department of Environmental Protection, and the New York City Department of Transportation.
   2. Requirements for asphaltic concrete, including, but not limited to handling, equipment, transportation etc., not specified herein shall conform to the more stringent of the New York City Department of Highway Standard Specifications, New York State Department of Transportation Standard Specifications, and AASHTO "Standard Specification for Transportation, Materials, Methods of Sampling and Testing".

1.5 REFERENCES

A. References and industry standards listed in this Section are applicable to the Work. Unless more restrictive criteria or differing requirements are explicitly stated in the Specifications, or mandated by governing codes or regulations, the recommendations, suggestions, and requirements described in the referenced standards shall be deemed mandatory and applicable to the Work.

B. Standard Specifications - New York City Department of Transportation Bureau of Highway Operations.

C. Construction Specifications for Asphaltic Concrete and Other Plant-Mix Types - The Asphalt Institute, Fourth Edition.

D. Standard Specifications - Construction and Materials - New York State Department of Transportation.

E. American Society of Testing and Materials (ASTM)

F. American Association of State Highway and Transportation Officials – "Standard Specification for Transportation, Materials, Methods of Sampling and Testing".

1.6 DEFINITIONS

A. Subbase: Either the compacted subgrade or compacted aggregate base that is to receive the base course.

B. Base Course: Asphaltic concrete mixture, usually referred to as plant-mix (described by the term binder mixture by NYCDOT), that is used as a base for the final asphaltic wearing surface when a Portland cement concrete base is not used.

C. Surface Course: Final asphaltic concrete wearing surface, usually referred to as surfacing mix (described by the terms fine or extra fine asphaltic concrete mixture by NYCDOT), placed over plant-mix or Portland cement concrete base.

1.7 ENVIRONMENTAL REQUIREMENTS

A. Asphaltic Concrete:
   1. Do not install asphaltic concrete paving when there is frost on the subbase or base; when the subbase or base is wet; or when the air temperature is 40°F or below.
   2. Materials containing frost will be rejected.

B. Prime coat: Apply prime coat when air temperature is above 50°F and when temperature has not been below 35°F for 12 hours immediately prior to application. Do not apply when subbase is wet.

C. Tack coat: Apply tack coat when air temperature is above 50°F and when temperature has not been below 35°F for 12 hours immediately prior to application. Do not apply unless base is completely dry.

D. Pavement Sealer: Apply sealer under conditions similar to prime and tack coats.

E. Joint Sealer: Apply joint sealer when air and substrate temperatures are above 40°F and rising for 12 hours after application.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Asphaltic Concrete: Materials shall comply with Section 3.01 of NYCDOT Standard Specifications for each item.

B. Prime Coat: Cut-back asphalt type, AASHTO M82, (ASTM D2027) MC-30, MC-70 or MC-250.

C. Tack Coat: Emulsified Asphalt; AASHTO M140 (ASTM D977) or M208 (ASTM D2397); SS-1h, CSS-1 or CSS-1h, Diluted with one part water to one part emulsified asphalt.

D. Pavement Sealer: Polymer modified asphalt emulsion sealer meeting ASTM D2939, D140, D244, and D529; containing no coal tar, and less than 10 grams per liter of volatile organic compounds.
1. Neyra Jennite AE polymer modified asphalt sealer
2. VelveTop PM Polymer Modified Asphalt Sealer
3. SealMaster Polymer-Modified Masterseal Sealer
4. Or approved equal

E. Reflective Cracking Membrane:
1. Woven or Non-woven polypropylene fabric pre-coated with a rubberized adhesive base at least 18" in width used for preventing cracks in substrate emanating through the asphalt topping.
2. Products:
   a. Petrotac by Amoco Fabrics and Fibers Co., with Celotex primer
   b. Polyguard NW 75 by Polyguard Products, Inc., with 650 RC Liquid Adhesive and Mastic to prime surface.
   c. Bituthene S 5300 by W.R. Grace & Co.
   d. Or approved equal

F. Joint Sealer: Cold-applied low modulus pourable two-component sealant comprised of polymeric compounds compatible for both Portland cement concrete and asphaltic concrete surfaces providing a flexible, rubber-like finish. Material shall not become brittle to temperatures as low as -20°F.

2.2 EQUIPMENT

A. Provide proper compaction equipment to properly compact asphaltic concrete pavement.

2.3 MIXES

A. Bituminous material shall come from one source only.

B. Bitumen and aggregate composition shall be plant mixed entirely.

C. Composition:
1. Aggregate:

Percent Passing by Weight of Aggregate

Sieve Size	Surface Course (NYCDOT Extra Fine Surfacing Mix)	Surface Course (NYCDOT Fine Surfacing Mix- NYS Type 7F)	Base Course (NYC Binder-mix – NYSDOT Type 3)	Variation from Job Mix Formula* (Fine and Binder mix only)
1 1/2"	-	-	100	-
1"	-	-	95-100	-
1/2"	100	100	70-90	+6 (bin. mix only)
3/8"	98-100	-	-	-
1/4"	-	90-100	48-74	+7 (bin. mix only)
1/8"	-	45-70	32-62	+7 (+6 for fine)
No. 4	70-90	-	-	-
No. 8	38-65	-	-	-
No. 20	-	15-40	15-39	+7
No. 40	-	8-27	8-27	+7
No. 50	6-25	-	-	-
No. 80	-	4-16	4-16	+4
No. 200	2-8	2-6	2-8	+2

*This is the tolerance from the approved job mix, but may never be out of the accepted range

2. Asphaltic Cement (Bitumen)

Percent Bitumen by Total Weight Job Mix Formula*	Variation from Mix	Soluble in Chloroform
Plant-mix	4.5-6.5	+.4
Fine Surfacing	5.8-7.0	+.4
Extra Fine Surfacing Mix	5.0-8.0	-

D. Penetration grade of the asphaltic cement shall be 85-100.

E. The Contractor has the option to provide either the fine or extra-fine surfacing mix.

2.4 SOURCE QUALITY CONTROL

A. Inspection
1. The Contractor will assign an inspector at the plant to ensure that the mix provided is that of the design mix.
2. Provide the inspector with any required testing apparatus to ensure conformance.
3. Notify the Commissioner 72 hours in advance of each asphaltic concrete placement so that the inspector can cover the work at the plant.

B. Testing:
1. The Testing Laboratory will determine the maximum theoretical density of each mix in accordance with ASTM D2041 and do an extraction and gradation test from samples obtained in the field.

PART 3 - EXECUTION

3.1 EXECUTION REQUIREMENTS

A. Refer to DDC General Conditions for execution requirements.

3.2 EXAMINATION

A. Verify that all grades and/or concrete slabs onto which asphaltic concrete is to be placed are at the required levels prior to placement. Verify that all miscellaneous concrete work has been installed. Notify the Commissioner in writing of conditions that will interfere with the proper completion of this Work. Do not begin work until all improper conditions are remedied. Installation of aggregate subbase is described in Section 31 00 00 - Earthwork.

3.3 PREPARATION

A. Protection:
1. Provide tarpaulins for use during conditions such as such as rain, chilling winds or unavoidable delay to cover and protect paving materials.
2. Protect pavement from debris and damage from equipment and other work.
3. Exercise care in applying bituminous materials to avoid smearing of adjoining concrete surfaces. Clean surfaces of bituminous materials when smearing occurs.

B. Surface Preparation:
1. Remove all lose and foreign materials before proof rolling and application of herbicide and prime coat.

2. Proofroll prepared subbase surface to check for unstable areas and areas requiring additional compaction.
3. Do not begin paving work until deficient subbase areas have been corrected and are ready to receive paving.
4. Subbase shall be dry and free from any standing water.
5. Apply weed control agent in accordance with manufacturer's recommended dosages and application instructions. Apply to compacted, dry subbase prior to application of prime coat.
6. Apply prime coat at rate of 0.20 to 0.50 gal per sq yd over compacted subbase. Apply material to penetrate and seal, but not flood, surface. Cure and dry as long as necessary to attain penetration and to allow for evaporation of volatiles.
7. Asphaltic concrete placed on Portland cement concrete pavements or existing asphaltic concrete pavement:
   a. Any joints (expansion, contraction, construction, etc.) in the base shall be covered with the reflective cracking membrane.
   b. The surface onto which the membrane is placed shall be dry and free of debris. Clean joints over 1/8" wide by pneumatic means and fill with asphaltic joint filler.
   c. Prime surface to receive membrane as specified by the membrane manufacturer. Place the membrane in strict accordance with the manufacturer's instructions. Ends shall be overlapped 4" to 6".
   d. Placement of the surface course shall closely follow membrane laydown. Do not place more membrane than can be overlaid that working day.

3.4 WOOD FORMS

A. Provide temporary wood forms at perimeter of areas to be paved where permanent side supports (i.e., curbs, gutters or edgings) have not been constructed. Forms are to remain in place until surface course has been thoroughly rolled and compacted to require thickness.

B. Form out areas to be depressed, such as high jump pits, etc.

C. Oil wood forms before placing any paving materials against them. Stake forms securely to line and grade, using at least 3 bracing stakes or pins to each ten feet of length, to properly resist pressure and impact of roller without springing form.

D. Forms are to rest firmly upon the thoroughly compacted subbase through their entire length.

E. Clean and re-oil forms each time before reuse.

3.5 PLACEMENT

A. General:
   1. Prior to installation of pavement, verify all miscellaneous concrete items have been installed.
   2. Establish and maintain required lines and elevations.
   3. Place asphaltic concrete mixture on prepared surface, spread and strike-off. Spread mixture at the temperature required by Table 404-1 of the NYSDOT Standard Specification. Place inaccessible and small areas by hand. Place each course to required grade, cross-section, and compacted thickness.

4. Begin rolling when mixture will bear roller weight without excessive displacement. Compact mixture with hot hand tampers or vibrating plate compactors in areas inaccessible to rollers.
5. After final compression, field density shall be not less than 92% of the theoretical maximum density as determined by ASTM D2041.

B. Asphaltic Concrete Base Course - Plant-Mix:
1. Provide plant-mix base unless Portland cement concrete base is shown on Drawings or specified herein.
2. Spread sufficient plant-mix to develop a uniform 4" thickness after rolling and compaction.
3. Sprinkle with clean water and compact with a vibratory 10-ton or greater roller. Smaller weight rollers may be required due to load prohibitions on existing structures. Provide multiple rollers for large areas. In areas where the use of a roller is impracticable, heavy mechanical tampers may be used to consolidate the material. Laydown temperature of mixture shall be adjusted to take into account the longer time of the many multiple passes required by smaller compactors or mechanical tampers to achieve the required density. Refer to NYCDOT Standard Specifications for other requirements.

C. Asphaltic Concrete Surface Course - Surfacing Mix:
1. Prior to placement of surface course, apply tack coat to contact surfaces of previously constructed asphaltic or Portland cement concrete and surfaces abutting or projecting into asphaltic concrete pavement. Distribute at rate of 0.05 to 0.15 gal per sq yd of surface. Allow to dry until at proper condition to receive paving.
2. Place surface course over base only when base is dry and free from standing water.
3. Spread in loose layer and of such depth to result in a uniform course having the thickness of 11/2" after compaction and rolling (1" for surface course over concrete base).
4. Compact the material with approved roller to a smooth even surface and to the levels indicated.
5. Roller shall be a minimum 10-ton tandem type having a rear wheel minimum compression of 225 lbs per lineal inch. Refer to subparagraph B.3 immediately above for other requirements.
6. Motion of roller shall be slow enough to avoid displacement of the surface rolled.
7. Keep roller wheels moistened with water to prevent adhesion of the materials to wheels, but without use of excessive amount. Use of any liquids other than water for this purpose is prohibited.
8. If the operation of laying materials is interrupted, the end of the laid material shall be left unrolled until the work is resumed so that there will be no joints in the topping.
9. If it is necessary to pass the roller over or to permit traffic to pass over such temporary end, thus consolidating it, cut back the material before recommencing laying operations in order to present a fresh clean surface for contact with the newly placed material.
10. Make joints between old and new pavements, or between successive days' work, to ensure continuous bond between adjoining work. Construct joints to have same texture, density and smoothness as other sections of the asphaltic concrete course. Clean contact surfaces and apply tack coat.
11. The use of liquid bitumen or hot smoothing irons in finishing such joints is prohibited.
12. At locations adjacent to curbing and gutters inaccessible to rollers, compression shall be effected with iron tampers weighing not less than 25 lbs, having a maximum bearing area of 48in2.
13. Any surfacing material (ie. sealer, paint, wearing surface, etc.) to be placed on the asphaltic concrete surface shall only be done after the asphaltic concrete has cured and the oils have dissipated. Consult with the product manufacturer for their exact requirements.
14. Where asphaltic concrete abuts concrete walls, existing asphalt pavement or concrete pavements apply asphalt joint sealant. Neatly tape all sides of joints, including vertical surfaces where existing) to prevent damage and smearing of material on surfaces and protect until cured.

3.6 FINISH

A. The rolled finish surface shall be free from porosity, fissures, or blemishes, true to crown and grade; free from depression, waves, bunches, or unevenness so as to allow complete runoff.

B. Should defects in composition compactness or surface finish appear in the completed work, remove defective areas to full depth of the course and replace with thickness and finish specified.

C. With permission of the Commissioner, minor surface defects may be restored with approved sealing compound.

D. Cracking, blistering, running, or deviation from requirements specified above that occur during the guarantee period are considered defects under the warranty conditions of the Contract.

3.7 PATCHING

A. Remove and replace paving areas mixed with foreign materials and defective areas in a manner acceptable to the Commissioner. Cut-out such areas and fill with fresh, hot, asphaltic concrete. Compact by rolling to maximum surface density and smoothness.

3.8 PAVEMENT SEALER APPLICATION

A. Do not apply pavement sealer on pavements covered with other materials, ie. unit pavers, resilient surfacing. Apply on all other pavements.

B. After asphaltic concrete surface course has been tested and approved for allowable tolerances and the surface is hardened to a degree acceptable to the sealer manufacturer (a minimum of 30 days), apply the sealer in accordance with the manufacturer's instructions.

C. Sweep or mechanically clean surfaces thoroughly free of dust, dirt and foreign materials; remove oil and grease spots with household detergent. Flush entire surface with water; remove all remaining water puddles. Apply primer if recommended by the manufacturer.

D. Dampen pavement as recommended by the manufacturer; pour sealer mix in spots or ribbons, then spread evenly with push broom or squeegee. Mechanical applicators may be used, and mix must be periodically agitated for uniformity. Two coats shall be applied, allowing for complete drying, tack free, between coats. Surface shall be uniform, with no holidays or pinholes.

E. Allow sealer to dry about 24 hours minimum depending on weather conditions before opening surface to traffic. Temperature for drying conditions shall not be less than 50°F for 48 hours after application.

F. Apply at a minimum rate per coat of 1.10 gallons of sealer concentrate for every 100 sq ft of surface, or more concentrate if required by the sealer manufacturer. Concentrate shall be mixed with water and clean, dry, silica sand in quantities recommended by the manufacturer. Typical sand content is 5 pounds per gallon of concentrate, and shall meet fineness rating recommended by manufacturer. Maximum water content is 15% of undiluted concentrate volume.

G. Apply Line Markings per manufacturer's recommendations.

3.9 TOLERANCES

A. The thickness of the plant-mix and surface course shall not vary by more than 1/2".

B. The finish elevation for the plant-mix shall not vary from plan grade by more than 1/2", the surface course by more than 1/4".

C. The smoothness tolerance for the plant-mix is 1/4", the surface course 1/8", when measured as described under "Field Quality Control".

3.10 FIELD QUALITY CONTROL

A. Testing and Inspection:
1. The inspector will take samples of the asphaltic concrete to check conformance with the design mix and will verify the in-place density.
2. Pay for any tests such as cores required by the Commissioner when such tests show non-conformance with the Drawings and Specifications.
3. Test finished surface of each asphaltic concrete course for smoothness, using 10-foot straightedge applied parallel with, and at right angles to, centerline of paved area.
4. Check the final surface for depressions by applying water in the presence of the Commissioner. Water should not pond and should flow to all catch basins and trench drains.

B. Survey: Provide a survey showing elevation of finished surface on 25 foot intervals.

3.11 CLEANING

A. After completion of paving operations, clean surfaces of excess or spilled asphalt materials to the satisfaction of Commissioner.

3.12 PROTECTION

A. After final rolling, do not permit vehicular traffic on asphaltic concrete pavement until it has cooled and hardened so as not to be marked and in no case sooner than 6 hours.

B. Provide barricades and warning devices as required to protect pavement and the general public.

C. Cover openings of structures in the area of paving until permanent coverings are placed.

END OF SECTION 32 12 16

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SECTION 32 13 15
Concrete Curbs and Pavement

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The following documents apply to all required work for the Project: (1) the Contract Drawings, (2) the Specifications, (3) the General Conditions, (4) the Addendum and (5) the Contract (City of New York Standard Construction Contract).

B. LEED / Environmentally Preferable Purchase (EPP) General Requirements:
   1. Refer to DDC General Conditions and the Addendum to the General Conditions
   2. LEED requirements apply to all Phase II work with the exception of the Existing Building scope. EPP requirements apply to the project's Existing Building scope only.

1.2 SUMMARY

A. Work includes:
   1. Furnish material, equipment, labor, services required to provide for concrete curbs, pavements and footings. Work includes the installation of formwork, reinforcement, expansion joints and other items listed herein within the site. Provide special formwork or form liners for concrete with smooth finishes. Allow ample time and facility for the Work of other Divisions to be installed.

B. Related Sections
   1. Section 32 12 16 - Asphaltic Paving

1.3 SUBMITTAL PROCEDURES

A. Refer to DDC General Conditions Section 01 33 00 "Submittal Procedures".

1.4 QUALITY ASSURANCE

A. Refer to DDC General Conditions Section 01 40 00 "Quality Requirements".

B. Regulatory Requirements:
   1. Building Code: Work of this Section shall conform to all requirements of the 2014 NYC Building Code and all applicable regulations including safety, health, noise, and anti-pollution regulations. Where more severe requirements than those contained in the 2014 NYC Building Code are given in this Section, the requirements of this Section shall govern.
   2. Industry Standards: The ACI Standards listed under references apply to Work of this Section. Where more severe requirements then those contained in the Standards are given in this Section or the Building Code, requirements of this Section or the Building Code shall govern. The Contractor shall keep a copy of ACI SP-15 - "Field Reference Manual" at the site.

C. Certifications:
   1. Acquire cement and aggregate from same source for all work. If a change in suppliers is required, a new mix submittal must be produced with the new material and submitted for approval.

D. Coordination:
   1. Coordinate this work with the work of other Divisions so that items to be installed are done so correctly and in proper sequence.

1.5 REFERENCES

A. References and industry standards listed in this Section are applicable to the Work. Unless more restrictive criteria or differing requirements are explicitly stated in the Specifications, or mandated by governing codes or regulations, the recommendations, suggestions, and requirements described in the referenced standards shall be deemed mandatory and applicable to the Work.

B. American Society of Testing and Materials (ASTM) standards, latest editions.

C. American Concrete Institute (ACI) standards, latest editions.

D. "Placing Reinforcing Bars - CRSI-WCRSI Recommended Practices", latest edition. Concrete Reinforcing Steel Institute.

1.6 DEFINITIONS

A. Exposed to view:
   1. Situated so that it can be seen from eye level from a public location. A public location is that which is accessible to persons not responsible for operation or maintenance of the building.

1.7 DESIGN REQUIREMENTS

A. Performance Characteristics:
   1. Curbs: Normal weight concrete with a minimum compressive strength of 3500 psi, air entrained, and a maximum water to cement ratio of 0.45.
   2. Exterior slabs on grade (pavements, stairs, etc): Normal weight concrete with a minimum compressive strength of 3500 psi, air entrained, and a maximum water to cement ratio of 0.40.

B. Mix design for concrete with smooth form is to contain a high-range water reducer (super plasticizer).

PART 2 - PRODUCTS

2.1 MATERIALS

A. Rough Formwork: Shall be Commercial Douglas Fir, DFPA: 5/8" thick minimum.

B. Overlaid Plyform Formwork

1. Basis-of-Design Product: Subject to compliance with requirements provide B-Matte Formguard by Simpson Timber Company or comparable product by one of the following:
   a. Dayton Richmond Concrete Accessories
   b. Forest Products Supply Co.,
   c. Or approved equal.

C. Smooth Form Finish Formliner
   1. Basis-of-Design Product: Subject to compliance with requirements provide #340 Smooth Face by Greenstreak or comparable product by one of the following:
      a. Architectural Polymers
      b. Sika
      c. Or approved equal.

D. Release Agent:
   1. Basis-of-Design Product: Subject to compliance with requirements provide VOC compliant material such as those of the Cresset Chemical Company for coating forms or comparable product by one of the following:
      a. W.R. Meadows
      b. TK Products
      c. Or approved equal

E. Form Ties: Wire ties not permitted. Form ties for exposed concrete shall be adjustable, leave no metal closer than 11/2" to the surface, and free of devices which leave holes or depressions larger than 7/8" back of exposed surface.

F. Reinforcing Bars: All reinforcing bars shall be of deformed type of new billet steel conforming to current requirements of ASTM A615 Grade 60. No rail or re-rolled steel will be permitted. All bars shall be epoxy coated in accordance with ASTM A775.

G. Welded Steel Wire Fabric: Wire Fabric shall conform to the requirements of ASTM A185. All wire mesh shall be epoxy coated in accordance with ASTM A884.

H. Supports for Reinforcement: Support for reinforcement supported by ground shall be coated wire bar supports or bar supports made of dielectric material or other acceptable materials or precast concrete block, 4" square minimum, having a compressive strength equal to that of the concrete being placed. Wire bar supports shall be coated with dielectric material for a minimum distance of 2" from the point of contact with the epoxy-coated reinforcing bars.

I. Cement: Shall conform to ASTM C150 Type II and shall be of the non air-entrained type.

J. Admixtures:
   1. The use of admixtures shall comply with the requirements of Section BC 1903.6 of the 2014 NYC Building Code. The final soluble chloride content in concrete, percent by weight of cement, due to the addition of admixtures and other ingredients shall not exceed 0.05 at 28 days.
   2. Air-entraining admixtures shall conform to ASTM C260.
   3. Chemical admixtures shall conform to ASTM C494.
   4. Slag cement: ASTM C989, Grade 100 or 120.

a. Basis-of-Design Product: Subject to compliance with requirements provide GranCem slag cement as manufactured by the St. Lawrence Cement Company or comparable product by one of the following:
   1) Lehigh Cement Company
   2) LafargeHolcim
   3) Or approved equal

5. The amount of cement required by the 2014 NYC Building Code may be reduced by 8% as per the code with the use of slag cement that has been reviewed and approved by the Commissioner.

K. Water: Shall be clean potable water free of injurious foreign matter conforming to the requirements of Section BC 1903.4 of the 2014 New York City Building Code.

L. Aggregate: Aggregate shall conform to ASTM C33, No.57, No.67 or No.8. Maximum size of coarse aggregate shall conform to paragraph 3.3.2 of ACI 318.

M. Curing Compounds:
1. Clear Curing and Sealing Compound (A.I.M. Regulations - VOC Compliant, 350 g/l): Liquid type membrane forming curing compound, clear styrene acrylate type, complying with ASTM C1315, Type I, Class A, 25% solids content minimum. Moisture loss shall be not more than 0.40 Kg/m2 when applied at 300 sq. ft./gal. Manufacturer's certification is required.
2. Curing Compounds:
   a. Basis-of-Design Product: Subject to compliance with requirements provide Super Diamond Clear VOX" by The Euclid Chemical Company or comparable product by one of the following:
      1) Master Builders
      2) W.R. Meadows
      3) Or approved equal

N. Bonding Agent:
1. Epoxy/acrylic resin that will not form a vapor barrier with the concrete with the following properties:
   a. Bond strength of 1800 psi in 2 hours when tested in accordance with ASTM C882.
   b. Flexural strength of 2000 psi in 28 days when tested in accordance with ASTM C78.
   c. Tensile strength of 600 psi in 28 days when tested in accordance with ASTM C496.
2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. "CR246 Sto Bonding and Anti-corrosion Agent" by Sto Concrete Restoration Division
   b. Sika Corp.
   c. Euclid Chemical
   d. Or approved equal

O. Expansion Joint Filler: Closed-Cell Polyurethane or Closed-Cell Expanded polyethylene Joint Filler - Resilient, compressible, semi-rigid
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. W.R. Meadow's Ceramar
   b. A.C. Horn's Closed Cell Plastic Foam Filler, Code 5401
   c. Sonneborn's Sonoflex F
   d. Or approved equal.

P. Expansion Joint Sealant: Type 1A Sealant

1. For Horizontal Joints: Two-part, self-leveling polyurethane sealant for traffic bearing construction.
   a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      1) Mameco's Vulkem 255
      2) Pecora's Urexpan NR-200
      3) Bostik's Chem-Calk 550 or Products Research & Chemical's RC-2SL
      4) Or approved equal.
2. For Vertical Joints: Two-part, non-sag polyurethane sealant.
   a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      1) Mameco's Vulkem 227
      2) Pecora's Dynatrol II
      3) Bostik's Chem-Calk 500 or Products Research & Chemical's RC-2
      4) Or approved equal.

2.2 MIXES

A. General: Concrete for all parts of the Work shall be of the specified quality capable of being placed without excessive segregation and, when hardened, of developing all characteristics required by the Specifications and Drawings.

B. Strength: Strength requirements given in Section 1 of this Specification are based on 28-day compressive strength, unless high early strength is specified, in which case required strengths are based on 7-day compressive strength.

C. Method of Proportioning:
   1. Proportion concrete mix of strength listed in B above in accordance with the requirements of Section BC 1905.2.3 of the 2014 NYC Building Code. The Testing Laboratory and the Commissioner will review the design mix.
   2. Mix designs are specific to material used, concrete producer, and method of placement. Each mix design must be reviewed and accepted by the Commissioner.
   3. Proportion and produce normal weight concrete to have a maximum slump of 4" or less. A tolerance of up to 1" above the indicated maximum shall be allowed for individual batches provided the average for all batches or the most recent 10 batches tested, whichever is fewer, does not exceed the maximum limit. The slump shall be determined by ASTM C143. Concrete containing High Range Water Reducer shall have a slump not exceeding 9", unless otherwise approved by the Commissioner. The concrete shall arrive at the job site at a slump of 2""to 3", be verified by the Commissioner, and the HRWR admixture added to increase the slump to the approved level.

D. Concrete shall be air-entrained with an air content for the grading size of coarse aggregate as follows:
   1. No.8.....71/2%
   2. No.57 or 67.....6%
   3. Tolerance on air content as delivered shall be +1.5%.

2.3 SOURCE QUALITY CONTROL

A. Tests:
   1. The Commissioner will review the proposed materials for compliance with the Specifications prior to construction.
   2. The Testing Laboratory will perform field tests as work progresses as listed in "Field Quality Control".

B. Inspection:
   1. Testing Laboratory:
      a. Concrete work is subject to Quality Control Inspection.
      b. The Commissioner will assign a licensed concrete testing laboratory to perform the required field testing. The Testing Laboratory will review the mix design, perform field testing, and inspect the work as it progresses. The listing of services to be performed by the testing Laboratory are given in Section 1.6 of ACI 301.
      c. The Testing Laboratory must be present when the concrete is being placed. The Commissioner may elect to have the laboratory present at the plant to witness the batching and mixing of the concrete.
   2. Notification
      a. Notify the Commissioner in writing at least forty-eight hours in advance of each concrete placement.
      b. During the placement of the concrete, notify the Commissioner immediately of any delay at the concrete plant or at the job site. Do not mix concrete or add admixtures unless the Commissioner and Testing Agency Technician are present.
   3. Contractors Responsibility for Quality Control
      a. The Commissioner and the Testing Laboratory shall receive the producer's Computer Batch Ticket for each truck.
      b. The tests and inspections, as provided in the Code, do not in any way relieve the Contractor of responsibility to construct the Work in accordance with the Drawings and Specifications and to use safe, standard methods of construction at all times, safeguarding the public, workmen, and structure. The Contractor shall be solely responsible for the physical control of the materials and concrete mixes, and shall see that such mix designs, tests, and controls are in accordance with the Code and Specifications. The Contractor's superintendent shall attest that the work was installed in accordance with the documents.

PART 3 - EXECUTION

3.1 EXECUTION REQUIREMENTS

A. Refer to DDC General Conditions for execution requirements.

3.2 EXAMINATION

A. Prior to placement of concrete, verify that the concrete cover over the reinforcement is that specified on Drawings.

B. Verify that reinforcement and all other embedded items are provided and held securely, positioned accurately, and will not be a detriment to concrete placement.

C. Examine all adjoining work on which this Work is in anyway dependent for proper installation and workmanship. Report to the Commissioner any condition that prevents the performance of this Work.

3.3 PROTECTION

A. Protect concrete members on grade and the subgrade from freezing before and after installation. Provide blankets and other items necessary.

B. Protect adjacent finish materials and previously poured concrete against spatter during concrete placement.

C. Provide and maintain barricades and safeguards around openings, etc. to protect workmen from injury and to comply with the 2014 New York City Building Code and OSHA regulations.

3.4 FORMWORK

A. Provide formwork wherever necessary to confine concrete to the required shapes shown on Drawings. Follow all procedures of Section 2 of ACI 301, ACI 347, and Section BC 1906 of the 2014 NYC Building Code. Formwork, reinforcement, and embedded items shall be clean of all accumulated mortar from previous concreting and other foreign material. Restore or replace any formwork as required.

B. Cover the surfaces of the rough or overlaid plyform formwork (when used) with an approved form release agent that will effectively prevent absorption of moisture, prevent bond with the concrete, and which will not stain the concrete surfaces. Do not apply oil or release agents on formwork for concrete to receive additional concrete (such as at construction joints). Apply at a rate that will help achieve the finish specified below. Follow manufacture's recommendations.

C. Adequately support and substantially brace formwork to hold lines and shape. Securely brace forms against lateral deflection. Formwork shall be tight jointed to prevent leakage of concrete.

D. Place chamfer strips in the corners of forms to produce beveled edges (chamfers) on permanently exposed surfaces.

E. Provide "Rough Form Finish" for surfaces not exposed to view. Use plywood or metal forms coated with a release agent.

F. Provide "Smooth Form Finish" for surfaces exposed to view and the elements. Use dress, square-edged lumber with form liner or overlaid plyform forms with applicable release agent. Do not exceed manufacture's recommendations for number of re-uses for the form liner or overlaid plyform. Arrange the forms or form liner in an orderly and symmetrical fashion, keeping the number of seams to a practical minimum.

G. Remove forms in such a manner as to assure the complete safety of the structure as required by Section BC 1906.5 of the 2014 NYC Building Code. Formwork not supporting the weight of the concrete may be removed as soon as the concrete has hardened sufficiently to resist damage from removal operations and as required by H below.

H. When restoration of surface defects or finishing is required at an early age, remove forms as soon as the concrete has hardened sufficiently to resist damage from removal operations.

3.5 REINFORCEMENT

A. Place reinforcement in accordance with CRSI "Placing Reinforcement Bars", Section 3 of ACI 301, and Section BC 1907.5 of the 2014 NYC Building Code.

B. Unless otherwise permitted, welding of crossing bars (tack welding) for assembly of reinforcement is prohibited.

C. Support and fasten together all reinforcement to prevent displacement by construction loads or placing of concrete.

D. Lifting of bars and welded wire fabric into position during placement of concrete is not permitted.

E. Where the concrete surface will be exposed to the weather in the finished structure, the portions of all accessories within 1/2" of the concrete surface shall be non-corrosive or protected against corrosion.

F. Provide minimum protective cover given in Section BC 1907.7 of the 2014 NYC Building Code if not indicated on Drawings.

G. All splices not shown on the Project Drawings shall be shown on the shop drawings and approved by the Commissioner.

H. All embedment lengths not shown on the Project Drawings shall be shown on the shop drawings and approved by the Commissioner.

3.6 PREPARATION

A. Remove ice, excess water, trash, and rubbish from forms.

B. Remove hardened concrete from inner surfaces of conveying equipment and all formwork, reinforcement, and dowels.

C. Prepare previously placed concrete to be in contact with new concrete in the manner described under "Construction Joints".

D. Prepare existing concrete to be in contact with new concrete by roughening and cleaning the surface and applying a bonding agent. Surface must be free of laitance. Concrete must be placed after agent cures and within 24 hours of applying bonding agent in accordance with the directions of the manufacturer.

E. Do not place concrete on frozen ground.

3.7 JOINTS AND EMBEDDED ITEMS

A. Construction Joints:
   1. Make joints not shown on Drawings at locations that will least impair the strength of the structure and comply with requirements of Section BC 1906.8 of the 2014 NYC Building Code. Such location is subject to the approval of the Commissioner.
   2. Continue reinforcement across joints. Provide longitudinal keys at least 1 1/2" deep in walls and provide other keys as required.

3. Thoroughly clean concrete surface of oil, grease, and other contaminants and remove all laitance prior to placement of adjoining concrete. Roughen surface of the concrete in an approved manner that will expose the aggregate uniformly and will not leave laitance, loosened particles of aggregate, or damaged concrete at the surface. Dampen surface immediately prior to placement.

B. Expansion Joints:
1. Do not extend reinforcement or other embedded metal items bonded to concrete continuously through expansion joint. Provide smooth dowels greased on one end at the joints or insert into pvc sleeve of length greater than the dowel length by .75" minimum.
2. Provide expansion joint filler at the joint of the sizes indicated on the Drawings or specified herein.

C. Embedded items:
1. Place all fence sleeves, shoes, and other embedded items required for the Work of other Divisions or for their support prior to concreting.
2. Provide ample notice and opportunity for items of other Division to be introduced and/or furnished for installation before concrete is placed. Coordinate the Work of the other Divisions so all items are placed in their proper location.
3. Set metal pipe sleeves, sockets, shoes, etc. into concrete to receive fence posts or any other items, all as indicated on details.

3.8 MIXING AND PLACING CONCRETE

A. General:
1. Notify Commissioner at least 48 hours in advance of each concrete placement. Do not place concrete without approval of the Commissioner.
2. Do not allow rainwater to increase mixing water nor damage surface finish.
3. When placing concrete in cold weather (below 40oF), concrete shall have an accelerating admixture added.
4. Production of concrete, including batching and mixing, shall be done in accordance with the requirements of Section 4 of ACI 301 and Section BC 1905.8 of the Building Code.
5. Placement of concrete shall be done in accordance with the requirements of Section 5 of ACI 301 and Sections BC 1905.9 through 1905.13 of the Building Code. All consolidation shall be done by vibration.

B. Mixing:
1. Batch, mix, and transport ready-mixed concrete in accordance with the appropriate sections of ASTM C94 and Section BC 1905.8.2 of the 2014 NYC Building Code. Truck mixers and agitators shall meet the requirements of the Truck Mixers Manufacturer's Bureau or shall comply with Section 8.1.2 of ASTM C94 and shall be NYSDOT approved. All trucks shall have working revolution counters and site gages.
2. Batch and mix other concrete in accordance with subsection 4.3.1 of ACI 301.
3. Use of chemical admixtures must be approved by the Commissioner.
4. Unless otherwise approved by the Commissioner, concrete shall be deposited within 11/2 hours or 300 revolutions of the mixing drum, whichever comes first, after introduction of water to the cement or cement to the aggregate. When the ambient temperature rises above 90oF, the time shall be decreased to 1 hour.
5. Tempering and control of mixing water

a. Mix concrete only in quantities for immediate use. Concrete which has started to set shall not be retempered, but shall be discarded. Water shall not be added at the site.
b. For concrete containing HRWR (Superplasticizer), if loss of slump occurs, HRWR may be redosed at the site as long as a "flash set" has not occurred. Redosage procedures must be discussed and approved by the Commissioner and the admixture manufacturer.

C. Placing: Place concrete in accordance with ACI 304R, ACI 318, and Sections BC 1905.9 and BC 1905.10 of the 2014 NYC Building Code.
1. Consolidate all concrete by vibration so that the concrete is thoroughly worked around the reinforcement, around embedded items and into corners of forms, eliminating all air or stone pocket or weakness. Internal vibrators shall be the largest size and most powerful that can be used in the Work, as described in Table 5.1.5 of ACI 309R, with a minimum frequency of 7000 revolutions per minute and shall be operated by competent workmen. Over-vibrating and use of vibrators to transport concrete within forms is not permitted. Insert and withdraw vibrators at many points, from 18" to 30" apart. At each insertion, the duration shall be sufficient to consolidate the concrete but not sufficient to cause segregation, generally from 5 to 15 sec duration. Keep a spare vibrator on the job site during all concrete placing operations.
2. Cold Weather Concrete Protection: When the mean daily temperature of the atmosphere is less than 40oF during concreting, or within 24 hours thereafter, follow the procedures outlined in ACI 306R to protect the concrete. Temperature of the plastic concrete shall be no lower than 55oF. Heat all forms, reinforcing steel, and surfaces to receive concrete above the freezing point and keep them completely free of frost, snow, and ice.
3. Hot Weather Protection: When the mean daily temperature of the atmosphere is over 90oF during concreting, follow the procedures outlined in ACI 305R to protect the concrete.

3.9 FINISHING OF FORMED SURFACES AND RESTORATION OF SURFACE DEFECTS

A. General:
1. Remove forms as soon as practicable.
2. Restore surface defects, including tie holes and cracks, immediately after form removal. Patches shall be of quality to match the specified finish.
3. Remove oil, grease, compounds, and other contaminants from surfaces and areas to be restored.
4. Provide finishes specified below immediately after form removal.
5. Provide curing and protection.

B. Restoration of Surface Defects:
1. Restore surface defects in accordance with subsection 5.3.6 of ACI 301. At the Commissioner's discretion, repair mortars and coatings shall be employed to rectify defects. Materials shall be as selected by the Commissioner.

C. Tie Holes and Other Restorations:
1. Remove ties, nails, and other form accessories below the concrete surface when the surface is exposed to view and/or the elements. For surfaces not exposed to view or the above mentioned conditions, remove metal to the surface.
2. Undercut surfaces of holes. After cleaning and thoroughly dampening the holes, fill them solid with the patching mortar. The mortar shall match the color of the existing concrete for concrete exposed to view as specified in paragraph B above.

D. Formed Finishes:
1. Rough Form Finish: Provide for concrete not exposed to view.
   a. Restore concrete surface as indicated above.
   b. Chip or rub off fins exceeding 1/4" in height.
2. Smooth Form Finish: Provide for concrete exposed to view. Concrete shall have been placed without the need for patching or removal of fins, etc.
   a. Restore concrete surfaces as indicated above.
   b. Chip or rub off fins completely and grind smooth.
   c. Provide smooth rubbed finish as follows:
      1) Produce on newly hardened concrete no later than the day following form removal.
      2) Wet the surfaces and rub with a No. 16 carborundum brick or other equal abrasive to obtain a smooth, even surface of uniform appearance without applying any cement or other coating.
      3) Obtain the final finish by thoroughly rubbing with a No. 30 carborundum brick. The surface shall be wet for a period of 3 days. The Commissioner shall be the sole judge if the finish is acceptable.

E. Acceptance of Concrete Finish:
1. If the finish produced is not acceptable to the Commissioner, the Contractor shall be responsible for all costs incurred to produce an acceptable finish by whatever means determined by the Commissioner. Remove stains, rust, efflorescence, and other surface deposits to the satisfaction of the Commissioner.

3.10 PAVEMENTS AND SLABS

A. General:
1. Mixing and placing shall be carefully coordinated with finishing. Do not place concrete more rapidly than it can be spread, straight edged, and darbied or bull floated. Provide leveling, floating, troweling, etc. at the correct time interval after pouring to prevent dusting and a non-durable surface as specified in ACI 302.1R. These operations must be performed before bleeding water has an opportunity to collect on the surface.
2. To obtain good surfaces and avoid cold joints, the size of finishing crews shall be planned with due regard for the effects of concrete temperature and atmospheric conditions on the rate of hardening of the concrete.

B. Finishing:
1. Slope pavements uniformly toward drains. If pitch or elevations are not shown on Drawings, provide a minimum of 1/8" per foot.
2. Finish pavement surface to a true smooth plane and texture with a toothed roller or float with a wood float. Score concrete pavement in squares of approximately 5'-0" and/or as shown on Drawings. Each rectangular slab shall have all edges neatly rounded with proper tools and be bounded on all sides by a troweled border about 1" in width.
3. Level ramp, step and driveway surfaces with wood float and follow with a broom finish perpendicular to direction of traffic.

C. Placement:
1. General:
   a. Aggregate base material and preparation is given in Section 31 00 00 - Earthwork.

b. Where pavements to remain are damaged or destroyed as a result of the Work, patch, restore, or replace as required. Color to match existing.
c. Subgrade and/or aggregate base shall be free of frost before concrete placing begins.
d. Control Joints:
   1) Primary Method: Soff-Cut System method, by Soff-Cut International, Corona, CA (800)776-3328. Finisher must have documented successful experience in the use of this method prior to this project. Install cuts within 2 hours after final finish at each saw cut location. Use 1/8 inch thick blade, cutting 11/4 inch into slab.
   2) Optional Method (Where Soff-Cut System Method Equipment is Not Available): Properly time cutting with the set of the concrete. Saw-cut control joints within 12 hours after finishing. Start cutting as soon as the concrete has hardened sufficiently to prevent aggregates being dislodged by the saw. Complete cutting before shrinkage stresses become sufficient to produce cracking. Use 1/4 inch thick blade, cutting 1/4 slab depth.
e. Dampen subgrade or aggregate base immediately prior to placement of concrete.
f. Pour slab to required thickness after installation of reinforcement.

2. Pavements
   a. Provide 4" thick concrete slab unless otherwise indicated.
   b. Provide 6x6-W2.9xW2.9 WWF placed 11/2" from top surface.
3. Driveways
   a. Provide 7" thick concrete slab.
   b. Provide 4x4-W4xW4 placed 2" from top surface.
4. Expansion joints
   a. Provide expansion joints for all exterior concrete pavement, slabs under asphalt, driveways, etc. specified under this Section. Expansion joints shall occur at intervals not to exceed 20' in each direction or as indicated on Drawings.
   b. Provide continuous expansion joints at the following locations: Driveways and other concrete pavements abutting area walls, buildings, retaining or any other walls, check pieces, steps, curbs.
   c. Expansion joint shall be 1/2" wide, full depth minus 1/4" to allow for the poured joint sealer.

3.11 MISCELLANEOUS CONCRETE WORK

A. Provide curbs, footings, walls, ramps, and other miscellaneous concrete work.

3.12 PATCHING AND BONDING TO EXISTING CONCRETE

A. Provide bonding agent whenever new concrete is to be poured against existing concrete, whenever the time between concrete pours is longer than that allowed for proper bond, and wherever bonding agent is indicated on the Drawings to be applied.

B. Remove loose concrete from surface to be bonded with new concrete and clean. Remove rust from reinforcement and structural steel by power chipping and power driven brushes.

C. Apply bonding agent in accordance with manufacturer's specifications. Pour concrete as soon as bonding agent has cured and within 24 hours after placement. If the 24-hour period has elapsed, then the bonding agent must be reapplied.

3.13 CURING AND PROTECTION

A. General:
1. Begin curing concrete immediately after placement and finishing. Protect all freshly deposited concrete from premature drying and excessively hot or cold temperatures and maintain it with minimal moisture loss at a relatively constant temperature for the period of time necessary for the hydration of the cement and proper hardening of the concrete. Detailed procedures are given in ACI 308.
2. Do not apply curing compounds to surfaces receiving additional concrete. Provide only wet curing.

B. Procedure:
1. Concrete surfaces not in contact with forms:
   a. Ponding or continuous non-manual sprinkling.
   b. Absorptive mat or fabric, sand, or other covering kept continuously wet.
   c. Curing compounds conforming to ASTM C1315.
2. Concrete surfaces in contact with forms:
   a. Minimize moisture loss from forms exposed to heating by the sun by keeping forms wet until they are removed.
   b. After form removal, cure with one of the methods listed in 1 above.
3. Continue curing until a total of 7 days has elapsed during which the temperature of the air in contact with concrete has remained above 50oF. Prevent rapid drying during and at the end of the curing period.
4. Remove all curing compounds with cleaners recommended by curing compound manufacturer.

C. Cold Weather Curing:
1. Concrete must be protected from water loss. This shall be accomplished by the application as soon as possible without harm to the concrete surfaces of either (a) exhaust steam, or vapor-resistant paper or polyethylene film, or (b) curing compounds. In all other respects, curing shall conform to applicable provisions of this Section. Concrete temperature shall be maintained between 50oF and 70oF.

D. Hot Weather Curing:
1. During the period June 1 to October 1 or when hot weather conditions require it, maintain continuous water curing for a minimum period of twenty-four hours. Provide for wind breaks, shading, and other necessary provisions.
2. After 24 hours, curing shall be by one of the methods specified under B above. In all other respects, curing shall conform to applicable provisions of this Specification. Upon termination of the specified moist curing, every effort should be made to reduce the rate of drying by avoiding air circulation.

E. Protection from mechanical injury: Protect concrete from mechanical disturbances during curing period as described under "Protection and Cleaning".

3.14 TOLERANCES

A. Construct formwork so that concrete surfaces will conform to the tolerance limits listed in ACI 117.

B. Establish and maintain in an undisturbed condition and until final completion and acceptance of the project sufficient control points and bench marks to be used for reference purposes to check tolerances.

C. Place reinforcing bars in accordance with the tolerances given in Section BC 1907.5.2 of the 2014 NYC Building Code.

D. Move bars as necessary to avoid interference with other reinforcement, conduits, or imbedded items. If bars are moved more than one bar diameter, or enough to exceed the above tolerances, the resulting arrangements are subject to approval by the Commissioner.

E. Place concrete to meet tolerances specified in ACI 117, unless specified otherwise herein.

3.15 FIELD QUALITY CONTROL

A. Tests - Tests to be performed by the Testing Laboratory during construction are as follows:
1. Compliance of materials to Specifications tested from production samples.
2. Determination of the slump of the concrete for each sample taken and whenever consistency of the concrete appears to vary using ASTM C143. The Testing Laboratory will reject any concrete that does meet the slump requirements.
3. Determination of water content of freshly mixed concrete utilizing the procedure of AASHTO TP23. Concrete that does not meet the maximum water to cement ratio or the proportions given in the approved design mix will be immediately rejected regardless of slump.
4. Strength tests: The frequency of conducting strength tests of concrete shall be in accordance with Section BC 1905.6.2 of the 2014 NYC Building Code, with additional cylinders taken for an additional strength test and one cylinder for a 7 day break. Strength tests shall be performed for each 50 cubic yards, or portions thereof, of concrete placed in any one day's concreting. Specimens will be stored at the site in the insulated curing box provided by the Contractor. Each group of specimens is considered one strength test. One cylinder will be broken at 7 days for information. Strength test shall be at 28 days for acceptance. The cylinders for the additional strength test will be utilized for either a strength test or other types of testing only if the 28-day breaks are low or durability of the concrete is in question. If one specimen in a test manifests evidence of improper sampling, molding, or testing, it shall be discarded and the average strength of the remaining cylinders shall be considered the test result. Should all specimens in a test show any of the above defects, the entire test shall be discarded.
5. Determination of air content and unit weight of concrete sample for each strength test in accordance with ASTM C173 or C231 and ASTM C138.
6. Determination of temperature of concrete sample for each strength test.
7. Determination of water soluble chloride content in the concrete, percent by weight of cement, of each sample.

B. Inspection:
1. Refer to "Source Quality Control" for responsibility and procedure.
2. The lab will inspect placement of reinforcement and thickness of members prior to placement.
3. Keep a record of all inspections, the name of the persons making them, and the name of the foreman in charge of formwork at the site. Submit to the Commissioner a copy of the inspection records prior to each concrete placement.
4. Cooperate in the making of all tests by the Laboratory Technician by:
   a. Providing an insulated curing box of sufficient size and strength to contain all specimens made in any four consecutive working days. Furnish an outlet to provide the necessary temperature in the storage box, pending delivery to the Laboratory of the test cylinders.
   b. Providing a buggy for transporting the concrete taken from the mixer (and/or point of placement) to the location of the curing box for testing and the preparation of specimens.

c. Protecting the property of the Laboratory and keeping test specimens free from vibration and other disturbances.
d. Providing a microwave of the size specified in AASHTO TP23 and a portable generator.

C. Evaluation and Acceptance of Concrete:
1. Strength tests on concrete will be evaluated according to Section BC 1905.6.3.3 of the 2014 NYC Building Code by the Commissioner. If the tests fail, the adequacy of the concrete will be checked according to the requirements of Section BC 1905.6.5 of the 2014 NYC Building Code. Concrete exposed to the elements with indications of poor durability will be rejected regardless of strength and will be subject to petrographic examination.
2. Pay for additional expense of labor and materials required at the job for all damages resulting from testing. Remove and replace concrete work that is not of adequate strength or weather resistance and cannot be made to work by remedial methods acceptable to the Commissioner at no cost to the City of New York. The Contractor shall be held responsible for all delays and damages to the work of other Divisions that occur as a result of non-conformance.

3.16 PROTECTION AND CLEANING

A. During the curing period, and thereafter as conditions may require, protect the concrete from damaging mechanical disturbances, particularly excessive load stresses, heavy shock, and excess vibration. Protect all finished concrete surfaces from damage caused by construction equipment, materials or methods, and by rain or running water.

3.17 ACCEPTANCE OF CONCRETE WORK

A. The provisions of Subchapter 1.6 of ACI 301 apply to the acceptance of the concrete work.

B. Concrete work judged inadequate by structural analysis, core test, or results of load test or deemed unacceptable due to appearance or durability concerns shall be restored, reinforced with additional construction if so directed by the Commissioner, or be replaced if so directed by the Commissioner at the Contractor's expense.

END OF SECTION 32 13 15

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SECTION 32 15 43
Crushed Stone Edging

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The following documents apply to all required work for the Project: (1) the Contract Drawings, (2) the Specifications, (3) the General Conditions, (4) the Addendum and (5) the Contract (City of New York Standard Construction Contract).

B. LEED General Requirements:
   1. Refer to DDC General Conditions
      a. Section 01 33 00 "Submittal Procedures"
      b. Section 01 74 19 "Construction Waste Management and Disposal"
      c. Section 01 81 13.04 "Sustainable Design Requirements for LEED v4 Buildings"

1.2 SUMMARY

A. Section includes:

   1. Provide all equipment and materials, and do all work necessary for new pavement marking and removal of existing pavement marking, as indicated on the Drawings and as specified. Provide the following systems as shown on Drawings and specified herein including, but not limited to the following:

      a. Crushed stone for borders in landscape.
      b. Metal edging at crushed stone border.

B. Related Sections
   1. Section 31 00 00 – Earthwork

1.3 SUBMITTAL PROCEDURES

A. Refer to DDC General Conditions Section 01 33 00 "Submittal Procedures".

1.4 REFERENCES

A. Comply with applicable requirements of the following standards. Where these standards conflict with other specified requirements, the most restrictive requirements shall govern. All standards shall include the latest additions and amendments as of the date of advertisement for bids.

   1. American Society for Testing and Materials (ASTM):

a) A 36	Structural Steel
b) A 123	Zinc (Hot-Galvanized) Coatings on Products Fabricated from Rolled, Pressed, and Forged Steel Shapes, Plates, Bars, and Strip
c) A 153	Zinc Coating (Hot-Dip) on Iron and Steel Hardware
d) A 386	Zinc Coating (Hot-Dip) on Assembled Steel Products
e) B 308	Aluminum-Alloy 6061-T6 Standard Structural Shapes, Rolled or Extruded
f) D 1557	Moisture-Density Relations of Soils and Soil Aggregate Mixtures Using 10-lb. (4.54-kg) Rammer and 18-in. (475-mm) Drop

1.5 SUBMITTALS

A. Submit for Commissioner's approval a 10 lb. sample of stone aggregate material demonstrating material gradation and color.

B. Submit for Commissioner's approval manufacturer's product data of steel edging and samples of edging material in specified finish. Edging sample shall be a minimum 2 ft. in length and showing interlock for staking; include with edging material one stake.

C. Samples: The following samples shall be submitted:

Material	Sample Size or Quantity
Crushed Stone Aggregate	2 lb.
Soil stabilization fabric	1 sq. ft.
Filter fabric	1 sq. ft.

D. Manufacturer's Product Data: Manufacturer's product data shall be submitted for the following materials:

1. Edging
2. Filter fabric

1.6 QUALITY ASSURANCE

A. Refer to DDC General Conditions Section 01 40 00 "Quality Requirements".

1.7 DELIVERY AND STORAGE

A. All materials shall be delivered and stored in sealed containers that plainly show the designated name, formula or specification number, batch number, color, date of manufacture, manufacturer's name, and directions, all of which shall be plainly legible at time of use.

PART 2 - PRODUCTS

2.1 AGGREGATE BASE COURSE

A. Aggregate for base course shall be a graded, granular, non-frost susceptible, free-draining material, consisting of either durable stone and coarse sand or of blast furnace slag, practically free from loam and clay, and which can be readily compacted to form a stable foundation

1. Material shall conform to Section M1.03.0 Type b, of the MHD Specifications, with less than 8% by weight passing No. 200 sieve.

2.2 CRUSHED STONE BED

A. Crushed stone surface shall be decomposed granite or trap rock meeting the following gradation:

Sieve Size	% Passing by Weight
¾ in.	100
No. 4	50-80
No. 50	8-24
No. 200	3-10

2.3 PEASTONE TOP COURSE

A. Stone aggregate shall be an angular, durable dense graded crushed stone meeting the following gradation:

Sieve Size	% Passing by Weight
1-1/2 in.	100
1-1/4 in.	85-100
¾ in.	10-40
½ in.	0-8

B. Pea Stone shall be white in color with color relatively uniform and shall be subject to the approval of the Commissioner.

2.4 STEEL EDGING

A. Basis of Design: Subject to compliance with requirements, provide Ryerson Steel Landscaping Edging, manufactured by Ryerson, an Inland Steel Company, Chicago, IL 60680 or comparable product by one of the following:

1. Border Concepts Edging, "Border King", manufactured by Border Concepts, Inc., P.O. Box 471185, Charlotte, NC 28247
2. Steel Landscape Edging, "Border King", manufactured by PRO-STEEL 5121 Kaltenbrun Road | Fort Worth, Texas 76119
3. Or approved equal

B. Steel edging shall be shop fabricated, 1/4 in. thick x 6 in. deep, galvanized steel, primed and painted flat black. Edging shall be furnished in 20 ft. lengths.

1. Steel edging shall have slotted holes for staking steel edging every 30 in. o.c.
2. Steel stakes shall be 16 in. long, tapered.

2.5 METAL

A. General: Provide products and materials of new stock, free from defects, and of best commercial quality for each intended purpose.

B. Steel Plates, Shapes, and Bars: ASTM A 36.

2.6 METAL FINISHES

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

C. Galvanizing: Hot-dip galvanize exterior metal fabrications indicated to be galvanized, in compliance with ASTM A 123, ASTM A 153, or ASTM A 386. Provide minimum 1.5 oz./ft.2 zinc coating. Galvanize after fabrication.

PART 3 - EXECUTION

3.1 EXECUTION REQUIREMENTS

A. Refer to DDC General Conditions for execution requirements.

3.2 GRADING

A. Areas to receive stone dust surfacing will be compacted and brought to subgrade elevation under Section 31 00 00, Earthwork before work of this section is performed. Final fine grading, furnishing and installing aggregate base course, stabilizer, and stone dust surface and compaction of these materials as required to form a firm, uniform, accurate, and unyielding stone dust surface at required elevations and to required lines, shall be done under this Section.

B. Existing subgrade material which will not readily compact as required shall be removed and replaced with satisfactory materials. Additional materials needed to bring subgrade to required line and grade and to replace unsuitable material removed shall be material conforming to this Section.

C. Subgrade of areas to receive stone dust surfacing shall be recompacted as required to bring top 4 in. of material immediately below gravel base to a compaction of at least 90% of maximum density, as determined by ASTM D 1557. Subgrade compaction shall extend for a distance of at least 1 ft. beyond proposed edge of stone dust surface.

D. Excavation required in subgrade shall be completed before fine grading and final compaction of subgrade are performed. Where excavation must be performed in completed subgrade or gravel base, subsequent backfill and compaction shall be performed as directed by the Commissioner as specified in Section 31 00 00, Earthwork. Completed subgrade after filling such areas shall be uniformly and properly graded.

E. Areas being graded or compacted shall be kept shaped and drained during construction. Ruts greater than or equal to 1 in. deep in subgrade, shall be graded out, reshaped as required, and recompacted before placing stone dust surfacing.

F. Materials shall not be stored or stockpiled on subgrade.

G. Disposal of debris and other material excavated and/or stripped under this section, and material unsuitable for or in excess of requirements for completing work of this section shall be disposed of off-site.

3.3 AGGREGATE BASE COURSE

A. Unless otherwise specified, base course for stone dust surfacing and the spreading, grading, and compaction methods employed shall conform to 31 00 00 Earthwork.

B. Compaction of aggregate base shall be to 95% of maximum density as determined by ASTM D 1557. Stone greater than 2 in. shall be excluded from course.

C. Width of base course shall be greater than or equal to the width of stone dust surface, if continuous lateral support is provided during rolling, and shall extend at least 2 x base thickness beyond edge of the course above, if not so supported.

D. Material shall be applied in lifts less than or equal to 3 in. thick, compacted measure. Each lift shall be separately compacted to specified density.

1. Rolling shall begin at sides and progress to center of crowned areas, and shall begin on low side and progress toward high side of sloped areas. Rolling shall continue until material does not creep or wave ahead of roller wheels.

2. Surface irregularities which exceed 1/2 in. as measured by means of a 10 ft. long straightedge, shall be replaced and properly compacted.

E. Subgrade and base course shall be kept clean and uncontaminated. Less select materials shall not be permitted to become mixed with base course. Materials spilled outside stone dust surfacing lines shall be removed and area repaired.

F. Portions of subgrade or of construction above which become contaminated, softened, or dislodged by passing of traffic, or otherwise injured, shall be cleaned, replaced, recompacted, or otherwise repaired to conform to the requirements of this specification before proceeding with next operation.

3.4 CRUSHED STONE BED AND PEASTONE SURFACING

A. Limestone bed and peastone surface shall be done only after excavation and construction work which might injure them have been completed. Damage caused during construction shall be repaired before acceptance.

B. Limestone bed shall be constructed on a compacted aggregate base. Peastone surface shall be constructed on a compacted limestone bed.

C. Stone aggregate shall be spread evenly over the indicated bed or base, rolled with a 3 to 5 ton steel-wheeled roller, and compacted to 95% of maximum density as determined by ASTM D 1557.

D. Water shall be added to stone paving as required to achieve a dense, hard packed surface conforming to the finish grades indicated.

E. Variations in smoothness of finished stone dust surface shall be less than or equal to 1/4 in. when tested with a 10 ft. straightedge, applied both parallel to and at right angles to centerline of stone dust surface

areas. Irregularities exceeding these amounts or which retain water on surface shall be corrected by removing defective work and replacing with new material conforming to this specification.

F. Allow finished surface to dry completely before permitting use.

3.5 EDGING

A. Steel edging shall be installed at locations indicated on the Drawings. Where required, edging shall be cut square and accurately to required length.

1. Steel edging shall be securely staked in required position. Stakes shall be driven every 30 in. o.c. along length of edging.

2. Adjacent lengths of edging shall overlap 8 in.

3. Edging shall be set plumb and vertical at required line and grade. Straights sections shall not be wavy; curved sections shall be smooth and shall have no kinks or sharp bends.

END OF SECTION 32 15 43

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SECTION 32 17 23
Pavement Markings

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The following documents apply to all required work for the Project: (1) the Contract Drawings, (2) the Specifications, (3) the General Conditions, (4) the Addendum and (5) the Contract (City of New York Standard Construction Contract).

B. LEED General Requirements:
   1. Refer to DDC General Conditions
      a. Section 01 33 00 "Submittal Procedures"
      b. Section 01 74 19 "Construction Waste Management and Disposal"
      c. Section 01 81 13.04 "Sustainable Design Requirements for LEED v4 Buildings"
      d. Section 01 81 13.13 "Volatile Organic Compound Limits for Adhesives, Sealants, Paints and Coatings for LEED Buildings"

1.2 SUMMARY

A. Section includes:

   1. Provide all equipment and materials, and do all work necessary for new pavement marking and removal of existing pavement marking, as indicated on the Drawings and as specified. Provide systems as shown on Drawings and specified herein including, but not limited to the following:

      a. Parking Stall Stripes.
      b. Traffic Arrows, crosswalks, accessible stall access aisles, walkways, symbols, stop bars, words and other markings.
      c. International Symbol of Accessibility.

   2. Proportion International Symbol of Accessibility in accordance with ICC A117.1-2009 Accessible and Usable Buildings or 2010 ADA Standards for Accessible Design:

B. Related Sections
   1. Section 03 30 00 – Cast-In-Place Concrete
   2. Section 31 00 00 – Earthwork
   3. Section 32 12 16 – Asphalt Paving
   4. Section 32 13 15 – Concrete Curbs and Pavement

1.3 SUBMITTAL PROCEDURES

A. Refer to DDC General Conditions Section 01 33 00 "Submittal Procedures".

1.4 REFERENCES

A. Comply with applicable requirements of the following standards. Where these standards conflict with other specified requirements, the most restrictive requirements shall govern. All standards shall include the latest additions and amendments as of the date of advertisement for bids.

1. Federal Specifications (Fed. Spec.):
   TT-P-115E Paint, Traffic, Highway, White, and Yellow
   TT-P-1952 Paint, Traffic And Airfield Marking, Waterborne

2. New York City Accessibility Code (NYCAC)

3. New York City Air Pollution Control Code

1.5 SUBMITTALS

A. Manufacturer's product sheets for each specified product.

B. Certificate stating that the proposed pavement marking paint meets the VOC regulations of the New York City Air Pollution Control Code standards.

1.6 QUALITY ASSURANCE

A. Refer to DDC General Conditions Section 01 40 00 "Quality Requirements".

1.7 DELIVERY AND STORAGE

A. All materials shall be delivered and stored in sealed containers that plainly show the designated name, formula or specification number, batch number, color, date of manufacture, manufacturer's name, and directions, all of which shall be plainly legible at time of use.

1.8 EQUIPMENT

A. All machines, tools and equipment used in the performance of the work shall be approved and maintained in satisfactory operating condition. Equipment operating on roads and runways shall display low speed traffic markings and traffic warning lights.

1.9 TRAFFIC CONTROL

A. Traffic Controls: NOTE: Guidance for traffic control procedures can be obtained from the Manual on Uniform Traffic Control Devices (MUTCD) for Streets and Highways.

B. Place traffic cones along newly painted lines to control traffic and prevent damage to newly painted surfaces. Remove when paint has dried fully.

1.10 WEATHER LIMITATIONS

A. Pavement surface shall be free of snow, ice, or slush. Surface temperature shall be at least 40 degrees F and rising at the beginning of operations, except those involving shot or sand blasting. Operation shall cease during thunderstorms. Operation shall cease during rainfall, except for waterblasting and removal of previously applied chemicals. Waterblasting shall cease where surface water accumulation alters the effectiveness of material removal

PART 2 - PRODUCTS

2.1 MATERIALS

A. Pavement marking materials shall meet Federal, NY State and Local NYC environmental standards.

B. Paint shall be manufactured and formulated from first grade raw materials and shall be free from defects or imperfections that might adversely affect product serviceability.

C. Paints shall comply with the National Organic Compound Emission Standards for Architectural Coatings, Environmental Protection Agency, 40 CFR Part 59.

D. The product shall not contain mercury, lead, hexavalent chromium, or halogenated solvents.

E. Paint and reflective media shall be in sealed containers that plainly show the designated name, formula or specification number, batch number, color, date of manufacture, manufacturer's name, formulation number and directions, all of which shall be plainly legible at time of use.

2.2 PAINT MATERIAL

A. Paint shall conform to Fed. Spec. TT-P-115E, color as selected.

B. The paint shall be homogeneous, easily stirred to smooth consistency, and shall show no hard settlement or other objectionable characteristics during a storage period of 6 months. Paints for parking areas shall conform to FS TT-P-1952, color as indicated. Pavement marking paints shall comply with applicable NY State and NYC laws enacted to ensure compliance with Federal Clean Air Standards. Paint materials shall conform to the restrictions of the local Air Pollution Control District.

2.3 PAINT COLOR

A. Color of paint unless noted otherwise on Contract Drawings, shall be traffic yellow, where shown on Contract Drawings or specified herein, shall match federal color chip No. 33538 commonly referred to as federal highway yellow. Color shall have daylight directional reflectance (without glass beads) of not less than 50% (relative to magnesium oxide) when tested in accordance with Federal Test Method Standard 141, Method 6121.

B. Paint color for blue accessible parking space pavement markings, if shown on Contract Drawings, shall match federal color chip No. 35180. Color shall have daylight directional reflectance (without glass beads) of not less than 52% (relative to magnesium oxide) when tested in accordance with Federal Test Method Standard 141, Method 6121.

C. Paint color for red special-use parking space pavement markings, if shown on Contract Drawings, shall match federal color chip No. 31136. Color shall have daylight directional reflectance (without glass beads) of not less than 52% (relative to magnesium oxide) when tested in accordance with Federal Test Method Standard 141, Method 6121.

D. Paint color for black special-use pavement markings, if shown on Contract Drawings, shall match federal color chip No. 37038. Black paint shall also meet Federal Specification TT-P- 110.

2.4 PRIMER

A. The primer for asphalt concrete pavements shall be a thermosetting adhesive with a solids content of pigment reinforced synthetic rubber and synthetic plastic resin dissolved and/or dispersed in a volatile organic compound. Solids content shall not be less than 10 percent by weight at 70 degrees F and 60 percent relative humidity. A wet film thickness of 0.005 inch plus or minus 0.001 inch, shall dry to a tack-free condition in less than 5 minutes.

2.5 MARKING EQUIPMENT

A. Machines, tools and equipment used in the application of pavement markings shall conform to IDOT Specifications Section 860.60 and shall be approved and maintained in satisfactory operating condition.

2.6 SURFACE PREPARATION EQUIPMENT

A. Sandblasting Equipment: shall include an air compressor, hoses, and nozzles of proper size and capacity as required for cleaning surfaces to be painted. The compressor shall be capable of furnishing not less than 150 cfm of air at a pressure of not less than 90 psi at each nozzle used, and shall be equipped with traps that will maintain the compressed air free of oil and water.

B. Waterblast Equipment: The water pressure shall be specified at 2600 psi at 140 degrees F in order to adequately clean the surfaces to be marked.

C. Marking Removal Equipment: shall be mounted on rubber tires and shall be capable of removing markings from the pavement without damaging the pavement surface or joint sealant. Waterblasting equipment shall be capable of producing an adjustable, pressurized stream of water. Sandblasting equipment shall include an air compressor, hoses, and nozzles. The compressor shall be equipped with traps to maintain the air free of oil and water.

D. Shotblasting Equipment: shall be capable of producing an adjustable depth of removal of marking and pavement. Each unit shall be self-cleaning and self-contained, shall be able to confine dust and debris from the operation, and shall be capable of recycling the abrasive for reuse.

E. Chemical Equipment: shall be capable of application and removal of chemicals from the pavement surface, and shall leave only non-toxic biodegradeable residue

PART 3 - EXECUTION

3.1 EXECUTION REQUIREMENTS

A. Refer to DDC General Conditions for execution requirements.

3.2 SURFACE PREPARATION

A. Surfaces to be marked shall be thoroughly cleaned before application of the pavement marking material. New pavement surfaces shall be allowed to cure for a period of not less than 48 hours before application of marking materials.

B. Dust, dirt, and other granular surface deposits shall be removed by sweeping, blowing with compressed air, rinsing with water, or a combination of these methods, as required. Rubber deposits, surface laitance, existing paint markings, and other coatings adhering to the pavement shall be completely removed using scrapers, wire brushes, sandblasting, approved chemicals, or mechanical abrasion, as directed.

C. Where oil or grease are present on old pavements to be marked, affected areas shall be scrubbed with several applications of trisodium phosphate solution or other approved detergent or degreaser, and rinsed thoroughly after each application. After cleaning, oil- soaked areas shall be sealed with cut shellac to prevent bleeding through the new paint. Pavement surfaces shall be allowed to dry, when water is used for cleaning, prior to striping or marking. Surfaces shall be recleaned, when work has been stopped due to rain.

3.3 PRIMER

A. After surface preparation has been completed the asphalt concrete pavement surface shall be primed. The primer shall be applied with spray equipment. Primer materials shall be allowed to "set-up" prior to applying the thermoplastic composition. The asphalt concrete primer shall be allowed to dry to a tack-free condition, usually occurring in less than 10 minutes. The Portland cement concrete primer shall be allowed to dry in accordance with the thermoplastic manufacturer's recommendations. To shorten the curing time of the epoxy resins an infrared heating device may be used on the concrete primer.

B. Asphalt Concrete Primer: Primer shall be applied to all asphalt concrete pavements at a wet film thickness of 0.005 inch, plus or minus 0.001 inch, (265-400 square feet per gallon).

3.4 APPLICATION OF MARKING MATERIALS

A. Marking materials shall be applied to clean, dry surfaces in accordance with the requirements of IDOT Specifications Section 780. Pavement marking materials shall be applied evenly to the pavement surface to be coated at a rate specified in IDOT Specifications Section 780.

B. Paint: Paint shall be applied pneumatically with approved equipment. Paint shall be applied to clean, dry surfaces, and only when air and pavement temperatures are above 40 degrees F and less than 95 degrees F. Paint temperature shall be maintained within these same limits. New asphalt pavement surfaces and new Portland concrete cement shall be allowed to cure for a period of not less than 30 days before applications of paint. Paint shall be applied pneumatically with approved equipment at rate of coverage specified . The Contractor shall provide guide lines and templates as necessary to control paint application. Special precautions shall be taken in marking numbers, letters, and symbols. Edges of markings shall be sharply outlined.

C. Guidelines and templates shall be employed as necessary to control paint application.

D. Special precautions shall be taken in marking numbers, letters, and symbols. Edges of markings shall be sharply outlined.

E. Maximum drying time requirements of the paint manufacturer shall be enforced to prevent undue softening of bitumen, and pickup, displacement, or discoloration by vehicle tires.

F. If markings require more drying time than stated by the paint manufacturer, painting operations shall be discontinued until cause of the slow drying is determined and corrected.

END OF SECTION 32 17 23

SECTION 32 17 26
Tactile Warning Surfacing

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The following documents apply to all required work for the Project: (1) the Contract Drawings, (2) the Specifications, (3) the General Conditions, (4) the Addendum and (5) the Contract (City of New York Standard Construction Contract).

B. LEED General Requirements:
   1. Refer to DDC General Conditions
      a. Section 01 33 00 "Submittal Procedures"
      b. Section 01 74 19 "Construction Waste Management and Disposal"
      c. Section 01 81 13.04 "Sustainable Design Requirements for LEED v4 Buildings"
      d. Section 01 81 13.13 "Volatile Organic Compound Limits for Adhesives, Sealants, Paints and Coatings for LEED Buildings"
      e. Section 01 81 19 "Indoor Air Quality Requirements for LEED Buildings"

1.2 SUMMARY

A. Section includes:

   1. Provide all equipment and materials, and do all work necessary to construct the tactile metal warning plates and accessories as indicated on the Drawings and specified herein.

B. Related Sections
   1. Section 03 30 00 – Cast-In-Place Concrete
   2. Section 31 00 00 – Earthwork
   3. Section 32 13 15 – Concrete Curbs and Pavement

1.3 SUBMITTAL PROCEDURES

A. Refer to DDC General Conditions Section 01 33 00 "Submittal Procedures".

1.4 SUBMITTALS

A. Shop Drawings shall be submitted for all tactile plate materials, including accessories for Commissioner's review.

1.5 REFERENCES

A. Comply with applicable requirements of the following standards. Where these standards conflict with other specified requirements, the most restrictive requirements shall govern. All standards shall include the latest additions and amendments as of the date of advertisement for bids.

1. American Society for Testing and Materials (ASTM):

A 48M	Standard Specification for Gray Iron Castings

2. Americans with Disabilities Act (ADA)

28 CFR Part 36	Detectable Warnings On Walking Surfaces,

1.6 QUALITY ASSURANCE

A. Refer to DDC General Conditions Section 01 40 00 "Quality Requirements".

B. Provide Cast Iron Tactile Warning Plates and accessories by a single supplier with a minimum of three (3) years' experience in the supply of Cast Iron Detectable/Tactile Warning Surface Indicator Plates

PART 2 - PRODUCTS

2.1 TACTILE METAL PLATE

A. Basis of Design: Subject to compliance with requirements, provide:

1. Bolted Plate 4984-24B by Neenah Foundry, 2121, Brooks Ave Neenah, WI 54956, 800-558-5075, www.nfco.com

a.	Mounting:	Per Manufacturer's instructions.
b.	Material:	Cast Iron
c.	Finish/Color:	Natural metal finish
d.	Size:	24" x 24"

or comparable product by one of the following:

2. Duralast Detectable Warning Plate 00700571 by EJ Group, 270 Redwing Rd, Ardmore Industrial Air Park, Ardmore, OK 73401, 580-389-5010 www.ejco.com

a.	Mounting:	Per Manufacturer's instructions.
b.	Material:	Cast Iron
c.	Finish/Color:	Natural metal finish
d.	Size:	24" x 24"

3. Irondome Tactile Warning Surface by ADA Solutions, Inc., 323 Andover Street – Suite 3 Wilmington, MA 01887, 1-800-372-0519, www.adatile.com
   a. Mounting: Per Manufacturer's instructions.
   b. Material: Cast Iron
   c. Finish/Color: Natural metal finish
   d. Size: 24" x 24"

4. Or approved equal

B. Fasteners shall be:

1. Corrosion resistant, hex head bolt, 3/8" diameter x 1-3/4" long. Min. two per Detectable/Tactile Warning Surface Indicator plate connection.

PART 3 - EXECUTION

3.1 EXECUTION REQUIREMENTS

A. Refer to DDC General Conditions for execution requirements.

3.2 INSTALLATION

A. Examine paving or other substrates for compliance with manufacturer's requirements for placement and location of embedded items, condition of substrate, and other conditions affecting installation of detectable warning plates.

B. Coordinate with the Commissioner to ensure that the surfaces being prepared and fabricated to receive the plates are constructed correctly and adequately for plate installation. Review manufacturer and contract drawings with the Contractor prior to the construction and refer any and all discrepancies to the Commissioner.

C. The physical characteristics of the concrete shall be consistent with the contract specifications while maintaining a slump range of 3-4 inches to permit solid placement of the Cast Iron Detectable/Tactile Warning Surface Indicator Plates.

D. When preparing to set the plate, ensure that the area to receive the plates has been finished to its final elevation. The concrete shall be poured and finished true and smooth to the required dimensions and slope prior to the plate placement. Vents in the plate allow air and displaced concrete to escape during the installation process.

E. Lift the Detectable/Tactile Warning Surface Indicator plate and gently place into position onto the wet concrete. The plate shall be placed true and square to the curb edge in accordance with the contract drawings. Press into the concrete. The Cast Iron Detectable/Tactile Warning Surface Indicator Plates shall be tamped into the fresh concrete to ensure that the field level of the plate is flush to the adjacent concrete surface.

F. Immediately after placement, the plate elevation is to be checked to adjacent concrete, and the concrete around the perimeter of the tile should be finished. The elevation and slope should be set consistent with contract drawings to permit water drainage to curb as the design dictates. Ensure that the field surface of the plate is flush with the surrounding concrete and back of curb so that no ponding is possible on the plate at the back side of curb, and to eliminate tripping hazards between adjacent finishes.

G. While concrete is workable, create a 1/4" concrete-free recess around the perimeter of the plate. Use a 3/8" radius edging tool to create a finished edge of concrete, then a steel trowel shall be used to finish the concrete around the plate's perimeter, flush to the field level of the plate.

H. Clean the surface of the tile of any concrete that has protruded from the vent holes.

I. During and after the Detectable/Tactile Warning Surface Indicator Plate installation and the concrete curing stage, it is imperative that there is no walking, leaning or external force placed on the plate that may rock the plate causing a void between the underside of Detectable/Tactile Warning Surface Indicator Plate and concrete.

J. Following Detectable/Tactile Warning Surface Indicator Plate placement, review installation tolerances to contract drawings and adjust plate before the concrete sets.

K. Following the concrete curing stage, a soft brass wire brush will clean the residue without damage to the plate surface

3.3 PROTECTION AND MAINTENANCE

A. Protect plates against damage during construction period to comply with Detectable/Tactile Warning Surface Indicator plate manufacturer's specification.

B. Protect plates against damage from rolling loads following installation by covering with plywood or hardwood.

C. Comply with manufacturer's maintenance manual for cleaning and maintaining plate surface. It is recommended to perform annual inspections for safety and plate integrity.

END OF SECTION 32 17 26

SECTION 32 31 19
Decorative Metal Fence and Gate

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The following documents apply to all required work for the Project: (1) the Contract Drawings, (2) the Specifications, (3) the General Conditions, (4) the Addendum and (5) the Contract (City of New York Standard Construction Contract]).

B. LEED General Requirements:
   1. Refer to DDC General Conditions
      a. Section 01 33 00 "Submittal Procedures"
      b. Section 01 74 19 "Construction Waste Management and Disposal"
      c. Section 01 81 13.04 "Sustainable Design Requirements for LEED v4 Buildings"

1.2 SUMMARY

A. Section includes:

   1. Provide all equipment and materials, and do all work necessary to construct the decorative metal site fences, including swing gates at the main gate and minor gates, and posts and connections, as indicated on the Drawings and specified herein including, but not limited to the following:

      a. Decorative metal site fencing around Household Goods area, including swing gates and hinges, posts and connections, and locking mechanisms.
      b. Decorative metal site fencing around generator at existing building, including swing gates and hinges, posts and connections, locking mechanisms, and panel removal system.
      c. Decorative metal site fencing at utility enclosure at new existing building, including swing gates and hinges, posts and connections, locking mechanisms, and panel removal system
      d. Decorative metal site fencing around gas meters at existing building, including, posts and connections, and panel removal system

B. Related Sections
   1. Section 03 30 00 – Cast-In-Place Concrete
   2. Section 31 00 00 – Earthwork

1.3 SUBMITTAL PROCEDURES

A. Refer to DDC General Conditions Section 01 33 00 "Submittal Procedures".

1.4 SUBMITTALS

A. Shop Drawings shall be submitted for all fence materials, including, gate assembly and related hardware, post and related hardware for Commissioner's review.

B. Samples. A sample will be provided for each panel type selected (additional samples available if needed). Each sample approximately 10" x 10" to be coated with the specified finish warranty (Sample will be in specified color, if available).

C. For installed products indicated shall comply with performance requirements and design criteria, provide analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

D. Welding certificates.

E. Qualification Data: For professional engineer.

1.5 WARRANTY

A. Product Warranty: Standard limited warranty that the swing gate hinge, lock and securing system is free from defects in material and workmanship and, under normal or proper usage, will remain free from such defects for a period of three (3) years from the date of Substantial Completion.

B. Finish Warranty: 20-year warranty TGIC polyester powder coat finish system.

1.6 QUALITY ASSURANCE

A. Refer to DDC General Conditions Section 01 40 00 "Quality Requirements".

B. Fence manufacturer shall have at least three years of experience in the manufacture of related metal fencing.

C. Provide complete swing gates system with all components provided by a single manufacturer.

D. Metal Bar Grating Standards. Comply with applicable requirements as listed below.
   1. Non-Heavy Duty Metal Bar Gratings Comply with NAAMM MBG 531, "Metal Bar Grating Manual for Steel, StainlessSteel, and Aluminum Gratings and Stair Treads

E. Engineering Responsibility: Preparation of Shop Drawings, design calculations, and other structural data by a qualified professional engineer.

F. Professional Engineer Qualifications: A professional engineer licensed in the state of NY who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of metal fabrications that are similar to those indicated for this Project in material, design, and extent.

G. Metal Surfaces, General: Provide materials with smooth, flat surfaces, unless otherwise indicated. For metal fabrications exposed to view in the completed Work, provide materials without seam marks, roller marks, rolled trade names, or blemishes.

1.7 PERFORMANCE REQUIREMENTS

A. Engineering Services: Metal fence panel and framing, anchoring and supports; swing gates framing, supports anchoring, and locking for main gates at household goods area and minor swing gates; including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.

1.8 PROJECT CONDITIONS

A. Field Measurements: Verify actual locations of grades and other construction contiguous with metal fence and gate fabrications by field measurements before fabrication and indicate measurements on Shop Drawings.

1. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish dimensions and proceed with fabricating metal fabrications without field measurements.

   a. Coordinate fence and other contiguous construction to ensure that actual dimensions correspond to established dimensions.

2. Provide allowance for trimming and fitting at site.

1.9 REFERENCES

A. Comply with applicable requirements of the following standards. Where these standards conflict with other specified requirements, the most restrictive requirements shall govern. All standards shall include the latest additions and amendments as of the date of advertisement for bids.

1. American Society for Testing and Materials (ASTM):

a. A 36	Standard Specification for Carbon Structural Steel
b. A 500	Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes
c. A 53	Pipe, Steel, Black and Hot-Dipped Zinc-Coated Welded and Seamless
d. A 90	Weight of Coating on Zinc-Coated (Galvanized) Iron or Steel Articles
e. A 123	Zinc (Hot-Galvanized) Coatings on Products Fabricated from Rolled, Pressed, and Forged Steel Shapes, Plates, Bars, and Strip
f. A 153	Zinc-Coating (Hot-Dip) on Iron and Steel Hardware
g. A 385	High-Quality Zinc Coatings (Hot-Dip)
h. A 392	Zinc-Coated Steel Chain-Link Fence Fabric

i.	A 569	Steel, Carbon (0.15 Maximum Percent) Hot-Rolled Sheet and Strip, Commercial Quality
j.	B 6	Zinc (Slab Zinc)
k.	D 412	Tests for Rubber Properties in Tension

PART 2 - PRODUCTS

2.1 METAL FENCE PANEL

A. Basis of Design: Subject to compliance with requirements, provide:

1. Orsogril Sterope Standard rectangular design metal panel by BarnettBates Orsogril,, 500 Mills Road, Joliet, IL 60433, (815) 726-5223 www.barnettbates.com

   or comparable product by one of the following:

2. Opus 10 fence panel by Coda Architectural 3651 Sausalito Street, Los Alamitos, CA 90720, (800) 321-4314 www.codaarchitectural.com

3. Orsogril Sterope Grating rectangular design metal panel by MarCo, Marco Specialty Steel, Inc., P.O. Box 750518, Houston, Texas 77275, 713-489-5416 www.marcospecialtysteel.com

B. Metal Fence Panel shall be constructed of:
   1. Steel Bar Stock ASTM A36
   2. Steel Tubing ASTM A500, Grade B
   3. Rectangular Pattern of Nominal 2 7/16" x 5 3/16" Grid opening. 1" x 3/32" (25mm x 2.5mm) main bar on 2 7/16" centers, 3/16" diameter round crossbar at 5 3/16" centers

2.2 METAL FENCE POSTS AND FRAMES

A. Plates, Shapes, and Bars: ASTM A 36/A 36M.

B. Bars (Pickets): Hot-rolled, carbon steel complying with ASTM A 29/A 29M, Grade 1010.

C. Tubing: ASTM A 500, cold formed steel tubing.

D. Uncoated Steel Sheet: Hot-rolled steel sheet, ASTM A 1011/A 1011M, Structural Steel, Grade 310.

E. Galvanized-Steel Sheet: ASTM A 653/A 653M, structural quality, Grade 340, with G90 (Z275) coating.

2.3 METAL FENCE, FASTENERS AND HARDWARE

A. General: Unless otherwise indicated, provide Type 316 stainless-steel fasteners for exterior use and zinc-plated fasteners with coating complying with ASTM B 633, Class Fe/Zn 5, at exterior walls. Provide stainless-steel fasteners for fastening aluminum. Select fasteners for type, grade, and class required.

B. Anchor Bolts: ASTM F 1554, Grade 36. Provide hot-dip or mechanically deposited, zinc-coated anchor bolts where item being fastened is indicated to be galvanized.

2.4 METAL FENCE, SWING GATES

A. General: Provide complete hardware assemblies and latching assemblies for main and minor swing gate operation including, but not limited to hinge systems, security latch and locking controls, anchoring supports for open and closed positions. Operation of gate opening and closing shall be manually operated without automated controls. Unless otherwise indicated, provide Type 316 stainless-steel components for exterior use.

2.5 METAL FABRICATION

A. Electro-forge welding Infill panels electro-forge welded for complete weld penetration of crossbar.

B. Fabrication per shop drawings All supplied components will be fabricated per detail shop drawings supplied by manufacturer.

C. NAAMM Prior to shipment, all fabricated components will be analyzed and meet standard NAAMM steel fabrication requirements and tolerances.

D. OSHA / BOCA Fabricated components, when installed properly will meet applicable OSHA, and/or BOCA loading requirements.

2.6 METAL FINSHES

A. All supplied components will be finished with:

1. All fabricated product to be 100% sandblasted to white metal for removal of scale, oil and debris to create a minimum 2mil etching for proper adhesion.

2. Electrostatic application of epoxy powder primer with 375f. minimum 15 minute duration heat cure for maximum corrosion protection.

3. Immediate electrostatic application polyester powder color coat while metal temperature is minimum of 300f. and heat cure for minimum 10 minutes at 400f.

    a. This process provides an average of 8-10 mils total coating thickness. Coating to withstand more than 4,000 hours salt spray. (Complete testing results available from manufacturer. See PERFORMANCE REQUIREMENTS 1.7)

B. Metal shall be color: Black

2.7 MISCELLANEOUS MATERIALS

A. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.

2.8 CONCRETE

A. Concrete shall be air-entrained type, conforming to Section 033000, Cast-In-Place Concrete -, except as modified below:

1. Minimum 28 day compressive strength shall be 2500 psi.
2. Maximum size of aggregate shall be 1-1/2 in

2.9 FABRICATION, GENERAL

A. Shop Assembly: Preassemble items in the shop to greatest extent possible. Disassemble units only as necessary for shipping and handling limitations. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.

B. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch, unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.

C. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.

D. Form exposed work true to line and level with accurate angles and surfaces and straight edges.

E. Weld corners and seams continuously to comply with the following:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.
4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.

F. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners where possible. Where exposed fasteners are required, use Phillips flat-head (countersunk) screws or bolts, unless otherwise indicated. Locate joints where least conspicuous.

G. Fabricate seams and other connections that will be exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.

H. Cut, reinforce, drill, and tap metal fabrications as indicated to receive finish hardware, screws, and similar items.

I. Provide for anchorage of type indicated; coordinate with supporting structure. Space anchoring devices to secure metal fabrications rigidly in place and to support indicated loads.

PART 3 - EXECUTION

3.1 EXECUTION REQUIREMENTS

A. Refer to DDC General Conditions for execution requirements.

3.2 INSTALLATION, GENERAL

A. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal fence fabrications. Set metal fabrications accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels.

B. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations. Do not weld, cut, or abrade surfaces of exterior units that have been hot-dip galvanized after fabrication and are for bolted or screwed field connections.

C. Field Welding: Comply with the following requirements:
   1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
   2. Obtain fusion without undercut or overlap.
   3. Remove welding flux immediately.
   4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.

D. Fastening to In-Place Construction: Provide anchorage devices and fasteners where metal fabrications are required to be fastened to in-place construction. Provide threaded fasteners for use with concrete and masonry inserts, toggle bolts, through bolts, lag bolts, wood screws, and other connectors.

E. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.

3.3 INSTALLING MISCELLANEOUS FRAMING AND SUPPORTS

A. General: Install framing and supports to comply with requirements of items being supported, including manufacturers' written instructions and requirements indicated on Shop Drawings.

B. Anchor supports for operable partitions securely to and rigidly brace from foundation or structures as indicated.

3.4 INSTALLING GATE HARDWARE

A. General: Install swing gate hardware assemblies, latching assemblies and locking assemblies to comply with requirements of items being supported, swung open, secured open or closed or otherwise noted, including manufacturers' written instructions and requirements indicated on Shop Drawings.

3.5 CLEANING

A. Clean up debris and remove from the site.

3.6 FOUNDATIONS

A. General: Unless otherwise indicated on the Drawings, footing diameter shall be as noted in the drawings. The depth shall be as indicated on the Drawings.

B. Concrete shall be crowned at top to shed water.

C. Post hole footings shall be allowed to cured 72 hours prior to any additional work.

3.7 POSTS

A. Concrete Set Posts: (Corner, End and Pull Posts) Drill holes (after final grading) in firm, undisturbed or compacted soil. Holes shall have a diameter equal to four times the diameter of the post, and depths approximately 6 in. deeper than post bottom. Excavate deeper as required for adequate support in soft and loose soils, and for posts with heavy lateral loads.

1. Set post not less than 35 in. below surface when in firm, undisturbed soil.
2. Place concrete around posts in a continuous pour, tamp for consolidation. Trowel finish tops of footings, and slope or dome to direct water away from posts, except at tennis courts, backstops and walks.
3. Gate posts and hardware: Set keepers, stops, sleeves and other accessories into concrete.

3.8 ADJUSTING AND CLEANING

A. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas. Paint uncoated and abraded areas with the same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.

1. Apply by brush or spray to provide a minimum 2.0-mil dry film thickness.

B. Touch-Up and Repair for Galvanized Surfaces: For damaged and field-welded metal coated surfaces, clean welds, bolted connections and abraded areas:

1. For galvanized surfaces, apply organic zinc repair paint complying with requirements of ASTM A 780, modified to 95 percent zinc in dry film. Galvanizing repair paint shall have 95 percent zinc by weight, ZiRP by Duncan Galvanizing. Thickness of applied galvanizing repair paint shall be not less than coating thickness required by ASTM A 123 or A 153 as applicable. Touch-up of galvanized surfaces with silver paint, brite paint, or aluminum paints is not acceptable.

2. For factory-applied finish coatings, field-touch-up shall be performed by factory approved personnel for warranties to apply. Touch-up shall be such that repair is not visible from a distance of 6 feet. If non factory-approved technicians are used for field touch-up, no warranties shall exist.

3. A touch-up repair kit or touchup instructions shall be provided to the Owner for each type of factory-applied finish.

END OF SECTION 32 31 19

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SECTION 32 33 00
Site Furnishings

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The following documents apply to all required work for the Project: (1) the Contract Drawings, (2) the Specifications, (3) the General Conditions, (4) the Addendum and (5) the Contract (City of New York Standard Construction Contract).

B. LEED General Requirements:
   1. Refer to DDC General Conditions
      a. Section 01 33 00 "Submittal Procedures"
      b. Section 01 74 19 "Construction Waste Management and Disposal"
      c. Section 01 81 13.04 "Sustainable Design Requirements for LEED v4 Buildings"

1.2 SUMMARY

A. Section includes:

   1. Provide all materials and equipment, and do all work necessary to furnish and install the site furnishings, as indicated on the Drawings and as specified. Site furnishings shall include:

      a. Fixed metal bollards
      b. DSNY Standard Litter and Recycling Receptacles
      c. NYCDOT Standard Hoop Bicycle Racks
      d. Site Benches

B. Related Sections
   1. Section 03 30 00 – Cast-In-Place Concrete
   2. Section 31 00 00 – Earthwork
   3. Section 32 13 15 – Concrete Curbs and Pavement

1.3 SUBMITTAL PROCEDURES

A. Refer to DDC General Conditions Section 01 33 00 "Submittal Procedures".

1.4 REFERENCES

A. Comply with applicable requirements of the following standards. Where these standards conflict with other specified requirements, the most restrictive requirements shall govern. All standards shall include the latest additions and amendments as of the date of advertisement for bids.

1. American Society for Testing and Materials (ASTM):

a. A 153	Zinc Coating (Hot-Dip) on Iron and Steel Hardware
b. B221	Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes
c. D 648	(2001) Deflection Temperature of Plastics Under Flexural Load in the Edgewise Position
d. D 2990	(2001) Tensile, Compressive, and Flexural Creep and Creep-Rupture of Plastics

2. American Architectural Manufacturers Association (AAMA)

a. AAMA 603.8	Voluntary Performance Requirements and Test Procedures for Pigmented Organic Coatings on Extruded Aluminum.

1.5 SUBMITTALS

A. Manufacturer's catalogue cuts for each specified product.

1.6 QUALITY ASSURANCE

A. Refer to DDC General Conditions Section 01 40 00 "Quality Requirements".

PART 2 - PRODUCTS

2.1 MATERIALS

A. Materials shall be the standard products of a manufacturer regularly engaged in the manufacture of such products. The materials provided shall be of a type with proven satisfactory usage for at least 2 years.

2.2 FASTENERS AND HARDWARE

A. Provide manufacturer's standard materials and accessories as required for assembly of units and as indicated on the assembly drawings. Provide unexposed aluminum, stainless steel or steel plates, angles and supports as required for complete assembly. Separate dissimilar materials to prevent electrolytic action

1. Fasteners and metal components shall be cadmium-plated steel or steel hot-dipped galvanized in accordance with ASTM A 153

2.3 STEEL PIPE BOLLARDS

A. Steel Pipe: ASTM A 53, schedule 40-3/8, Type S (seamless), Grade A for cold-bending.

B. Metal Bollards shall be:
1. 36" visible height, 8" dia. embedded bollard or 60" visible height, 12" dia. embedded bollard as noted on the drawings
2. Fixed Carbon Steel, IBF08040
3. Yellow, powdercoat finish

C. Metal Bollards Cap shall be:
1. 8" dia. or 12" dia. rubber bollard cap
2. Yellow, color to match bollard

2.4 TRASH AND RECEPTACLES

A. Manufacturers: Subject to compliance with requirements, trash receptacles shall be:

1. Trash and Recycling Receptacles shall be DSNY Standard 32 gal. Litter and Recycling Baskets. No exceptions or alternatives will be accepted.
   a. Mounting: Per Manufacturer's instructions.
   b. Finish/Color: DSNY Standard Color and finish.

2.5 BICYCLE RACKS

A. Manufacturers: Subject to compliance with requirements, trash receptacles shall be:

1. Bicycle Racks shall be NYCDOT standard "Large Hoop" bicycle racks. No exceptions or alternatives will be accepted.
   a. Mounting: Per Manufacturer's instructions.
   b. Finish/Color: DSNY Standard Color.

2.6 SITE BENCH

A. Basis of Design: Subject to compliance with requirements, provide:

1. The "Socrates" Bench, manufactured by Landscape Forms, Inc., 431 Lawndale Avenue Kalamazoo, Michigan 49048 (800) 521-2546
   a. Mounting: Per Manufacturer's instructions.
   b. Finish/Color: Grey
   c. Size: 95" length (24"x95"x18")

   or comparable product by one of the following:

2. The "TF5117" Bench, manufactured by Wassau , PO Box 1520 Wausau, WI 54402-1520 (715) 359-3121
   a. Mounting: Per Manufacturer's instructions.
   b. Finish/Color: A26 Charcoal.
   c. Size: 2 units of (18"x48"x18") coupled together to achieve 96" length

3. The "Slab" Bench, manufactured by QCP , 731 Parkridge Avenue | Norco, CA 92860 (866) 703-3434, www.qcp-corp.com
   a. Mounting: Per Manufacturer's instructions.
   b. Finish/Color: French Gray.
   c. Size: 3 units of (18"36"x17") coupled together to achieve 108" length

4. Or approved equal

2.7 MISCELLANEOUS MATERIALS

A. Concrete: Concrete fill for steel bollards and steel stair systems is specified in Section 03 30 00, Cast-In-Place Concrete

B. Inserts: Threaded or wedge type, galvanized ferrous castings; either ASTM A 47 malleable iron, or ASTM A 27 cast steel.
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. Hohmann and Barnard.
      b. Gateway Erections, Inc.
      c. Richmond Screw Anchor Co.
      d. Or approved equal

C. Anchor Bolts:
   1. Expansion Anchors: Threaded stud type with two independent expansion anchor wedges per Fed. Spec. FF-S-325, Group II, Type 4, Class 1 for concrete expansion anchors. Stud, wedges, washer and nut shall be zinc-plated steel.
      a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
         1) Hilti Fastening Systems, "Kwick Bolt"
         2) Molly Fastener Group, Parabolt"
         3) Red Head, Phillips Anchors, "Wedge Anchors"
         4) Or approved equal

   2. Adhesive Anchor System: Self-contained glass vial containing pre-measured amounts of quartz sand, hardening agent and polyester resin. Studs shall be threaded rod conforming to ASTM A307 with compatible washers and hexagon nuts furnished by the anchor manufacturer.
      a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
         1) Hilti Fastening System, "HVA"
         2) Molly Fastener Group, "Parabond"
         3) Ramset Fastening System, "Chemset"
         4) Or approved equal

PART 3 - EXECUTION

3.1 EXECUTION REQUIREMENTS

A. Refer to DDC General Conditions for execution requirements.

3.2 GENERAL

A. The Contractor shall verify that finished grades and other operations affecting mounting surfaces have been completed prior to the installation of site furnishings. Site furnishings shall be installed plumb and true, at locations indicated, in accordance with the approved manufacturer's instructions.

3.3 ASSEMBLY AND ERECTION OF COMPONENTS

A. Items shall be shipped knocked-down (KD) ready for site assembly. Packaged components shall be complete including all accessories and hardware. New parts shall be acquired from the manufacturer; substitute parts will not be accepted unless approved by the manufacturer. When the inspection of parts has been completed, the site furnishings shall be assembled and anchored according to manufacturer's instructions or as indicated. When site furnishings are assembled at the site, assembly shall not interfere with other operations or pedestrian and vehicular circulation.

3.4 ANCHORAGE, FASTENINGS AND CONNECTIONS

A. Furnish metal work, mounting bolts or hardware in ample time for securing into concrete or masonry as the work progresses. Provide anchorage where necessary for fastening furniture or furnishings securely in place. Provide, for anchorage not otherwise specified or indicated, slotted inserts, expansion shields, and power-driven fasteners, when approved for concrete; toggle bolts and through bolts for masonry; machine and carriage bolts for steel; through bolts, lag bolts, and screws for wood. Do not use wood plugs in any material. Provide non-ferrous attachments for non-ferrous metal. Make exposed fastenings of compatible materials, generally matching in color and finish the fastenings to which they are applied. Conceal fastenings where practicable.

3.5 TESTING

A. Each site furnishing shall be tested to determine a secure and correct installation. A correct installation shall be according to the manufacturer's recommendations and by the following procedure: The Contractor shall measure the physical dimensions and clearance of each installed site furnishing for compliance with manufacturer's recommendations and as indicated. Site furnishings which do not comply shall be reinstalled. Fasteners and anchors determined to be non-compliant shall be replaced. A written report describing the results of the testing shall be provided.

3.6 STEEL PIPE BOLLARD – INSTALLATION

A. Install steel pipe bollards as indicated on Drawings. Set bollards in concrete. Concrete shall be as specified in Section 03 30 00, Provide temporary bracing to accurately plumb bollards until concrete base has set. Fill pipe with concrete and form a smooth, rounded crown on top to shed water.

3.7 SITE FURNISHINGS - INSTALLATION

A. Examination

1. Examine areas to receive furnishing.
2. Notify Commissioner of conditions that would adversely affect installation or subsequent use.
3. Do not begin installation until unacceptable conditions are corrected.

B. Coordinate installation with installation of the surrounding surface at grade beneath the furnishing.

C. Installation

1. Install furnishing in accordance with manufacturer's instructions at locations indicated on the Drawings.
2. Install level.
3. Anchor securely in place.

D. Adjusting

1. Finish Damage: Repair minor damages to finish in accordance with manufacturer's instructions and as approved by Commissioner.
2. Component Damage: Remove and replace damaged components that cannot be successfully repaired as determined by Commissioner.

E. Cleaning

1. Clean promptly after installation in accordance with manufacturer's instructions.
2. Do not use harsh cleaning materials or methods that could damage finish.

F. Protection

1. Protect installed furnishings to ensure that, except for normal weathering, furnishings will be without damage or deterioration at time of Substantial Completion.

G. Concrete footings for pedestals shall be furnished and installed under Section 033000, Cast-In-Place Concrete.

END OF SECTION 32 33 00

SECTION 32 93 00
Trees, Shrubs, and Groundcovers

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The following documents apply to all required work for the Project: (1) the Contract Drawings, (2) the Specifications, (3) the General Conditions, (4) the Addendum and (5) the Contract (City of New York Standard Construction Contract).

B. LEED General Requirements:
   1. Refer to DDC General Conditions
      a. Section 01 33 00 "Submittal Procedures"
      b. Section 01 74 19 "Construction Waste Management and Disposal"
      c. Section 01 81 13.04 "Sustainable Design Requirements for LEED v4 Buildings"

1.2 SUMMARY

A. Section includes:
   1. Provide all materials and equipment, and do all work required to complete the planting of trees, shrubs, perennial groundcovers, and preparation and placement of planting soil, as indicated on the Drawings and as specified.

      a. Locate, purchase, deliver, and install all specified plants
      b. Maintain proper irrigation of all specified plants
      c. Mulch, fertilize, stake, and prune (if necessary) all specified plants
      d. Maintenance of all specified plants before and during warranty period
      e. Provide a plant material warranty
      f.

   2. The work of this Section also includes providing all equipment and materials and doing all work necessary to supply and place planting soils as indicated on the Contract Documents and as specified. Supplying and placement of planting soils shall include, but not be limited to:

      a. Sampling and testing of topsoil, loam borrow and planting soil.
      b. Supplying, placing, spreading and grading of planting soil.

B. Related Sections
   1. Section 31 00 00 – Earthwork
   2. Section 32 92 00 – Tree, Shrub, & Perennial Installation

1.3 SUBMITTAL PROCEDURES

A. Refer to DDC General Conditions Section 01 33 00 "Submittal Procedures".

1.4 REFERENCES

A. Comply with applicable requirements of the following standards. Where these standards conflict with other specified requirements, the most restrictive requirements shall govern. All standards shall include the latest additions and amendments as of the date of advertisement for bids.

1. American National Standards Institute, Inc. (ANSI):

a. ANSI Z60.1	American Standard for Nursery Stock (Sponsor: American Nursery and Landscape Association) most current edition.
b. ANSI A 300	American National Standards for Tree , Shrub and other Woody Plant Care Operations by the Tree Care Industry Association (TCIA) most current edition and parts.

2. American Society for Testing and Materials (ASTM):

a. C136	Sieve Analysis of Fine and Coarse Aggregates
b. D 422	Particle-Size Analysis of Soils
c. E 11	Wire-Cloth Sieves for Testing Purposes
d. F 405	Corrugated Polyethylene (Pe) Tubing and Fittings

3. Interpretation of plant names and descriptions shall reference the following documents. Where the discrepancies occur, the most current document shall prevail.

   a. "Hortus Third", A Concise Dictionary of Plants Cultivated in the United States and Canada, Cornell University, L.H. Bailey Hortorium, MacMillian Publishing Co., New York, NY. ISBN-13: 978-0025054707

   b. "Manual of Woody Landscape Plants: Their Identification, Ornamental Characteristics, Culture, Propagation and Uses, Revised Edition", Michael A. Dirr, Stipes Publishing LLC. 2009. ISBN-13: 9781588748683

   c. New York State Invasive Plant Lists

      1) http://nyis.info/species-information/#Terrestrial%20Plants
      2) http://www.dec.ny.gov/animals/265.html

1.5 DEFINITIONS

A. Finish Grade: Elevation of finished surfaces.

B. Subgrade: Surface or elevation of subgrade soil remaining after completing excavation, or top surface of a fill or backfill immediately beneath planting soil.

C. Topsoil: Soil that is present at the top layer of the existing soil profile at the Project site. This shall be considered the "Base Loam 1" component of Planting Soil mixes.

D. Loam: Soil that contains a combination of particles typically almost equal in parts sand, silt and clay and including organic matter.

E. Loam Borrow: Soil that contains a combination of particles typically almost equal in parts sand, silt and clay and including organic matter obtained from off-site sources.

F. Planting Soil: Unless otherwise indicated throughout this Section, the term "Planting Soil" shall apply to on-site blended soil modified with planting soil components and soil amendments to meet the specific Planting Soil mix recommendations submitted by the testing laboratory.

1.6 SUBMITTALS

A. Samples: The following samples shall be submitted:

Material	Sample Size or Quantity
Mulch (organic)	1 ft.3
Mulch (gravel)	0.25 ft.3
Compost	1 ft.3
Topsoil	1 ft.3
Planting soil	1 ft 3
Tree stake	24 in. length
Tree wrap	24 in. length

B. Manufacturer's Product Data: Manufacturer's product data shall be submitted for the following materials:

1. Aluminum sulfate
2. Antidessicant
3. Fertilizer
4. Fungicide
5. Herbicide
6. Insecticide
7. Compost
8. Mycorrhiza Fungi Inoculant

C. Certificates: Labels from the manufacturer certifying that the product meets the specified requirements shall be submitted for the following materials:

1. Commercial fertilizer
2. Limestone
3. Compost

D. Test Reports: Test reports from an approved testing agency indicating compliance with the specifications shall be submitted for existing topsoil, amended planting soil and any other materials designated by the Commissioner.

1.7 INSPECTION AND TESTING

A. Work will be subject to inspection at all times by the Commissioner. The Commissioner reserves the right to have the Contractor engage an independent testing laboratory in accordance with requirements of Section 01 40 00, Quality Requirements of the DDC General Conditions to analyze and test materials used in the construction of the work. Where directed by the Commissioner, the testing laboratory will make material analyses and will report to the Commissioner whether materials conform to the requirements of this specification.

1. Testing equipment will be provided by and tests performed by the testing laboratory.

1.8 CONTRACTOR'S INSPECTION AND TESTING

A. The Contractor shall engage an independent testing laboratory, experienced in the testing of agricultural soils and acceptable to the Commissioner, to perform the topsoil and planting soil tests and analyses specified herein. All costs associated with testing shall be the Contractor's responsibility.

1. Particle size analysis shall include the following gradient of mineral content:

USDA Designation	Size in mm
Gravel	+ 2 mm
Very coarse sand	1-2 mm
Coarse sand	0.5-1 mm
Medium sand	0.25-0.5 mm
Fine sand	0.1-0.25 mm
Very fine sand	0.05-0.1 mm
Silt	0.002-0.05 mm
Clay	< 0.002 mm

2. Chemical analysis shall include the following:
   a. pH and buffer pH Test results shall include recommendations to meet the required range.
   b. percentage of organic content by oven-dried weight
   c. Nutrient levels by parts per million, including phosphorus, potassium, magnesium, manganese, iron, zinc, and calcium. Nutrient test shall include testing laboratory recommendations for

supplemental additions to the soil, if necessary, based on the requirements for ornamental horticultural plants. Test results shall include recommended rates at which additives are to be applied.

d. Soluble salt by electrical conductivity of a 1:2 soil/water sample:

1.9 SOURCE QUALITY CONTROL

A. Identification of plant names shall be as listed section REFERENCES 1.4.3.

B. Selection of Plant Materials: Submit to the Commissioner the names and locations of nurseries and/or re-wholesalers or distributors proposed as sources of acceptable plant material. Inspect all plant materials to determine that they meet the requirements of this section. Proposed materials shall be flagged at the nurseries by the Contractor prior to viewing by the Commissioner.

1. Schedule with the Commissioner a time for viewing plant material at the nursery and/or re- wholesaler or distributor facilities. Trips shall be efficiently arranged to allow Commissioner to maximize viewing time. A minimum of four weeks shall be allowed for this viewing prior to time that plants are to be transported to the project site.
2. Commissioner may choose to attach a seal to each plant, or representative samples.
3. If requested by the Commissioner, photographs of plant material or representative samples of plants shall be submitted by the Contractor.
4. If re-wholesalers or distributors are proposed as sources of plant material, the Contractor shall supply the Commissioner with names and locations of nurseries from which plants were obtained.
5. Viewing and/or sealing of plant materials by the Commissioner prior to shipping does not preclude the Commissioner's right to reject material for non-conformance to specifications at the site of planting.

C. Plant Photographs: Include color photographs in digital format of each required species and size of plant material as it will be furnished for the Project. Take photographs from an angle depicting true size and condition of the plant to be provided. Include a scale rod or other measuring device in each photograph. Include a minimum of three photographs showing best plant quality and worst plant quality for each species to be furnished. Clearly identify photographs with botanical name, size and source nursery.

1.10 QUALITY ASSURANCE

A. Refer to DDC General Conditions Section 01 40 00 "Quality Requirements".

B. Installer Qualifications: A qualified landscape installer whose work has resulted in successful establishment of plants.

1. Installer's Field Supervision: Require Installer to maintain an experienced full-time supervisor on Project site when work is in progress.

C. Pesticide Applicator: NY State licensed, commercial.

1.11 PLANT MATERIAL QUANTITIES

A. In the event of a discrepancy in plant material quantities between the Drawings and the Plant List(s) on the Drawings, the Contractor shall notify the Commissioner.

1.12 DELIVERY, STORAGE, AND HANDLING

A. Transportation of Plant Material: Plants transported to the project in open vehicles shall be covered with tarpaulins or other suitable covers securely fastened to the body of the vehicle to prevent injury to the plants. Closed vehicles shall be adequately ventilated to prevent overheating of the plants. Trees shall not be transported when daytime air temperatures are below 20F or above 75F

1. Plants shall be kept moist, fresh, and protected at all times. Such protection shall encompass the entire period during which the plants are in transit, being handled, or are in temporary storage in a Commissioner approved storage area.

2. Unless otherwise authorized by the Commissioner, notify the Commissioner at least two working days in advance of the anticipated delivery date of any plant material. A legible copy of the bill of lading, showing the quantities, kinds, and sizes of materials included for each shipment shall be furnished to the Commissioner, if requested.

B. Storage: Unless specific authorization is obtained from the Commissioner, unprotected plants shall not remain on the site of work longer than three days prior to being planted.

1. Plants that are not planted immediately shall be protected as follows:
   a. Earth balls shall be kept moist, not be allowed to freeze, and their solidity carefully preserved.
2. Both the duration and method of storage of plant materials shall be subject to the approval of the Commissioner.

C. Handling of Plant Materials: Exercise care in handling plant materials to avoid damage or stress.

1.13 REJECTION OF MATERIALS

A. Evidence of inadequate protection following digging, carelessness while in transit, or improper handling or storage, shall be cause for rejection.

1. Upon arrival at the temporary storage location or the site of the work, plants shall be inspected for proper shipping procedures. Plants with roots dried out, large branches broken, balls of earth broken or loosened, or areas of bark torn shall be subject to rejection by the Commissioner.

B. Rejected plants shall be removed from the area of work and replaced with same species of the required size and quality

1.14 DIGGING/PLANTING SEASONS

A. Spring Digging: Spring digging of plant materials may commence as soon as the ground has thawed and weather conditions make it practicable to dig at the nursery.

1. Deciduous plants shall not be dug after they have leafed out.
2. Broadleaf evergreens and conifers shall not be dug after new growth or candle push is visible.

3. Season sensitive species such as Oaks shall only be dug in Spring season. Contractor shall coordinate the timing of all season sensitive planting with The City of New York and Commissioner.

B. Fall Digging: Fall digging of plant materials may commence after dormancy has begun and shall continue until such time as the ground has frozen or weather conditions make it impractical to work.

C. Planting Seasons: Planting shall only be performed when weather and soil conditions are suitable for planting the material specified, in accordance with locally accepted practice, approval of the Commissioner, and to maintain the Contractor's guarantee.

1.15 PLANT MAINTENANCE

A. The Contractor shall maintain plant material until Substantial Completion and for 2 years following the date of Substantial Completion, per Installer's Guarantee.

1.16 GUARANTEE

A. Plants shall be guaranteed for a period of 2 years from the date of Substantial Completion.

B. Plants shall be healthy, free of pests and disease, and in flourishing condition at the end of the guarantee period. Plants shall be free of trunk damage, dead and dying branches, dead and dying branch tips, and shall bear foliage of normal density, size, and color.

C. Replace dead plants and all plants not in a vigorous, thriving condition, as determined by the Commissioner during and at the end of the guarantee period, without cost to the City of New York, as soon as weather conditions permit and within the specified planting period.

1. Replacements shall closely match adjacent specimens of the same species.
2. Replacements shall be subject to all requirements stated in this Specification.
3. Make all necessary repairs due to plant replacements. Such repairs shall be done at no extra cost to the City of New York.
4. The guarantee of all replacement plants shall extend for an additional one year period from the date of their Acceptance after replacement. In the event that a replacement plant is not acceptable during or at the end of the said extended guarantee period, the City of New York may elect one more replacement or credit for each item.

D. At the end of the guarantee period, the Commissioner will remove staking and guying materials, and tree wrap and ties.

PART 2 - PRODUCTS

2.1 PLANTS

A. Type and size of plants to be planted shall be as shown on the Contract Drawings.

B. Except as otherwise specified, size and grade of plant materials and their root balls shall conform to ANSI Z60.1.

C. Plants shall have outstanding form; symmetrical, heavily branched with an even branch distribution, densely foliated and/or budded, and a strong, straight, distinct leader where this is characteristic of species. Plants shall possess a normal balance for the species between height and spread. The Commissioner will be the final arbiter of acceptability of plant form.

1. Shade Trees: Single-stem trees with straight trunk, well-balanced crown, and intact leader, of height and caliper indicated, complying with ANSI Z60.1 for type of trees required.
2. Small Trees: Branched or pruned naturally according to species and type, with relationship of caliper, height, and branching according to ANSI Z60.1; stem form.
3. Multi-stem Trees: Branched or pruned naturally according to species and type, with relationship of caliper, height, and branching according to ANSI Z60.1; stem form.
4. Deciduous Shrubs: Form and Size: Deciduous shrubs with not less than the minimum number of canes required by and measured according to ANSI Z60.1 for type, shape, and height of shrub.
5. Coniferous Evergreens: Symmetrically shaped coniferous evergreens with form and size conforming to ANSI Z60.1.
6. Broadleaf Evergreens: Form and Size: Normal-quality, well-balanced, broadleaf evergreens, of type, height, spread, and shape required, complying with ANSI Z60.1.
7. Perennials: Size proportional to age and container size with form similar to mature character. Healthy vegetation visible and unpruned or altered, well-rooted and conforms to ANSI Z60 1.

D. Plants shall be healthy and vigorous, free of disease, insect pests and their eggs, and larvae.

E. Plants shall have a well-developed fibrous root system free of root binding or girdling.

F. Plants shall be free of physical damage such as scrapes, broken or split branches, scars, bark abrasions, sunscalds, fresh limb cuts, disfiguring knots, or other defects.

G. Plants shall meet the sizes indicated on the Plant List on the Drawings. Plants larger or smaller than specified may be used only if accepted in writing by the Commissioner.

H. Where a size or caliper range is stated, at least 50% of the material shall be closer in size to the top of the range stated. A tree shall be dimensioned as it stands in the nursery, and shall be calipered at a point six (6") inches above the ground for trees six (6") inches or less in diameter. The stock furnished shall be a fair average of the minimum and maximum sizes specified.

I. Plants shall not be pruned before delivery.

J. All plants shall be labeled. Labels shall be durable and legible, stating the correct plant name and size in weather-resistant ink or embossed process. Labels shall be securely attached to all plants prior to delivery to the site, being careful not to restrict growth.

K. Nursery Dug Plant Material:

1. Unless otherwise permitted by the Commissioner, plants shall be nursery grown.

2. Plants shall be grown for at least two years under climatic conditions similar to those in the locality of the Project.
3. Nursery grown plants shall be dug in the current planting season. No heeled in plants or plants from cold storage that were dug in the previous season shall be accepted.
4. Ball diameters shall be not less than the following:

Tree Caliper	Minimum Root Ball Diameter
From 2-1/2" to under 3"	30"
From 3" to under 3-1/2"	36"
From 3-1/2" to under 4"	42"
From 4" to under 4-1/2"	46"
From 4-1/2" to under 5"	52"
From 5" to under 6"	60"

L. Container grown plants shall be well rooted and established in the container in which they were grown. They shall have grown in the container for a sufficient length of time for the root system to hold the planting medium when taken from the container, but not long enough to become root bound. Container grown plants exceeding the sizes indicated in ANSI Z60.1 shall have containers which are not less than 75% of the ball sizes for comparable B&B plant material. Each container plant shall be inspected and circling roots loosened or pruned as needed.

M. Canes or Trunk(s) and Branches:

1. Very well formed and sturdy with distinct leader and no crotches that may interfere with growth of leader. Trees with included bark in crotches shall be avoided.
2. Branching well-spaced and uniformly distributed both vertically and around the circumference to form a well-balanced plant.
3. Pruning scars clean cut leaving little or no protrusion from the trunk or branch.
4. Graft union completely healed.
5. No mechanical or pest damage.
6. No extreme succulence.
7. Evidence of adequate twig growth in the past 2-4 years, and well-formed buds.

N. Foliage:
1. Densely supplied with healthy, vigorous leaves of normal size, shape, color and texture (except shrubs moved bare-root or deciduous shrubs when dormant).
2. No chlorosis.
3. No more than 5% of total foliage affected by pest or mechanical damage.

O. Root System:

1. Sturdily established and evenly distributed.
2. Container grown plants shall be well developed and hold the soil ball together when removed from the container.
3. Container grown plants shall not be excessively root bound (except if deliberately grown root bound to produce a dwarf plant).

P. Care and Shipping:

1. Confirm with the Commissioner that adequate water supply is available onsite prior to shipping plant material. If conditions do not allow the use of New York City water sources, the Contractor must obtain its own source of water.

2. Transport plant material in closed vehicles or in open vehicles with the entire load properly covered for protection from drying winds, heat, freezing or other exposure that may be harmful. Water plant material during shipment as necessary to avoid excessive stress due to drying and desiccation. Plant material may be rejected if not properly shipped.

3. Shipping shall be scheduled to minimize on site storage of plants. Stock shall not be shipped until the planting preparations have been completed. The Contractor is responsible for the guarding and safe keeping of all plant material prior to installation.

4. Plants shall be clearly identified with legible and durable labels stating correct Latin name for each species. Reference the Scientific Name used on plant list for current nomenclature expected to be delivered – synonyms are not acceptable to use on the plant labels. Labels should be securely attached to individual plants or to bundles of like species and size.

5. During shipment, plants shall not be bent, stacked or bound in a manner that damages the plant in any way, or destroys its natural shape. Plants may be cut back to aid in shipment and installation as long as sufficient growing surface to meet industry standards is left intact.

6. Document deliveries of plant material upon receipt to the job site. Record information by species, and submit immediately to the Commissioner, who will cross check all deliveries, and accept or reject materials.

7. If delays beyond the Contractor's control occur after plant delivery, as a change order, plants shall be kept watered, and protected from sun, wind and mechanical damage.

8. Handle plants at all times in accordance with best horticultural practices. Do not remove container-grown stock from containers until immediately before planting time.

9. All tubers, rootstocks and bare root material shall be fully dormant or in early stages of growth upon delivery to the site, and shall be kept in coolers for the short duration before installation. Materials that have started to rot due to staging times will be rejected.

10. Store all materials in pre-approved temporary nursery areas that offer structural shade protection and irrigation support (all to be provided by the Contractor).

2.2 PLANTING SOIL

A. Existing Topsoil
1. Existing topsoil from on-site source(s) may be used for planting soil, to the extent available, if it meets the requirements of this Section for planting soil, or if approved by the Commissioner.

B. Planting Soil
1. Planting soil shall be composed of a natural, fertile, friable soil typical of cultivated topsoils of the locality, suitable for the germination of seeds and support of vegetative growth, with additives, if required, to achieve particle distribution and organic content specifications. Topsoil shall be taken from a well-drained, arable site, free of subsoil, large stones, earth clods, sticks, stumps, clay lumps, roots, other objectionable, extraneous matter or debris nor contain toxic substances. Planting soil shall have a pH value between 6.0 and 6.8 and organic matter content of 5 to 10% of total dry weight.
2. Planting soil shall have the following mechanical analysis (see paragraph 1.8 for particle sizes):

a. Approximate Particle Distribution

Gravel	Less than 10%
Coarse to medium sand	50 – 65%
Fine to very fine sand	15 – 25%
Silt	10– 20%
Clay	15 – 25%

3. Minimum planting soil nutrient levels shall be: Nitrogen @ 5% average of organic matter, Phosphorus @ .02 to .05% average of total soil content, Potassium @ 1.2% average of total soil content.
4. The Contractor shall provide the Commissioner with planting soil test results, as specified in Paragraph 1.8, before the start of planting operations. If planting soil does not fall within the required particle distribution, organic content, or pH range, it shall be adjusted to meet the specifications through the addition of sand, compost, limestone, or aluminum sulfate to bring it within the specified limits.

2.3 COMPOST

A. Compost shall be derived from organic wastes such as food and agricultural residues, animal manures, mixed solid waste and biosolids (treated sewage sludge) that meet all New York State Department of Environmental Conservation requirements. The product shall be well composted, free of viable weed seeds and contain material of a generally humus nature capable of sustaining growth of vegetation, with no materials toxic to plant growth.

1. Compost shall have the following properties:

Parameters	Range
pH	5.5 – 8.0
Moisture Content	35% - 55%
Soluble Salts	4.0 mmhos (dS)
C:N Ratio	15 – 30:1
Particle Size	< 1"
Organic Matter Content	> 50%

Bulk Density	1000 lbs / cy
Foreign Matter	< 1 % dry weight

2. Compost generator shall also provide minimum available nitrogen and other macro and micro nutrients to determine fertilizer requirements.
3. Guidelines for quantity of compost required to achieve suitable soil organic content in soil mixes for ornamental horticultural planting shall be as recommended by the compost manufacturer based on soil test results.

2.4 LIMESTONE

A. Limestone shall be an approved agricultural limestone containing no less than 50% of total carbonates, and 25% total magnesium with a neutralizing value of at least 100%. The material shall be ground to such a fineness that 40% will pass through a No. 100 U.S.

B. Standard Sieve, and 98% will pass through a No. 20 U.S. Standard Sieve. The lime shall be uniform in composition, dry and free flowing, and shall be delivered to the site in the original unopened containers, each bearing the manufacturer's guaranteed analysis. Any lime which becomes caked or otherwise damaged making it unsuitable for use, will be rejected.

2.5 ALUMINUM SULFATE

A. Aluminum sulfate shall be unadulterated and shall be delivered in containers with the name of the material and manufacturer and net weight of contents.

2.6 WATER

A. Water shall be suitable for irrigation and shall be free from ingredients harmful to plant life. Refer to Sec. 2.1P.1

2.7 MYCORRHIZAL FUNGI INOCULANT

A. Mycorrhizal inoculant should be used for planting trees, woody shrubs, and woody groundcovers only; it is not needed for herbaceous material.

B. Mycorrhizal fungi inoculant shall be applied by means of a three ounce (3 oz.) premeasured dry formulation packet, such as Mycor Tree Saver Transplant, as manufactured ply Plant Health Care, Inc., Pittsburgh, PA; Rhizanova Tree Transplant, as manufactured by Becker Underwood, Inc., Ames IA; DIEHARD, as manufactured by Horticultural Alliance and distributed through Atlantic Irrigation, White Plains, NY; or approved equal.

C. Mycorrhizal fungi inoculant shall contain Vesicular-Arbuscular fungi, including: *Entrephosphora columbiana, Glomus clarum, Glomus etunicatum*, and *Glomus* sp.; seventeen million-five hundred thousand (17,500,000) live spores of Ectomycorrhizal fungi, including: *Pisolithus tinctorius; biostimulants* including

Yucca schidigera extract; soluble sea kelp extract derived from *Ascophylum nodosum*; humic acids; and acrylamide copolymer gel as a water absorbent medium.

D. Inoculant shall be added after the trees have been placed in their hole. Three (3) packets of each 2-1/2" to 3" caliper tree and four (4) opackets for each 3-1/2" to 4" caliper tree shall be added to the top size to eight inches (6-8") of backfill soil added to each pit and thoroughly mixed to distribute the inoculant. The opened packets shall be given to the Engineer at the end of each day. Mycorrhizal inoculant is a date material and must be used before it expires.

E. The material shall be applied according to the following chart:

Size of Rootball or Container	Ounces per Plant
1 gallon	1 oz.
3 gallon	3 oz.
5 gallon	3 oz.
10 gallon	6 oz.
24"	9 oz.
30"	9 oz.
36"	12 oz.
42"	12 oz.

2.8 WATER RETENTIVE ADDITIVE

A. Water retentive additives shall be a granular polyacrylamide polymer of a potassium base and not a sodium base that slowly releases water into the root zone such as Terra Sorb, as manufactured by Plant Health Care, Inc., Pittsburgh, PA; Soil Moist, JRM Chemical, Inc., Cleveland, OH; Stockosorb 660 manufactured by Evonik Corporation, P.O. Box 34628 Richmond, VA. or, an approved equal. The water retention additive shall be applied at the time of planting during a dry planting season as defined by the Department of Parks and Recreation. Each tree shall receive three ounces (3 oz.) or an amount specified by the product instructions. When planting shrubs, perennials or annuals, apply as per product instructions.

2.9 FERTILIZER

A. Commercial Fertilizer: Commercial-grade complete fertilizer of neutral character, consisting of fast- and slow-release nitrogen, 50 percent derived from natural organic sources of urea formaldehyde, phosphorous, and potassium in the following composition:

1. Composition: Nitrogen, phosphorous, and potassium in amounts recommended in soil reports from a qualified soil-testing agency. Manufacturer's literature shall be submitted for approval.

B. Slow-Release Fertilizer: Granular or pelleted fertilizer consisting of 50 percent water- insoluble nitrogen, phosphorus, and potassium in the following composition:

1. Composition: Nitrogen, phosphorous, and potassium in amounts recommended in soil reports from a qualified soil-testing agency.

C. Fertilizer shall be delivered in manufacturer's standard container printed with manufacturer's name, material weight, and guaranteed analysis.

D. Fertilizers with N-P-K analysis other than that stated above may be used provided that the application rate per square foot of nitrogen, phosphorus, and potassium is equal to that specified

2.10 SUPERPHOSPHATE

A. Superphosphate shall be composed of finely ground phosphate rock as commonly used for agricultural purposes, and containing not less than 20% available phosphoric acid. The superphosphate shall be delivered to the site in the original unopened containers, each bearing the manufacturer's guaranteed analysis. Any superphosphate which becomes caked or otherwise damaged making it unsuitable for use, will be rejected.

2.11 MULCH

A. Woody Plant Beds and Tree Saucers: Mulch for beds shall be a 100% fine-shredded pine or hardwood bark, of uniform size and free from rot, leaves, twigs, debris, stones, and material harmful to plant growth. Bark shall have been shredded and stockpiled no less than six months and no more than two years before use. Mulch shall be free of bark chunks larger than 3 in. and material thicker than ¼ inch. The pH factor should range from 5.8 to 6.2.

B. Mulch applications shall not cover or suffocate woody plant crowns or trunk root flares. Mulch application shall be parallel to finished grade and no deeper than 4" in depth.

C. Herbaceous Plants and Flower Beds: Mulch for beds shall be finely processed leaf mulch or leaf mold.

1. Ground leaf material collected from select municipal leaf collection programs.
2. Contains no debris, wood, non-leaf materials, and be largely free of seeds.
3. Leaves shall be process through a grinder twice to reach optimum particle size.
4. Contains no chemical adjuvants or other non-organic products.

2.12 GUYING AND STAKING MATERIALS

A. Staking:

1. Steel Pipe for Tree Staking: 2 in. diameter steel pipe of lengths indicated on the Drawings.

2. Paint dark brown color, approved by the Commissioner.

B. Strapping for Guying and Staking: Arbortie, manufactured by DeepRoot Green Infrastructure, LLC, 530 Washington Street, San Francisco, CA, HORTtie and HORTstrap, manufactured by HORT Industries Ltd. 10771 Tumbull Weed Ct., Bennett, CO., Tree-Mate-O manufactured by Safeguard Nursery Products LLC, 100 Galvan Way, New Albany, IN., or approved equivalent.

C. Burlap shall be a natural fabric. No nylon burlap shall be permitted.

PART 3 - EXECUTION

3.1 EXECUTION REQUIREMENTS

A. Refer to DDC General Conditions for execution requirements.

3.2 EXAMINATION OF SUBGRADE

A. Examine subgrade and rough grading before planting. Alert Commissioner to unacceptable rough grading or subgrade conditions.

3.3 PREPARATION OF SUBGRADE

A. Subgrade shall be brought to true and uniform grade and shall be cleared of stones greater than 2 in., sticks, and other extraneous material.

3.4 DECOMPACTION OF PLANTING AREAS

A. After subgrade levels have been reached and immediately prior to placing planting soils, the entire subgrade area shall be loosened to a minimum depth of 6 inches. Care shall be exercised to minimize damage to existing tree roots that may be in the area. Contractor shall obtain Commissioner approval for the equipment method used to loosen subgrade prior to starting work.

B. Any subgrade areas which have become heavily compacted (defined as exceeding 86% - 88% compaction ASTM C698 Standard Proctor) including, but not limited to, temporary parking areas, material stockpile areas, temporary roadways, construction areas, areas shown on the plans, or areas identified by Commissioner shall be deep-scarified. Immediately prior to placing soils, compacted areas shall be loosened to the depth required to overcome the excessive compaction using a ripper blade, the teeth of a backhoe or other suitable equipment. Frequency of compaction tests shall be one per 200 square feet.

C. Using a wide-track bulldozer size D-5 or smaller, compact the scarified subgrade to 86% - 88% compaction ASTM D698 Standard Proctor. Contractor shall provide shovel dug test pits to the full depth of the mitigation, where located per the direction of the Commissioner, in order for the Commissioner to review whether the work has been done as required. Backfill the pits after the review(s).

D. Confirm that the subgrade is at the proper elevation and that no further earthwork is required to bring the subgrade to proper elevations. Provide a written report to Commissioner indicating that subgrade has been placed to the required elevations, has been decompacted according to the Contract Documents and is ready for inspection at least 3 days prior to placing planting soil. Perform no work of placing and spreading planting mixes until elevations have been confirmed and written report has been accepted by the Commissioner.

E. After the soils have been loosened and inspected, topsoil may be spread by using a wide track bulldozer size D-5 or smaller or may be dumped and spread with bucket of a backhoe from the edge of the loosened area. No rubber-tired equipment or heavy equipment except for small bulldozer shall pass over the subsoils (subgrade) after they have been loosened. If Contractor plans to utilize such areas for any use of heavy equipment, this should be carried out prior to beginning the process of loosening soils or filling in that area, or it shall be rescarified to meet this specification requirement.

3.5 SOIL DRAINAGE/DETRIMENTAL SOILS

A. Test drainage of five planting pits in each of the different general planting areas of the project as directed by the Commissioner. Pits shall be filled with water twice in succession. The time at which water is put into the pit for a second filling shall be noted. Commissioner shall then be notified of the time it takes for pit to drain completely. Planting operations shall not proceed until Commissioner has reviewed test drainage results.

B. The Contractor shall notify the Commissioner in writing of all soil or drainage conditions that are considered detrimental to growth of plant material. Submit proposal and cost estimate for correction of the conditions for Commissioner's approval before starting work.

3.6 LAYOUT OF PLANTING AREAS

A. Individual plant locations and outlines of shrub and ground cover areas to be planted shall be staked by the Contractor for approval by the Commissioner prior to planting.

B. Digging shall not begin until locations are approved by the Commissioner.

C. Location of trees shall be staked using color coded stakes. A different stake color shall be used for each tree species.

3.7 SPREADING OF PLANTING SOIL AND PLANT BED PREPARATION

A. Planting soil shall be spread in lifts not greater than 12 inches and compacted to a density between 82% and 86% Standard Proctor Maximum Dry Density in accordance with ASTM D698. The surface area of each lift, including the subgrade after it has been compressed by a backhoe, shall be scarified by raking prior to placing the next lift. No soil shall be placed around tree trunk, root flares or top of root balls of new plants.

B. Place and spread planting medium to a depth greater than required such that after settlement, finished grade shall conform to the lines, grades and elevations shown on the Drawings. Ensure proper drainage in an uninterrupted pattern free of hollows and pockets.

C. Remove stiff clods, lumps, brush, roots, stumps, litter and other foreign material and stones over 1 inch diameter and legally dispose of off-site.

3.8 PLANT PIT EXCAVATION

A. Planting pits for trees and shrubs shall be excavated to the depth and dimensions indicated on the Drawings.

B. Excavation shall not begin until locations are approved by the Commissioner.

3.9 PLANTING TREES AND SHRUBS

A. Tree, shrub, perennial and groundcover beds shall be excavated to the depth and widths indicated on the Drawings. If the planting pit for any tree is dug too deep, soil shall be added to bring it to correct level, and the soil shall be thoroughly tamped. Walls of plant pits shall be dug so that they are sloped as shown on the Drawings, and scarified. Do not excavate compacted subgrades of adjacent pavement or structures.

B. Plants shall be set as indicated on Drawings. Plants shall be set so that the root flare is at, or slightly above, finished grade. Plants located in poorly drained soils shall be set 2 to 4 inches above finished grade, gradually sloping between the top of the root ball and the surrounding finished grade.

C. Plants shall be turned to the desired orientation when required by Commissioner.

D. Containerized plants shall be removed from container taking care not to damage roots. In the event of excessive root binding, care must be taken to tease and loosen roots to ensure proper growth after planting.

E. The side of the root ball shall be scarified to prevent root-bound condition before positioning in planting pit.

F. Plants shall be positioned in center of planting pits, set plumb, and rigidly braced in position until all planting soil has been tamped solidly around the balls.

G. Pits shall be backfilled with planting soil. Soil shall be worked carefully into voids and pockets, with watering tamping lightly every 6 in.

1. At this time, ropes or strings on top of balls shall be cut and shall be pulled back. Burlap or cloth wrapping shall be removed from the top 2/3 of the ball. Non-biodegradable ball wrapping and support wire shall be totally removed from ball and planting pit.
2. When pit is two-thirds full, plants shall be watered thoroughly, and water left to soak in before proceeding.
3. Wire baskets shall be completely cut away from sides of root ball, and removed from pit. Bottom of basket may remain.
4. Remove nursery plant identification tags.

H. Backfilling and tamping shall then be finished and a saucer formed around plant pits as indicated on the Drawings.

I. Saucer shall be filled with water and water left to soak in. Saucer shall then be filled with water again.

3.10 PLANTING GROUND COVERS AND PERENNIAL PLANTS

A. Set out and space plants as indicated on the Drawings.

B. Planting: Check root ball after removing plant from its container. Encircling roots shall be gently loosened from the tight mat of root-bound plants. If roots are very dense at bottom of pot, slice off the bottom 1". If roots are seriously disturbed when planting, cut back some foliage just above leaf nodes to reduce the water stress that will occur. Plant at the same soil level as the plant was in its container.

C. Set container-grown stock plumb and in center of planting pit or trench with root flare 1 inch (25 mm) above adjacent finish grades.

1. Use planting soil specified for backfill.
2. Carefully remove root ball from container without damaging root ball or plant.
3. Backfill around root ball eliminating voids and air pockets, and water thoroughly taking care to not cover plant crowns with wet soil.
4. Protect plants from hot sun and wind; remove protection if plants show evidence of recovery from transplanting shock.

3.11 PRUNING

A. Any tree or shrub pruning that is necessary shall be done to preserve the natural character of the plant, and shall be done under the direct supervision of The City of New York and Commissioner. Pruning shall be done after delivery of plants and after plants have been inspected and approved by the Landscape Commissioner. Pruning procedures shall be reviewed with Commissioner before proceeding.

B. Pruning shall be done with clean, sharp tools. Cuts shall be made just outside the branch collar. No tree paint shall be used.

C. Dead wood, suckers, and broken, weak, interfering and badly bruised branches shall be removed.

3.12 MAINTENANCE OF PLANTING

A. Maintenance shall begin immediately after each plant is planted and shall continue until Substantial Completion and for 2 years following the date of Substantial Completion, per Installer's Guarantee.

B. Maintenance shall consist of pruning, watering, cultivating, weeding, mulching, fertilizing, removal of dead material, repairing and replacing of tree stakes, tightening and repairing of guys, resetting plants to proper grades and upright position, and furnishing and applying such sprays as are necessary to keep plantings free of insects and disease, and in a healthy growing condition. Watering and weeding shall be conducted on a weekly basis and shall take into consideration on-site conditions and seasonal weather events.

C. Planting areas shall be kept free of weeds, grass, and other undesired vegetative growth.

3.13 WATERING

A. Trees: At the time of planting, the soil around each tree shall be thoroughly saturated. Trees will acquire at least twenty gallons (20 gal.) of water. Soil shall be firmed at six to eight inches (6-8") intervals and thoroughly settled with water. Water shall not be applied in a manner which damages plants, staking materials, erodes soil, or damages plant saucers.

B. Shrubs, Container and Plug Perennials: At time of planting, all container plants must be thoroughly watered before removing from containers. After planting, spot watering shall ensure that the soil around each shrub and perennial plant shall be thoroughly saturated. Care must be taken not to wash soil away, exposing the top portion of the root mass.

C. Water shall be free from oil, have a pH not less than 6.0 nor greater than 8.9 and shall be free from impurities injurious to vegetation. Unless otherwise directed, water may be drawn from mains owned by or supplying water to the City of New York.

3.14 WEED CONTROL

A. All chemical herbicide applications shall be performed by landscape professionals with a valid New York State herbicide applicator's license.

B. Stockpiled Soils - Weeds shall not be permitted to grow and self-seed on stockpiled soils. Weed control for stockpiled topsoil shall be a non-selective weed killer for control of grassy and broadleaf weeds; weed control shall have short half-life residence time, allowing planting operations to occur within 7 days of soil installation without effect on installed plantings.
   1. Glyphosate-only herbicide shall be used including Gly-4 Plus, Ranger Pro, Roundup Pro Max or approved equal. Herbicides shall not contain additional additives such as Imazapyr or Triclopyr Ester. commonly found in Roundup Max Control or Extended Life 365.
   2. If schedules significantly delay installation of stockpiled soils, application of herbicide will commence after one week of first weed emergence ensuring that a majority of the exposed weed seedbank is treated in one application. Reemergence of weeds shall require additional herbicide applications, taking in account of expected soil installation and planting schedules.

C. Planted Areas and Meadows – Landscaped areas including meadows shall be monitored for weeds on a weekly basis under the Contractor's landscape guarantee of twelve months. Weed control for landscaped and meadow areas shall be primarily manual removal by-hand. In the event of large scale weed establishment or the presence of woody or invasive weeds as defined by Sec. 1.4.4, spot treatments of a Glyphosate-only herbicide, as defined by Sec. 3.14.B.1 shall be permitted.

D. Natural Area Invasive Weed Removal – The Northeast site boundary shall be surveyed and monitored for invasive woody and herbaceous plant species as defined by Sec. 1.4.4. All invasive plant species shall be removed, without damage to native shrubs, trees, and herbaceous plant material.
   1. Invasive Woody Species – Invasive trees and shrubs with a trunk caliper of 0.50" or greater shall be manually removed by saw, weed wrench, or lopping shears leaving 4" of trunk growth with cut marks to be spot treated/dabbed with an herbicide formulated for woody species including Triclopyr (Garlon 3A/Vastlan, Garlon 4, or other brush killers with Triclopyr), Glyphosate (Roundup), or approved equal

2. Invasive herbaceous material including shall be mowed weekly and treated with Glyphosate-only herbicide as defined by Sec. 3.14.B.1.

END OF SECTION 32 93 00

SECTION 33 02 00
Protection of Existing Utilities

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The following documents apply to all required work for the Project: (1) the Contract Drawings, (2) the Specifications, (3) the General Conditions, (4) the Addendum and (5) the Contract (City of New York Standard Construction Contract).

B. LEED / Environmentally Preferable Purchase (EPP) General Requirements:
   1. Refer to DDC General Conditions and the Addendum to the General Conditions
   2. LEED requirements apply to all Phase II work with the exception of the Existing Building scope. EPP requirements apply to the project's Existing Building scope only.

1.2 SUMMARY

A. Work includes:
   1. Identification and field markout of all on-site utility lines to remain in operation during construction.
   2. Identification and field markout of all on-site utility lines to be removed and/or abandoned.
   3. Submission of procedures to be used to ensure the safety of the utility.
   4. Restoration from any damage during construction operations.

B. Related Sections
   1. Section 31 00 00 - Earthwork
   2. Section 31 10 00 Site Clearing, Removals and Preparation

1.3 SUBMITTAL PROCEDURES

A. Refer to DDC General Conditions Section 01 33 00 "Submittal Procedures".

1.4 QUALITY ASSURANCE

A. Refer to DDC General Conditions, Section 01 40 00 "Quality Requirements".

1.5 REGULATORY REQUIREMENTS

A. Notify affected utility companies before starting work and comply with their requirements.

B. Contractor shall contact the "Call Before You Dig" service for an official utility mark out prior to excavation.

1.6 PROJECT RECORD DOCUMENTS

A. Accurately record actual locations of capped utilities and utility lines encountered during construction.

PART 2 - PRODUCTS

PART 3 - EXECUTION

3.1 EXECUTION REQUIREMENTS

A. Refer to DDC General Conditions for execution requirements.

3.2 IDENTIFICATION

A. Locate all existing utilities which are to remain in service during construction as shown on the contract drawings.

B. Any conditions found to differ from what is shown on the contract drawings shall be immediately brought to the attention of the Commissioner.

3.3 PROTECTION

A. Flag, barricade or suitably protect existing utilities during construction operations and equipment movement.

3.4 LATERAL DISCONNECTION

A. Where a utility line is to be disconnected from portions to remain following construction, the lateral pipes shall be cut and suitably plugged/capped in accordance with the contract documents and NYC DEP regulations.

3.5 RESTORATIONS

A. Any damage to existing, operational utilities by the Contractor during the on-going construction operation shall be immediately restored to operational standards at the contractor's expense.

END OF SECTION 33 02 00

SECTION 33 10 00
Water Utilities

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The following documents apply to all required work for the Project: (1) the Contract Drawings, (2) the Specifications, (3) the General Conditions, (4) the Addendum and (5) the Contract (City of New York Standard Construction Contract).

B. LEED / Environmentally Preferable Purchase (EPP) General Requirements:
   1. Refer to DDC General Conditions and the Addendum to the General Conditions
   2. LEED requirements apply to all Phase II work with the exception of the Existing Building scope. EPP requirements apply to the project's Existing Building scope only.

1.2 SUMMARY

A. Work includes:
   1. Construction of the water systems. This shall include, but not be limited to the following: pipe and fittings for site water line including domestic water line and fire water line, valves, flexible connections, fire hydrants and hydrant fenders. Set lines, elevations, and grades for water distribution system work for duration of work including careful observation of benchmarks, property corners, monuments, or other reference points.
   2. This section does not include work within the building footprint.

B. Related Sections
   1. Section 31 00 00 - Earthwork
   2. Section 32 12 16 - Asphaltic Paving
   3. Section 32 13 15 - Concrete Curbs and Paving
   4. Section 33 02 00 - Protection of Existing Utilities

1.3 SUBMITTAL PROCEDURES

A. Refer to DDC General Conditions Section 01 33 00 "Submittal Procedures".

B. The Contractor must provide the following submittals to the Commissioner for approval prior to purchase of materials:
   1. Material Certificates
   2. Product Warranty
   3. Product Data
   4. Manufacturer's Certificate

1.4 QUALITY ASSURANCE

A. Refer to DDC General Conditions, Section 01 40 00 "Quality Requirements".

B. Perform work in accordance with NYCDEP, utility company and NYCDOB requirements.

C. Valves: Manufacturer's name and pressure rating must be marked on valve body.

1.5 TESTING AGENCY

A. Retain an independent testing agency to perform material testing as required. The Contractor shall provide any necessary assistance to the testing agency and provide the testing agency with the intended construction schedule at least one week prior to the start of construction.

1.6 CONTRACTOR RESPONSIBILITIES

A. Contractor is responsible for coordinating the work of this trade with other trades on-site.

B. Identify and describe unexpected variations to subsoil conditions and the discovery of uncharted utilities.

1.7 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, and handle materials as recommended by the manufacturer to protect from damage.

1.8 PERMITS AND APPROVALS

A. Contractor shall prepare and obtain all required permits prior to construction unless otherwise directed by the Commissioner. Copies of all permits shall be supplied to the Commissioner prior to the commencement of work authorized by the permit.

B. Connections with existing facilities shall be performed in accordance with the requirements of NYCDOB and NYCDEP. The Contractor shall be required to comply with all such requirements, including securing all permits, and payment of all permit and/or connection fees.

1.9 PROJECT RECORD DOCUMENTS

A. Refer to the DDC General Conditions for project record drawings requirements
   1. Record drawings for work of this section shall include, but shall not be limited to, an as-built survey of all new water, sewer, electric and gas service lines.

1.10 REFERENCE STANDARDS

A. Unless more restrictive criteria or differing requirements are explicitly stated in the Specifications, or mandated by governing codes or regulations, the recommendations, suggestions, and requirements described in the referenced standards shall be deemed mandatory and applicable to the Work.

B. The latest edition, as of the date of the executed construction contract, of referenced standards listed below applies to this contract.

1. New York City Department of Environmental Protection Bureau of Water and Sewer Rules, Standard Details, and Specifications.
2. American Society for Testing Materials (ASTM), American National Standards Institute (ANSI), and American Water Works Association (AWWA)
3. ANSI/ASME B16.18 - Cast Copper Alloy Solder Joint Pressure Fittings.
4. ANSI/ASME B16.22 - Wrought Copper and Copper Alloy Solder Joint Pressure Fittings.
5. ASTM B88 - Seamless Copper Water Tube.
6. ANSI/AWS A5.8 - Brazing Filler Metal.
7. ANSI/AWWA C104 - Cement Mortar Lining for Ductile Iron Pipe and Fittings for Water.
8. ANSI/AWWA C105 - Polyethylene Encasement for Ductile Iron Piping for Water and Other Liquids.
9. ANSI/AWWA C111- Rubber-Gasket Joints for Ductile Iron and Grey Iron Pressure Pipe and Fittings.
10. ANSI/AWWA C151 - Ductile Iron Pipe, Centrifugally Cast in Metal Molds or Sand Lined Molds, for Water or Other Liquids
11. ANSI/AWWA C500 - Gate Valves, 3 through 48 inches NPS, for Water and Sewage Systems.
12. ANSI/AWWA C502 - Dry Barrel Fire Hydrants.
13. ANSI/AWWA C504 - Rubber Seated Butterfly Valves.
14. ANSI/AWWA C508 - Swing Check Valves for Waterworks Service, 2 inches through 24 inches NPS.
15. ANSI/AWWA C509 - Resilient Seated Gate Valves 3 inches through 12 inches NPS, for Water and Sewage Systems.
16. ANSI/AWWA C600 - Installation of Ductile Iron Water Mains and Appurtenances.
17. ANSI/AWWA C606 - Grooved and Shouldered Type Joints.
18. UL 246 - Hydrants for Fire - Protection Service.

PART 2 - PRODUCTS

2.1 MATERIALS

A. As required by NYC DEP for water main and building service work.

2.2 GEOTEXTILES AND GEOGRID MATERIALS

A. As required by NYC DEP for water main and building service work.

2.3 WATER PIPE MATERIALS AND ACCESSORIES

A. Ductile Iron Pipe: Cement-Lined, ANSI A21.10 (AWWA C-151) Class 56 for pipe 6 inch diameter and larger; Class 52 for smaller than 6 inch diameter:

1. Fittings: Ductile iron, standard thickness.
2. Joints: AWWA C151, mechanical joints.
3. Cement mortar lining: AWWA C-104.
4. Retainer glands: Ductile Iron, 350 psi pressure rating.

B. Gate Valves – 3 inches (75 mm) and over
1. Manually operated, inside non-rising stem, ductile iron body/bonnet/seal plate, non-packing, bronze seated, double disc, seating wedge mechanism gate valve; model and manufacturer as approved by the NYCDEP Bureau of Water and Sewer and Commissioner.

C. Meter: Meter shall be per plumbing plans and specifications. Meter make and model shall be filed and approved by the NYCDEP Cross Connection Unit and Commissioner.

D. Backflow Prevention Device: Backflow prevention device shall be per plumbing plans and specifications. Backflow prevention device make and model shall be filed and approved by the NYCDEP Cross Connection Unit and Commissioner.

E. Hydrant
1. Hydrant: As approved by NYCDEP Bureau of Water and Commissioner.
2. Hydrant Extensions: Fabricate in multiples of 6 inches with rod and coupling to increase barrel length.
3. Hose and Streamer Connection: Match sizes with NYC Fire Department, two hose nozzles, and one pumper nozzle
4. Finish: Primer and two coats of enamel or special coating in color permitted by NYCDEP and NYC Fire Department.
5. Hydrant Drain and Fenders: As shown on contract drawings in accordance with requirements of NYCDEP.

2.4 CONCRETE MATERIALS

A. Concrete for Thrust Blocks: Place thrust blocking consisting of 3,000 psi concrete to provide sufficient bearing area to transmit unbalanced thrust from bends, tees, caps, or plugs to undisturbed soil without loading undisturbed soil in excess of 2,500 lbs/sq. ft. when water main pressure is 100 psi.

2.5 SUBSTITUTIONS

A. All products shall be as approved by NYC DEP and the Commissioner. No substitutions will be accepted without prior approval by NYC DEP and the Commissioner.

PART 3 - EXECUTION

3.1 EXECUTION REQUIREMENTS

A. Refer to DDC General Conditions for execution requirements.

3.2 EXAMINATION

A. Obtain NYCDEP permit to perform the work.

B. Contact NYCDEP for field inspection.

C. Verify existing conditions.

D. Verify building service connection points with plans.

E. Verify that existing water main size, location, and invert are as indicated on the drawings.

3.3 PREPARATION

A. Cut pipe ends square, ream pipe and tube ends to full pipe diameter, remove burrs.

B. Remove scale and dirt on inside and outside before assembly.

C. Prepare pipe connections to equipment with flanges or unions.

D. Hydrants removed from site shall remain property of the City of New York, with relocation or disposal at the Commissioner's discretion.

3.4 CLEANING

A. After the system has been cleaned, the Contractor shall thoroughly inspect the system and all restorations shown to be necessary shall be promptly made by the Contractor.

B. All Work of cleaning and repair as specified herein shall be performed at the Contractor's expense and to the complete satisfaction of Commissioner.

C. Disinfection of Water Piping System
   1. Sterilize distribution system with a solution of not less than 50 parts per million of chlorine with water prior to domestic operation. Thoroughly flush lines before introduction of chlorinating materials and after the contact period of at least 24 hours. De-chlorinate water prior to flushing into storm sewer system.
   2. Open and close valves in lines being sterilized several times during contact period. System shall be flushed with clean water until residual chlorine content is less than 1.0 part per million.
   3. After sterilization, test water for bacterium in accordance with AWWA specifications. Do not place distribution system in service until approval is obtained from New York City Department of Environmental Protection.

3.5 BEDDING

A. Excavate pipe trench in accordance with Section 31 00 00 "Earthwork".

B. Form and place concrete for pipe thrust restraints at any change of pipe direction.

C. Place bedding material at trench bottom.

D. Backfill around sides and to top of pipe with cover fill, tamp in place and compact in accordance with Construction Documents.

3.6 INSTALLATION - PIPE

A. Maintain separation of water main from sanitary and storm sewer piping in accordance with NYCDEP, New York state, and New York City code. Unless otherwise approved, water mains shall be separated from sanitary sewer pipes a minimum distance of 10 feet horizontal or 18 inches vertical.

B. Install ductile iron piping and fittings to ANSI/AWWA C600.

C. Route pipe in straight line.

D. Install pipe to allow for expansion and contraction without stressing pipe or joints.

E. Install access fittings to permit disinfection of water system performed under this section.

F. Slope water pipe and position drains at low points.

G. Form and place concrete for thrust restraints at each elbow or change of direction of pipe main.

H. Coordinate with NYCDEP for new wet tap to existing main.

I. Establish elevations of buried piping to ensure not less than 4-ft of cover over the top of pipe under proposed grading. Locations where shallow cover cannot be avoided must be brought to the attention of the Commissioner for review.

J. Backfill trench in accordance with Construction Documents.

K. Connections with Existing Pipelines: Where connections are made between new work and existing piping, make connection using suitable fittings for conditions encountered. Make each on-site wet tap connection under conditions which least interfere with operation of existing pipeline. NYCDEP will provide wet tap to their main.

3.7 INSTALLATION – VALVES

A. Install gate valves as indicated on Drawings, supported on concrete pads with the valve stem vertical. Install valve boxes in a manner that will not transmit loads, stress, or shock to valve body. Center valve box over operating nut of valve vertical and plumb. Securely fit valve box together leaving cover flush with finished grade Form and place cast in place concrete base pad, with provision for storm sewer pipe end sections, or place precast reinforced concrete pad at the location and elevation specified on the plans.

3.8 INTERFACE WITH EXISTING FACILITIES

A. Construct water service lines to within 5 feet of the building entry point.

3.9 CONSTRUCTION WITHIN THE PUBLIC RIGHT-OF-WAY

A. Construction within the public right-of-way shall conform to all requirements of NYCDOB, NYCDEP, and NYCDOT.

3.10 FIELD QUALITY CONTROL

A. Water line installation and testing shall be certified to the NYCDOB by a plumber licensed in the State of New York. The Contractor shall cooperate with the Commissioner as required to facilitate testing and inspection of the work.

B. Test water distribution system installed below grade and outside the building in accordance with NYCDEP and NYCDOB and the following procedures:
   1. All pipework shall be tested at a hydrostatic pressure equal to 150 psi. The pipe work shall maintain said pressure for not less than two hours.
   2. Furnish, install, and operate the necessary connections, pumps, meters, and gauges. Leakage shall not exceed that permitted by AWWA Specifications C600 64 for mechanical joint and push on joint pipe. Prior to running any field test, a meter shall be tested, sealed, and approved by NYCDEP and NYCDOB at Contractor's expense.
   3. Locate and restore any leaks. Repeat testing until process results are satisfactory and in compliance with this section.
   4. Furnish a copy of the results of the meter test and the hydrostatic pressure test to the Commissioner upon completion of water distribution system backfilling operations

C. Contractor shall call for NYCDEP inspection of all waterline work and shall be responsible for obtaining all NYCDEP signoffs, including but not limited to tap release letters and meter release letters.

D. All waterline work, including but not limited to meters, taps, and backflow prevention device shall be constructed in accordance with the latest version of RCNY Title 15 Chapter 20 Rules Governing and Restricting the Use and Supply of Water.

3.11 INSPECTION AND TESTING

A. Final Inspection: Upon completion of the Work and before backfill is placed and final acceptance by the Commissioner, the entire drainage system shall be subject to a final inspection in the presence of the Commissioner. The Work shall not be considered as complete until all requirements for line, grade, cleanliness, and workmanship have been completed to the satisfaction of the Commissioner.

END OF SECTION 33 10 00

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SECTION 33 31 00
Sanitary Sewer System

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The following documents apply to all required work for the Project: (1) the Contract Drawings, (2) the Specifications, (3) the General Conditions, (4) the Addendum and (5) the Contract (City of New York Standard Construction Contract).

B. LEED / Environmentally Preferable Purchase (EPP) General Requirements:
   1. Refer to DDC General Conditions and the Addendum to the General Conditions
   2. LEED requirements apply to all Phase II work with the exception of the Existing Building scope. EPP requirements apply to the project's Existing Building scope only.

1.2 SUMMARY

A. Work includes:
   1. Sanitary sewerage piping, fittings, accessories and bedding.

B. Related Sections
   1. Section 31 00 00 – Earthwork
   2. Section 33 02 00 – Protection of Existing Utilities
   3. Section 33 49 00 – Storm and Sanitary Structures

1.3 SUBMITTAL PROCEDURES

A. Refer to DDC General Conditions Section 01 33 00 "Submittal Procedures".

1.4 QUALITY ASSURANCE

A. Refer to DDC General Conditions Section 01 40 00 "Quality Requirements".

B. Coordination:
   1. Coordinate the Work with the building sanitary sewer connection point shown by the plumbing plans, and connection to the on-site sewer system.

1.5 REFERENCES

A. ASTM A746-03 – Ductile Iron Gravity Sewer Pipe

B. ANSI/AWWA C111/A21.11 – Rubber Gasket Joints for Ductile-Iron Pressure Pipe and Fittings

C. ASTM D1785-15 – Standard Specification for Poly(Vinyl Chloride) Plastic Pipe, Schedules 40, 80, and 120

1.6 PROJECT RECORD DOCUMENTS

A. Refer to the DDC General Conditions for project record drawing requirements.

B. Accurately record actual locations of pipe runs, connections, outlet structures, headwalls, and invert elevations.

C. Identify and describe unexpected variations to subsoil conditions and the discovery of uncharted utilities.

1.7 PERMITS AND APPROVALS

A. Obtain street opening permit, and all permits and inspections for the sanitary sewer system construction as required by New York City Department of Environmental Protection (NYCDEP), New York State Department of Environmental Conservation (NYSDEC), and New York State Department of Transportation (NYSDOT).

PART 2 - PRODUCTS

2.1 SEWER PIPE MATERIALS

A. Ductile Iron Sanitary Sewer

1. Class 56 type, inside nominal diameter of as specified on plans, bell and spigot end.
2. All piping shall be in accordance with the 2014 New York City Building Code.

B. Polyvinyl Chloride (PVC) Sanitary Sewer

1. All PVC Sanitary pipe shall meet the requirements of AWWA C900.
2. Nominal outside diameters and wall thicknesses of PVC pipe shall conform to the requirements of AWWA C900. Integral bell joint pipe shall be furnished in 4", 6", 8", 10", and 12" sizes, in Class 200(DR14). Pipe shall be furnished in lengths of 20 feet.
3. Pipe shall incorporate a formed bell complete with a single rubber gasket conforming to ASTM F477. Joints shall be designed to meet the zero leakage test requirements of ASTM D 3139.
4. Pipe shall be homogenous throughout and free from voids, cracks, inclusions and other defects, and shall be as uniform as commercially practicable in color, density and other physical characteristics.
5. Every pipe shall pass the AWWA C900 hydrostatic proof test requirements of 4 times the pressure class for 5 seconds.

2.2 PIPE ACCESSORIES

A. Fittings: Same material as pipe molded or formed to suit pipe size and end design, in required tee, bends, elbows, cleanouts, reducers, traps and other configurations required.

B. PVC Fittings and couplings shall conform to the requirements of the PVC pipe for classification and size. Rubber gaskets for elastomeric joints shall conform to ANSI/ASTM F477. Lubricant for the joints shall be furnished by the pipe manufacturer. The rubber gaskets shall be factory installed in the bell of the pipe,

fittings, and couplings. The plain end of the pipe shall be marked by the manufacturer to show the depth of penetration into the bell or coupling.

2.3 CLEANOUTS

A. Lid and Frame: Heavy Duty cast iron construction, H20 rated.

B. Shaft Construction: Cast Iron shaft of internal diameter as specified on plans with 4,000 psi concrete collar for cleanouts located in paved areas.

C. Base Pad: Cast in place concrete, 4,000 psi leveled top surface to receive cast iron shaft sections, sleeved to receive sanitary sewer pipe sections.

PART 3 - EXECUTION

3.1 EXECUTION REQUIREMENTS

A. Refer to DDC General Conditions for execution requirements.

3.2 PREPARATION

A. Hand trim excavations to required elevations.

B. Remove large stones or other hard matter, which could damage pipe or impede consistent backfilling or compaction.

3.3 BEDDING

A. Excavate pipe trench in accordance with Section 31 00 00 – Earthwork for work in this Section.

B. Place and compact bedding material at trench bottom. Hand trim bedding for accurate placement of pipe to elevations indicated.

C. Maintain moisture content of bedding material between 1% below and 3% above optimum during compaction.

3.4 INSTALLATION - PIPE

A. Install pipe, fittings, and accessories in accordance with ANSI/ASTM or AWWA requirements or manufacturer's instructions. Seal joints shall be watertight.

B. Lay pipe to slope gradients noted on Construction Drawings.

C. Lay pipe beginning at low point of system, true to grades and alignment indicated with unbroken continuity of invert. Place bell ends of piping facing upstream.

D. Refer to Section 31 00 00 for trenching requirements. Do not displace or damage pipe when compacting.

E. Refer to Section 33 49 00 for manhole requirements.

F. Connect to building sanitary sewer outlet within New York City public sewer systems.

G. Pipe shall be installed in accordance with AWWA C605.

3.5 INSTALLATION - CLEANOUTS

A. Form bottom of excavation clean and smooth to correct elevation.

B. Form and place cast in place concrete base pad, with provision for sanitary sewer pipe end sections.

C. Mount lid and frame level in grout, to finished grade elevation indicated on plan.

3.6 INTERFACE WITH EXISTING FACILITIES

A. Requirements: Make all required connections of the proposed drainage facilities into existing facilities, where and as shown on the Drawings in accordance with the New York City Department of Environmental Protection.

B. Compliance with NYC Requirements: Connections made into existing facilities shall be performed in accordance with the requirements of the New York City Department of Buildings (NYCDOB), New York City Department of Environmental Protection (NYCDEP), and New York City Department of Transportation (NYCDOT). The Contractor will be required to comply with all such requirements, including securing of all required permits, and expenses thereof. The expense of making the connections in accordance with all such requirements shall be included in the Contract Sum.

3.7 CONSTRUCTION WITHIN THE PUBLIC RIGHT-OF-WAY

A. Construction within the public right-of-way shall conform to all requirements of the New York City Department of Environmental Protection (NYCDEP), New York City Department of Transportation (NYCDOT), and New York State Department of Transportation (NYSDOT).

3.8 MODIFICATIONS OF EXISTING STRUCTURES

A. General: Alter, reconstruct, or convert existing structures where and as shown on the Drawings, or as approved by the Commissioner. In general, alterations shall be performed with the same type of material used in the original construction unless otherwise indicated on the Drawings or approved by the Commissioner.

B. Damage to Existing Installations: Exercise extreme care during such alteration, reconstruction or conversions so as not to damage any portions of the structure or pipe shown to remain. Any such damage shall be repaired by the Contractor at his own expense and to the satisfaction of the Commissioner.

3.9 LATERALS

A. General: Make all required lateral connections from the building to the on-site sewer system as shown on the Drawings or approved by the Commissioner. Work shall include making the connections into the on-site system, furnishing and installing all lateral pipe from the on-site sanitary sewer system to points located five (5) feet outside of the proposed building lines and properly sealing the ends with watertight plugs.

B. Coordinate trades and the exact location and elevation of the utility point of entry into the building. For laterals not immediately connected to building utility, stake and mark end of lateral as per Section 31 00 00 - Earthwork.

3.10 FIELD QUALITY CONTROL

A. Backfill placement and quantity control will be performed in accordance with Section 31 00 00 "Earthwork".

B. If tests indicate work does not meet specified requirements, remove work, replace and retest at no additional expense to the City of New York.

C. Inspection and Testing - Cooperate with the Commissioner to facilitate testing and inspection of the work. Clean and "Lamp" the lines in the presence of the Commissioner before final acceptance of the work. Infiltration and Exfiltration Testing shall be determined by the Commissioner and shall meet New York City Department of Building and New York City Department of Environmental Protection standards.

D. The complete sanitary sewer system, including all mains, lateral sewers and manholes shall be tested for both infiltration and exfiltration. Provide all materials equipment and services as necessary to perform the tests as described herein except as noted.

E. Infiltration Testing - The ends of any service sewers shall be securely plugged and the sewer main plugged at the manhole at the low end. The uppermost manhole shall be filled with water to a level of 4 feet above the top of the sewer or 4 feet above the groundwater level. The water shall stand for 2 hours to allow the sewer system to reach its maximum absorption. Subsequently, the uppermost manhole shall be refilled to the original 4 feet height.

1. Rate of infiltration shall be determined by means of V-notch weirs or other approved measuring devices in an approved manner and at such times and locations as may be directed by the Commissioner. The maximum leakage limit shall be 100 gallons per inch of diameter, per day, per mile.

2. For shorter stretches, less than 500 feet in length, rate of 100 percent in total excess of the above figures may be permitted, providing the total infiltration is in excess of the maximum allowable, the leaking joints shall be re-laid if necessary, or other remedial construction shall be performed by and at the expense of the Contractor. The section of sewer shall then be re-tested after restorations are completed to determine compliance with the specifications.

F. Low Pressure Air Exfiltration Testing - The sewer mains or laterals shall be tested for leakage by the use of low-pressure air as specified hereinafter and as approved by the Commissioner. Provide test plugs, air compressor, and installers properly instructed by the manufacturer for conducting the test. The test length shall not exceed one (1) interval of pipe between two (2) manholes. Take all necessary precautions to prevent blowouts.

1. After the pipe has been backfilled and cleaned, pneumatic plugs shall be placed in the line at each manhole and inflated to 25 psi. Low-pressure air shall be introduced into this sealed line until the internal air pressure reaches 4 psi greater than the average back pressure of any groundwater that may be over the pipe. At least two (2) minutes shall be allowed for the air pressure to stabilize.

2. After the stabilization period (3.5 psi minimum pressure in the pipe), the portion of line being tested shall be acceptable if the time required in minutes for the pressure to decrease from 3.5 to 3.0 psi (greater than the average back pressure of any groundwater that may be over the pipe) is not less than the time indicated in the following table:

Pipe Size (in.)	Time (Min.)
4	2.5
6	4
8	5
10	6.5
12	7.5
15	9.5

G. Correction of Defective Work - If leakage exceeds the specified amount, the Contractor shall at their own expense make the necessary restorations or replacements required to permanently reduce the leakage to within the specified limit and the tests shall be repeated until the leakage requirement is met.

1. Any defects found in the system are to be restored at the expense of the Contractor so to conform strictly to the Specifications and to the satisfaction of the Commissioner. All restorations shown necessary by the tests are to be made, broken or cracked pipe replaced, all deposits removed, and sanitary sewer left true to line and grade and entirely clean, free from lumps of cement, protruding gaskets, bulkheads, etc., and ready for use before final acceptance by the Commissioner.

H. Pipe to Manhole Connections - Connections of pipe to manholes shall be water tight. Connections of polyvinyl chloride sewer pipe to the manholes shall be made using a flexible compression gasket that meets or exceeds ASTM C-478, ASTM C 923 and ASTM F 2510.

END OF SECTION 33 31 00

SECTION 33 40 00
Storm Drainage Utilities

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The following documents apply to all required work for the Project: (1) the Contract Drawings, (2) the Specifications, (3) the General Conditions, (4) the Addendum and (5) the Contract (City of New York Standard Construction Contract).

B. LEED / Environmentally Preferable Purchase (EPP) General Requirements:
   1. Refer to DDC General Conditions and the Addendum to the General Conditions
   2. LEED requirements apply to all Phase II work with the exception of the Existing Building scope. EPP requirements apply to the project's Existing Building scope only.

1.2 SUMMARY

A. Work includes:
   1. Site storm sewerage drainage piping, fittings and accessories, and bedding.
   2. Catch basins, area drains, paved area drainage and site surface drainage.
   3. Building storm drainage lateral construction.

B. Related Sections
   1. Section 31 00 00 – Earthwork
   2. Section 33 49 00 – Storm and Sanitary Structures

1.3 SUBMITTAL PROCEDURES

A. Refer to DDC General Conditions Section 01 33 00 "Submittal Procedures".

1.4 QUALITY ASSURANCE

A. Refer to DDC General Conditions Section 01 40 00 "Quality Requirements".

1.5 REFERENCES

A. 2014 New York City Building Code.

B. NYCDEP Bureau of Water and Sewer Rules and Specifications, latest revision.

C. ANSI/ASTM C14 Concrete Sewer, Storm Drain, and Culvert Pipe.

D. ANSI/ASTM C76 Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe.

E. ANSI/ASTM C443 Joints for Circular Concrete Sewer and Culvert Pipe, Using Rubber Gaskets.

F. ASTM C507 Reinforced Concrete Elliptical Culvert, Storm Drain and Sewer Pipe.

G. ASTM D1248 - Polyethylene Plastics Molding and Extrusion Materials

H. ASTM C478 – Precast Reinforced Concrete Manhole Sections

I. ASTM D3350 - Polyethylene Plastics Pipe and Fittings Materials

J. ASTM D3212 – Joints for Drain and Sewer Plastic Pipes Using Flexible Elastomeric Seals

K. ASTM A536 – Ductile Iron Castings

L. ANSI C150 – Ductile Iron Pipe (DIP) Class 56, Ceramic Epoxy lined Tyton Joints

M. ANSI C151 – Ductile Iron Pipe, Centrifugally Cast in Metal Molds or Sand-Lined Molds, for water or other liquids.

N. AASHTO M294 and M252 – Corrugated polyethylene pipe, smooth interior

1.6 DEFINITIONS

A. Bedding: Fill placed under, beside and around pipe, prior to subsequent backfill operations.

1.7 PROJECT RECORD DOCUMENTS

A. Accurately record actual locations of pipe runs, connections, catch basins, and invert elevations.

B. Identify and describe unexpected variations to subsoil conditions and the discovery of uncharted utilities.

1.8 COORDINATION

A. Coordinate the Work with the roof drain connection locations from the buildings.

PART 2 - PRODUCTS

2.1 SEWER PIPE MATERIALS AND ACCESSORIES

A. Ductile Iron Pipe: Comply with requirements of AWWA C104 Cement Mortar Lining, AWWA C110 Ductile Iron Fittings, AWWA C111 Joints and Fittings, AWWA C150 Thickness, AWWA C151 Ductile Iron Pipe. All buried Ductile Iron Pipe (DIP) shall be mechanical joint unless otherwise shown on the drawings, specified herein, or directed by the Commissioner. Mechanical Joint DIP and fittings shall be minimum Class 52, unless otherwise specified.

B. High-Density Polyethylene Pipe: Comply with requirements of ASTM D1248, Type III, Category 4, grade P33, Class C or ASTM D3350 Cell Classification 324420C. All High Density Polyethylene (HDPE) pipe shall be N-12 Sure Lock pipe, watertight, and manufactured by ADS or approved equal and shall have NYCDOB MEA Approval. HDPE pipe is permitted in lieu of RCP for pipes sizes 30 inches and smaller, except for underground detention basins, where 36-inch and 60-inch diameter HDPE shall be used.

C. Reinforced Concrete Pipe: Comply with requirements of ASTM C 76 installed with flexible plastic (Bitumen) gaskets at all joints. Gaskets shall comply with ASTM C443, and shall be installed in strict accordance with pipe manufacturer's recommendations. For all pipe installations with cover less than two (2) feet, Class IV RCP shall be used.

2.2 CATCH BASINS AND AREA DRAINS

A. Precast Catch Basins: 4,000 psi concrete reinforce for H20-16 loading in accordance with ASTM C478 of size, shape and depth as indicated on the Drawings.

B. Base Pad: Cast-in-place or precast reinforced concrete pad.

C. Lid and Frame: Shall be ADA compliant, H-20 rated, and be fitted with vandal resistant bolts.
   1. Basis of Design: Subject to compliance with requirements, provide IronSmith 'ADA' 9031DR-24, 24" Square, 1/4" Slots, Gray Cast Iron, Raw Natural Finish, H20 rated or comparable product by one of the following:
      a. Iron Age: 'Regular Joe', 24" Square, Gray Cast Iron, Raw Natural Finish, H20 rated
      b. Urban Accessories: 'Standard ADA', 24" Square, 1/4" openings, Manufacturer's Frame, Ductile Cast Iron with Baked on Oil Finish, H20 rated
      c. Or approved equal

D. Hood: Standard cast iron hood and hook.
   1. Basis of Design: Subject to compliance with requirements, provide Campbell Foundry Cast Iron Trap or comparable product by one of the following:
      a. General Foundries Inc., USF 5500 Hood
      b. Neenah Foundry, R 3711
      c. Or approved equal.

E. Steps: Per details shown on plans or approved equal.

2.3 TRENCH DRAIN

A. Basis of Design: Subject to compliance with requirements, provide Zurn Drains, Model Z812 or comparable product by one of the following:
   1. Josam
   2. NDS
   3. Or approved equal.

B. Grate: Shall be ADA compliant, H-20 rated, and be fitted with vandal resistant bolts.
   1. Basis of Design: Subject to compliance with requirements, provide IronSmith 'ADA' 9032, 11-1/2" Custom Width, 1/4" Slots, Gray Cast Iron, Raw Natural Finish, H20 rated or comparable product by one of the following:

a. Iron Age 'Regular Joe', 1/4" Slots, Gray Cast Iron, Raw Natural Finish, H20 rated
b. Urban Accessories: 'Jamison', 1/4" Slots, Manufacturer's Frame, Ductile Cast Iron with Baked on Oil Finish, H20 rated
c. Or approved equal

2.4 CLEAN OUTS

A. Lid and Frame: H20 rated, cast iron construction
   1. Basis of Design: Subject to compliance with requirements, provide Neenah Foundry, or comparable product by one of the following:
      a. General Foundries Inc.
      b. Campbell Foundry
      c. Or approved equal.

B. Shaft Construction: HDPE shaft of internal diameter as specified on the plans.

C. Concrete Collar: Cast-in-place concrete, 3,000-psi level top surface.

PART 3 - EXECUTION

3.1 EXECUTION REQUIREMENTS

A. Refer to DDC General Conditions for execution requirements.

3.2 EXAMINATION

A. Verify the trench cut and excavation base to be hard, smooth, and dry.

B. Verify excavation location, dimensions and elevation with contract drawings.

3.3 PREPARATION

A. Set all lines, elevations, and grades for utility work and maintain for the duration of work. Provide careful maintenance of bench marks, property corners, monuments, or other reference points.

B. Protect and maintain in operating condition, existing utilities encountered during utility installation. Restore any damage to surface or subsurface improvements shown on the drawings.

C. Coordinate structure placement with inlet and outlet pipe or duct sleeve locations and inverts required by other sections.

D. Coordinate all building sewer connection locations and elevations with civil and plumbing plans. Comply with 2014 New York City Construction Codes.

E. Hand trim excavations to required elevations and thoroughly compact as per DDC General Conditions.

F. Install dewatering systems that will be required to construct the proposed utilities to the design elevations and using the methods described herein. Water pumped out of excavations shall be disposed of per NYCDEP and

DDC General Conditions, and will not be discharged directly to the City's storm drainage system without prior approval of NYCDEP.

G. Remove large stones or other hard matter which may damage piping or impede consistent backfilling or compaction.

H. Subgrade areas identified by the Commissioner as unsuitable shall be excavated to suitable material or a maximum of two additional feet, backfill with bedding material and compact as specified in Section 31 00 00 "Earthwork".

3.4 BEDDING

A. Excavate pipe trench in accordance with Section 31 00 00 "Earthwork" for work of this section.

B. Place and compact bedding material at trench bottom. Hand trim bedding for accurate placement of pipe to elevations indicated.

C. Maintain moisture content of bedding material between 1% below and 3% above the optimum.

3.5 INSTALLATION – PIPE

A. Place pipe on minimum 6 inch deep bed of compacted bedding aggregate.

B. Install pipe, fittings, and accessories in accordance with ASTM C12, ASTM D2321, manufacturer's instructions and/or state or local requirements. Seal joints to be watertight.

C. Lay pipe to slope gradients noted on civil drawings; with maximum variation from true slope of 1/8 inch in 10 feet.

D. Place and compact bedding aggregate at sides and to the springline of the pipe as per Section 31 00 00.

E. All sewer pipe joints installed within ground water or partially submerged within ground water shall be installed with water tight joints.

F. Pipe joints shall not be installed within the leachate collection stone trench.

G. Refer to Section 31 00 00 "Earthwork" for trenching and backfill requirements. Do not displace or damage pipe when compacting.

H. Refer to Section 33 49 00 "Storm and Sanitary Structures" for manhole requirements.

3.6 INSTALLATION - CATCH BASINS & AREA DRAINS

A. Form bottom of excavation clean and smooth and to correct elevation. Place minimum of 6" compacted bedding aggregate.

B. Form and place cast-in-place concrete base pad, with provision for storm sewer pipe end sections, or place precast reinforced concrete pad at the location and elevation specified on the plans.

C. Level top surface of base pad to receive concrete shaft sections, sleeved to receive storm sewer pipe sections.

D. Establish elevations and pipe inverts for inlets and outlets as indicated.

E. Mount lid and frame level in grout, secured to top cone section to elevation indicated.

F. Outlet structures shall be constructed in accordance with the section and elevations shown on the Contract Drawings.

3.7 INSTALLATION – CLEANOUTS

A. Form bottom of excavation clean and smooth to correct elevation.

B. Form and place cast-in-place concrete collar, with provision for storm pipe end sections.

C. Mount lid and frame level in grout to elevation indicated on plans.

3.8 FIELD QUALITY CONTROL

A. Clean the entire drainage system of all debris and obstructions. This shall include, but not be limited to, removal of all formwork from structures, concrete and mortar droppings, construction debris and dirt. Thoroughly flush the system clean and furnish all necessary hose, pumps, pipe and other equipment that may be required for this purpose. Do not flush debris into existing storm drains or streams; remove all debris from the system. Perform all removals and disposal in accordance with the DDC General Conditions.

B. After the system has been cleaned, thoroughly inspect the system. Promptly make restorations as necessary.

C. Perform all work of cleaning and restore as specified herein at own expense and to the complete satisfaction of the Commissioner.

D. It shall be the Contractor's responsibility to comply with all regulations of the New York City Department of Environmental Protection (NYCDEP), New York City Department of Buildings (NYCDOB), and New York City Department of Transportation (NYCDOT).

E. The inline check valve shall be tested for verification of the manufacturer's hydraulic testing, backpressure, and cracking pressure limits.

3.9 FINAL INSPECTION

A. Upon completion of the Work and before backfill is placed and final acceptance by the Commissioner, the drainage system shall be subject to a final inspection in the presence of the Commissioner. The Work shall not be considered as complete until all requirements for line, grade, cleanliness, and workmanship have been completed to the satisfaction of the Commissioner.

END OF SECTION 33 40 00

SECTION 33 49 00
Storm and Sanitary Structures

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The following documents apply to all required work for the Project: (1) the Contract Drawings, (2) the Specifications, (3) the General Conditions, (4) the Addendum and (5) the Contract (City of New York Standard Construction Contract).

B. LEED / Environmentally Preferable Purchase (EPP) General Requirements:
   1. Refer to DDC General Conditions and the Addendum to the General Conditions
   2. LEED requirements apply to all Phase II work with the exception of the Existing Building scope. EPP requirements apply to the project's Existing Building scope only.

C. New York City Department of Environmental Protection (NYCDEP) Specifications.

D. Geotechnical Report prepared by Langan Engineering, Environmental, Surveying and Landscape Architecture, D.P.C., dated October 22, 2018.

1.2 SUMMARY

A. Work includes:
   1. Monolithic concrete manholes with masonry transition to lid frame, covers, anchorage and accessories.
   2. Modular precast concrete manhole sections with tongue and groove joints with masonry transition to lid frame, covers, anchorage and accessories.

B. Related Sections
   1. Section 33 31 00 – Sanitary Sewer System
   2. Section 33 40 00 – Storm Drainage Utilities

1.3 SUBMITTAL PROCEDURES

A. Refer to DDC General Conditions Section 01 33 00 "Submittal Procedures".

B. The Contractor must provide the following submittals to the Commissioner for approval prior to the purchase of materials:
   1. Shop Drawings: Indicate manholes locations, elevations, invert elevations, piping, sizes and elevations of penetrations.
   2. Product Data: Provide manhole covers, component construction, features, configuration, and dimensions.

1.4 QUALITY ASSURANCE

A. Refer to DDC General Conditions Section 01 40 00 "Quality Requirements".

1.5 REFERENCES

A. ANSI/ASTM C55 Concrete Building Brick.

B. ASTM A48 Gray Iron Castings.

C. ASTM C478 Standard Specification for Precast Reinforced Concrete Manhole Sections.

D. ASTM C857 – Standard Practice for Minimum Structural Design Loading for Underground Precast Concrete Utility Structures

E. ASTM C858 – Standard Specification for Underground Precast Concrete Utility Structures

F. ASTM C891 – Standard Specification for Installation of Underground Precast Concrete Utility Structures

G. ASTM C923 Resilient Connectors Between Reinforced Concrete Manhole Structures and Pipes.

H. ASTM C990 – Standard Specification for Joints for Concrete Pipe, Manholes, and Precast Box Sections Using Preformed Flexible Joint Sealants

I. ASTM D4101 - Standard Specification for Copolymer steps construction

J. ASTM D4097 - Standard Specification for Contact- Molded Glass - Fiber- Reinforced Thermoset Resin Corrosion - Resistant

K. International Masonry Industry All Weather Council (IMIAC): Recommended Practices and Guide Specification for Cold Weather Masonry Construction.

L. New York City Department of Environmental Protection (NYCDEP) Specifications and applicable 2014 New York City Building Code Requirements.

PART 2 - PRODUCTS

2.1 MANHOLE

A. Manhole Sections: Reinforced precast concrete.

1. 4,000 psi concrete reinforced for H20-16 loading or greater in accordance with ASTM C478 with self-sealing butyl gaskets in accordance with ASTM C923.

2. Construct manholes of precast concrete sections as required by Drawings to size, shape, and depth indicated.

B. Manhole Sections: Reinforced cast-in-place concrete.

1. Cast-in-place Manholes shall be constructed of 4,000 psi concrete reinforced for H20-16 loading or greater.
2. Forms shall be accurately made of steel sheets and shapes of sufficient strength to form dense watertight walls to true dimensions.
3. Concrete shall be deposited in evenly distributed layers of about 18 inches, with each layer vibrated to bond it to the preceding layer.

C. Mortar and Grout

1. Masonry cement used for laying up dimension masonry shall conform to the requirements of ASTM C91.
2. Grouting material for use in grouting anchor bolts, flanges, dowels and other miscellaneous items in concrete shall be a non-metallic, non-shrink grout which when mixed with water, will harden rapidly to produce a permanent anchoring bond. It shall be free of any corrosion promoting agents.

D. Reinforcement: Grade 60 deformed steel rebars with galvanized finish. Reinforcing shall conform to the latest revised edition of the AISC code.

E. Bitumastic Coating: The entire exterior surface of all manholes shall be coated with two (2) coats of an approved bitumastic material to produce a dry film thickness of 0.07 inches (7 mils) per coat.

F. Clear Inside Dimensions: 48 inch diameter or as indicated on plans.

G. Design Depth: As indicated on plans.

H. Clear Lid Opening: 24 inches diameter minimum.

I. Pipe Entry: Provide openings as indicated

J. Main and Lateral Pipes: Neatly cut off main and lateral pipes flush with inside of manhole or inlet where they enter structure walls, and point up irregularities and rough edges with non-shrink grout.

K. Inverts: Shape inverts for smooth flow across structure floor as shown on Drawings. Use concrete and mortar to obtain proper grade and contour and finish surface with fine textured wood float. Provide benches in all sanitary sewer manholes.

2.2 MANHOLE CASTINGS

A. Lid and Frame: Per details shown on plans or as approved by the Commissioner.

B. Manhole Steps: Cast iron or as approved by the Commissioner.

C. Base Pad: Precast reinforced concrete or cast-in-place concrete with leveled top surface.

PART 3 - EXECUTION

3.1 EXECUTION REQUIREMENTS

A. Refer to DDC General Conditions for execution requirements.

3.2 EXAMINATION

A. Verify items provided by other sections of work are properly sized and located.

B. Verify that built in items are in proper location, and ready for roughing into Work.

C. Verify excavation for manholes is to the correct depth and that the bottom is hard and smooth.

3.3 PREPARATION

A. Set all lines, elevations, and grades for utility and drainage system work and maintain for the duration of work. Provide careful maintenance of bench marks, property corners, monuments, or other reference points.

B. Protect and maintain in operating condition, existing utilities encountered during utility installation. Restore any damage to surface or subsurface improvements shown on the drawings.

C. Verify location, size, elevation, and other pertinent data required to make connections with existing sewer systems indicated on the Contract Drawings.

D. Coordinate structure placement with inlet and outlet pipe or duct sleeve locations and inverts required on the Contract Documents.

E. Coordinate all building utility connection locations and elevations with architectural, structural, and plumbing drawings.

F. Install dewatering systems that will be required to construct the proposed utilities to the design elevations and using the methods described herein. Water pumped out of excavations shall be disposed of on-site for sedimentation removal, and will not be discharged directly to the City's storm drainage system.

G. Subgrade areas identified by the Commissioner as not being capable of supporting the proposed structure shall be excavated to suitable material or a maximum of two additional feet, backfill with bedding material and compact as specified.

3.4 INSTALLATION OF PRE-CAST MANHOLE SECTIONS

A. Place granular base pad, trowel top surface level for placement of manhole barrel base section. Place manhole base plumb and level to correct elevation.

1. Cast in place bases: After completion of excavation, setting of reinforcing steel and placing inlet and outlet pipes, but prior to placing concrete for invert slab, set concrete blocks on granular base pad to support first manhole barrel section which shall be lowered into excavation, grooved end first. Align and adjust to proper grade prior to placing invert slab, which shall be poured immediately after setting of first manhole barrel section.

B. Prior to setting subsequent manhole barrel sections, apply primer to tongue and groove ends and allow to set in accordance with manufacturer recommendations. Place gasket on tongue end. Lower next section into position, and remove excess material form interior of structure. Add additional primer on exterior of joint, if necessary, for completely watertight joint.

C. Castings belonging to reset/converted structures shall be salvaged and reused, if possible.

D. Set cover frames and covers securely to correct line and grade elevations.

E. Grout base of shaft sections to achieve slope to exit piping. Trowel smooth. Contour as required.

F. Coordinate with other sections of work to provide correct size, shape, and location.

3.5 MASONRY CONSTRUCTION

A. Maintain masonry courses to a uniform dimension. Form vertical and horizontal joints of uniform thickness.

B. Lay masonry units in running bond.

C. Form flush mortar joints.

D. Lay masonry units in full bed of mortar, with full head joints, uniformly jointed with other work.

E. Install joint reinforcement 16 inches on center.

F. Place joint reinforcement in first and second horizontal joints above base pad and below lid frame opening.

G. Set cover frames and covers securely to correct line and grade elevations.

H. Grout base of shaft sections to achieve slope to exit piping. Trowel smooth. Contour as required.

I. Coordinate with other sections of work to provide correct size, shape, and location.

END OF SECTION 33 49 00

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SECTION 33 49 10
Other Utilities

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The following documents apply to all required work for the Project: (1) the Contract Drawings, (2) the Specifications, (3) the General Conditions, (4) the Addendum and (5) the Contract (City of New York Standard Construction Contract).

B. LEED / Environmentally Preferable Purchase (EPP) General Requirements:
   1. Refer to DDC General Conditions and the Addendum to the General Conditions
   2. LEED requirements apply to all Phase II work with the exception of the Existing Building scope. EPP requirements apply to the project's Existing Building scope only.

C. National Grid Specifications, Blue Book, 2015 Edition

D. The National Electric Code, Latest Edition

E. New York City Fire Department Standard Details and Specifications, Latest Edition

1.2 SUMMARY

A. Work includes:
   1. Furnish labor, materials, services, equipment, and other necessary items required to excavate, install and backfill the piping, conduit, duct banks and manhole/pull box structures related to the on-site primary and secondary electrical service, site lighting, and telephone/data in accordance with the Contract Documents.

B. Related Sections
   1. Section 33 02 00 - Protection of Existing Utilities
   2. Section 31 00 00 – Earthwork

1.3 SUBMITTAL PROCEDURES

A. Refer to DDC General Conditions Section 01 33 00 "Submittal Procedures".

1.4 COORDINATION

A. All work in this Section shall be coordinated with the Commissioner and electric and telephone/data utility companies and shall comply with all requirements, details, regulations, etc. of said companies. The Contractor shall coordinate with each utility to define where his limit of work exists.

1.5 QUALITY ASSURANCE

A. Refer to DDC General Conditions Section 01 40 00 "Quality Requirements".

PART 2 - PRODUCTS

2.1 CONDUIT, FITTINGS AND CABLE

A. Electric and Telephone/Data: Refer to Division 26 and 27 of the Technical Specifications and the Contract Drawings.

2.2 STRUCTURES

A. Manholes, pull boxes and junction boxes shall comply with all requirements, specifications, details, and recommendations of the governing utility company and as indicated on the Contract Drawings.

2.3 BEDDING AND BACKFILL

A. Refer to Section 31 00 00 – "Earthwork"

2.4 CONCRETE ENCASEMENT

A. Concrete for encasement of electric duct banks shall be 3,500 psi concrete.

PART 3 - EXECUTION

3.1 EXECUTION REQUIREMENTS

A. Refer to DDC General Conditions for execution requirements.

3.2 EXAMINATION

A. Verify existing conditions.

B. Verify building service connection points with architectural plans.

3.3 BEDDING

A. Excavate all utility trenches and place bedding in accordance with Specification Section 31 00 00 "Earthwork".

3.4 PREPARATION

A. Conduit:

1. Remove scale and dirt, on inside and outside of conduit, prior to assembly.
2. Prepare conduit in accordance with manufacturer's recommendations.

3.5 INSTALLATION

A. Conduit:
1. Maintain minimum conduit separation in accordance with state and/or local code.
2. Establish elevations of conduit in accordance with Section 31 00 00 – "Earthwork" and the Contract Drawings.
3. Place forms for concrete encased duct banks. Install conduit to conserve space and to allow for expansion and contraction without stressing conduit or joints. Pour concrete and vibrate to ensure there are no voids.
4. Backfill trench in accordance with Section 31 00 00 – "Earthwork".

B. Structures:
1. Install manholes, handholes, junction boxes and/or pullboxes in accordance with Construction Drawings.

C. Service Connections:
1. Construct service lines to within 5 feet of the exterior building wall at the building entry point unless otherwise indicated on the Contract Drawings. Cap and stake ends of conduits.
2. Connections with existing facilities shall be performed in accordance with the requirements of the specific utility company. The Contractor shall be required to comply with all such requirements, including securing all permits, and payment of all permit and/or connection fees related to this section.
3. Any product, which is damaged or disturbed through any cause prior to acceptance of the Work, shall be restored, realigned, or replaced as directed by the Commissioner, at no expense to the City of New York.

END OF SECTION 33 49 10

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SECTION 335213.13

Fiberglass Double Containment Piping

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The following documents apply to all required work for the Project: (1) the Contract Drawings, (2) the Specifications, (3) the General Conditions, (4) the Addendum and (5) the Contract (City of New York Standard Construction Contract).

B. Related Sections:

1. Section 22 15 13.10 "Motor Fuel Dispensing System."
2. Section 22 15 13.20 "Fluid Dispensing System."
3. Section 33 56 14 "Underground Storage Tanks."
4. Section 26 32 13 "Engine Generators."

C. Governing Standards:

1. ASTM D-2992 - Standard Practice for Obtaining Hydrostatic or Pressure Design Basis for "Fiberglass" (Glass-Fiber-Reinforced Thermosetting-Resin) Pipe and Fittings.
2. ASTM D-2996 - Standard specification to Filament-Wound "Fiberglass" (Glass-Fiber-Reinforced Thermosetting-Resin) Pipe.
3. ASTM D-2310 - Standard Classification for Machine-Made "Fiberglass" (Glass-Fiber-Reinforced Thermosetting-Resin) Pipe.
4. NFPA 30 - Flammable and Combustible Liquids Code.
5. NFPA 30A - Code for Motor Fuel Dispensing Facilities and Repair Garages.
6. NFPA 31 - Installation of Oil-Burning Equipment.
7. UL 971 - Underwriters Laboratories (UL) Nonmetallic Underground Piping for Flammable Liquids.

1.2 SUBMITTALS

A. Refer to DDC General Conditions Section 01 33 00 "Submittal Procedures."

B. Submit the following Shop Drawings and other data for approval:

1. Catalog data consisting of specifications, illustrations and a parts schedule that identifies the materials to be used for various piping components and accessories. The illustrations shall be in sufficient detail to serve as a guide for assembly and disassembly.
2. Fully dimensioned layout of pipe, fittings, couplings, sleeves, expansion provisions, anchors, harnessing, valves, and equipment. Label pipe size, type and materials on drawing and include schedule. Piping layout drawings shall indicate information on pipe supports, location, support type, hanger rod size, insert type and the load in pounds.

3. Cross sections showing elevations of pipe, fittings, sleeves, couplings, supports, anchors, harnessing, valves, and equipment.
4. Locations where pipe and valve identification signs will be placed.
5. Other piping appurtenances.
6. Certificates: Submit certificate of compliance with referenced standards.

C. When special designs or fittings are required, show the work in large detail and completely describe and dimension the special or fitting.

D. Submit expansion/contraction analysis.

E. Provide field assembly instructions.

F. Submit copies of the system installation, operation and maintenance manual prior to delivery.

G. Submit copies of all quality control testing documentation, and written warranty to the commissioner at time of documentation completion.

1.3 QUALITY ASSURANCE

A. Refer to DDC General Conditions Section 01 40 00 "Quality Requirements."

B. Manufacturer shall have a minimum of 3 years experience in producing similar equipment.

C. Installer shall be a licensed NYC installer having a minimum of 3 years experience in installing similar equipment.

D. Installer must have completed, if applicable, manufacturer's instruction courses on installation of piping.

E. The pipe and fittings shall be free from defects including delimitations, indentations, pinholes, foreign inclusions, bubbles, resin-starved areas which, due to their nature degree or extent, detrimentally affect the strength and serviceability of pipe or fittings. The pipe and fittings shall be as uniform as commercially practicable in color, opacity, density, and other physical proper- ties.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Use every precaution to prevent damage to the equipment during transportation and delivery to the site.

1. Do not allow equipment to be dropped, bumped, dragged, pushed, rolled or moved in any way which will cause damage.
2. If, in the process of transportation or handling, any equipment is damaged, replace or repair such equipment or accessories. Make all required repairs.

B. Provide temporary storage on site prior to installation in a dry, enclosed area, off the ground and away from all possible contact with water, ice or snow. Materials shall be protected from extreme heat and direct sunlight.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Ameron International.
2. National Oilwell Varco
3. Conley Composites
4. Or approved equal

2.2 GENERAL REQUIREMENTS

A. Both the pipe and fittings shall be from the same manufacturer, to ensure both material and dimensions compatibility.

B. Double containment piping shall be manufactured as an integral unit. The primary pipe shall be chemically inert, non-permeable, fiberglass reinforced epoxy resin which is inherently resistant to deterioration due to water and microbial attack. The primary pipe shall be covered with a porous layer to provide a small interstitial space to facilitate rapid leak detection. A secondary containment layer, comprised of the same material as the primary, shall be wound over the primary and porous layers.

C. All double containment pipe components shall be listed with Underwriters Laboratories (UL) for use as nonmetallic underground piping for petroleum products, alcohols, and alcohol- gasoline mixtures. All pipe, fittings, and adhesives must demonstrate performance which meets or surpasses testing specified in UL subject 971 for all fluids.

2.3 PERFORMANCE REQUIREMENTS

A. Pipe, fittings and adhesives shall be suitable for continuous operations at the pressures listed below at a sustained temperature of 150°F:

1. 2-inch nominal pipe size:

   a. Primary piping: 250 psi.
   b. Secondary piping: 40 psi.

2. 4-inch nominal pipe size:

   a. Primary piping: 125 psi.
   b. Secondary piping: 40 psi.

2.4 PHYSICAL AND MECHANICAL PROPERTY REQUIREMENTS

A. Primary pipe shall conform to ASTM D2310 standard classification RTRP-11CX and ASTM D2996 specification RTRP 11CF1-5430. Secondary piping shall be classified as RTRP-11AX.

B. Double containment pipe shall have the following characteristics:

1. Longitudinal Tensile Strength: 32,500 psi.
2. Circumferential Tensile Strength: 65,000 psi.
3. Longitudinal Tensile Modulus: 2,800,000 psi.
4. Circumferential Tensile Modulus: 4,000,000 psi.
5. Longitudinal Compressive Strength: 2,800 psi.
6. Longitudinal Compressive Modulus: 2,800,000 psi.
7. Long-Term Hydrostatic Design Basis (Static): 21,000 psi.
8. Maximum Linear Thermal Expansion: 9,000,000 in/in/°F.
9. Stiffness factor at 5 percent deflection:

   a. 2 inch nominal pipe size: 45 lb-in^3/in^2. b.
   b. 4 inch nominal pipe size: 55 lb-in^3/in^2.

2.5 MATERIALS

A. Primary Carrier Pipe:

1. All primary filament-wound pipe shall contain a resin-rich inner liner with a minimum thickness of 0.015 inches. The liner resin system shall be a chemically resistant epoxy resin that has been demonstrated to be satisfactory for use with diesel fuel including biodiesel blends up to 20 percent (B20) and unleaded gasoline including ethanol blends up to 85 percent (E85).
2. The resins, reinforcements, colorants, and other materials when combined as a composite laminate structure shall meet the performance requirements of this specification. Glass fiber reinforcement shall be Type E glass with an epoxy-compatible finish. Glass fiber content shall not be less than 60 percent by weight of the reinforced structural wall.

B. Interstitial Layer: The interstitial layer between the primary and secondary containment layers shall be of uniform thickness with the ability to allow fluid flow throughout, meeting UL criteria. This layer shall also prevent relative movement of the primary and secondary pipe walls.

C. Secondary Containment Pipe: Construction of the secondary containment pipe and materials used shall be identical to the reinforced portion of the primary pipe, exhibiting similar physical properties.

2.6 DIMENSIONS AND TOLERANCES

A. Primary pipe shall be manufactured to steel pipe outside diameters. Pipe outside diameter tolerances shall not exceed ±1 percent. Secondary piping shall fit into fittings supplied by manufacturer.

B. The total wall thickness of pipe shall not at any point be greater than 120 percent or less than 87 ½ percent of the nominal thickness.

C. All fittings shall have face-to-face dimensions and laying lengths as specified in the manufacturer's literature.

2.7 SYSTEM JOINING AND ASSEMBLY

A. Primary pipe and fittings shall be joined by means of a matching taper adhesive joint.

Adhesives used for joining components shall be compatible with all intended fluids. The adhesive system shall be used in accordance with the manufacturer's recommendations.

B. Secondary containment pipe joints shall be made with bolted clamshell halves bonded together with adhesive. Clamshell halves shall be fabricated from the identical material to primary fittings and shall be listed by Underwriter's Laboratories (UL).

C. The following adapters and crossovers shall be provided as required:

1. Bell x NPT threaded female.
2. Bell x NPT threaded male.
3. Spigot x NPT threaded female.
4. Spigot x NPT threaded male.

D. Flanges shall be two-piece (van Stone) type with raised grooves on the sealing face. Fiberglass-reinforced stub ends shall be adhesive bonded to the pipe or fitting.

2.8 MARKING

A. Each component shall be marked to show the following:

1. Underwriter's Laboratories listing mark.
2. Manufacturer's name.
3. Maximum pressure rating.

B. Identify all piping in accordance with Section 23 05 53 "Identification for HVAC Piping and Equipment".

2.9 FACTORY TESTING

A. Fittings shall be hydrostatically tested according to UL specification by the manufacturer to rated pressure prior to shipment for signs of leakage or porosity.

B. All primary and secondary piping shall be proof tested at or above field test conditions.

PART 3 – EXECUTION

3.1 EXECUTION REQUIREMENTS

A. Refer to DDC General Conditions for execution requirements.

3.2 INSTALLATION

A. All equipment shall be installed in strict accordance with the most recent manufacturer's guide- lines and NFPA code

B. Field cutting and tapering primary pipe: Pipes shall be held securely during all cutting and tapering. When using a pipe vise, wrap pipe with a protective material approved by the pipe manufacturer and take care not to damage or over-deflect pipe when tightening the vise. A fine- blade hacksaw, radial cut-

off saw or circular saw with abrasive wheel shall be used to cut pipe in the field. Ends shall be cut square to within 3/16 inch. Contractor shall use a taper maker approved by the piping manufacturer to taper primary pipe.

C. Joint Preparation: All pipe tapers must be clean, dry and warm for proper bond. Avoid contamination from fingerprints, petroleum fumes, mist, and condensation. Clean contaminated joints by sanding with emery cloth. Dry wet or moist tapers with a blow dryer or heat gun taking special care not to overheat or burn the pipe. During cold weather tapers, fittings, and adhesives shall be heated to between 50 and 100 degrees Fahrenheit. Only adhesives approved by the piping manufacturer shall be used.

D. Double containment piping shall be supported from hangers and supports as needed.

E. Piping shall be installed in accordance with the manufacturer's instructions especially regarding linear expansion due to temperature differentials. Contractor shall consider the linear expansion of the pipelines when installing them and provisions shall be made to compensate for such changes in length.

F. Piping runs shown on contract drawings depict essentially straight runs of piping. Offsets, bends, expansion loops shall be provided to accommodate the necessary expansion/contraction needed in accordance with manufacturer's instructions. The contractor shall prepare expansion/contraction analysis which identifies differential expansion, pipe stresses and thrust loads on fixed supports. Expansion/contraction analysis shall include sketches demonstrating that pipe deflection will not cause interference between pipe and any other object.

G. Piping shall slope back toward tanks. Annular space shall be allowed to drain into tank containment collar for leak detection.

H. Fittings and piping shall be joined together per manufacturer's recommendations and as specified herein

I. Buried pipe: For all buried fiberglass double containment piping provide a trench width equal to the pipe diameter plus six inches on each side and allowing for at least four inches between multiple lines. Trench bottom shall slope evenly towards sumps or tanks with a minimum pitch of 1/8 inch per foot. Trench bottom shall be free of hard or sharp objects. Pipes shall be protected from impact during backfilling and abrasion during operation by surrounding with a minimum of four inches of pea gravel. For piping buried underneath four inches or more of reinforced concrete, a minimum of four inches of pea gravel shall be provided between the top of the pipe and reinforced concrete. For piping buried underneath two inches or more of asphalt pavement, a minimum of eight inches of pea gravel shall be provided between the top of the pipe and asphalt pavement. For piping buried beneath unpaved ground surfaces, a minimum of eighteen inches of pea gravel shall be provided between the top of the pipe and the unpaved surface.

3.3 FIELD TESTING

A. Field testing shall be done by pneumatic means and shall be done where complete adherence to the manufacturer's installation instructions and use of manufacturer's testing equipment are observed.

B. Plan field tests carefully and carry them out with all due precautions. Pressurizing equipment should be suited to the size of the system and the pressure required and shall be operated by qualified and experienced personnel only. Pressure sources shall be capable of approaching test pressure gradually. Use gauges with a full-scale reading of no more than twice the test pressure. Use reliable gauges calibrated against a dead weight tester zeroed for atmospheric pressure. Should gauge reading fail to remain stable, a soap solution shall be used to locate leakage.

C. Manufacturer's Services: The Contractor shall retain the services of the supplier to supervise and/or perform testing and start-up of all system components. As part of these services, the supplier shall

include for those equipment items not manufactured by him, the services of an authorized manufacturer's representative to check the equipment installation and place the equipment in operation. The manufacturer's representative shall be thoroughly knowledgeable about the installation, operation and maintenance of the equipment.

END OF SECTION 335213.13

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SECTION 335213.16

Stainless Steel Double Containment Piping

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The following documents apply to all required work for the Project: (1) the Contract Drawings, (2) the Specifications, (3) the General Conditions, (4) the Addendum and (5) the Contract (City of New York Standard Construction Contract).

B. Related Sections:

1. Section 22 15 13.10 "Motor Fuel Dispensing System."
2. Section 22 15 13.20 "Fluid Dispensing System."
3. Section 33 56 14 "Underground Storage Tanks."
4. Section 26 32 13 "Hangers and Supports."

C. Governing Standards:

1. ASME B31.3 – Standards for Pressure Piping.
2. FDNY Rules.
3. NFPA 30 – Flammable and Combustible Liquids Code.
4. NFPA 30A – Code for Motor Fuel Dispensing Facilities and Repair Garages.
5. NFPA 31 – Installation of Oil-Burning Equipment.
6. NYC Fire Code.
7. NYC Mechanical Code.
8. UFC – Uniform Fire Code.

1.2 SUBMITTALS

A. Refer to DDC General Conditions Section 01 33 00 "Submittal Procedures."

B. Submit the following Shop Drawings and other data for approval.

1. Catalog data consisting of specifications, illustrations and a parts schedule that identifies the materials to be used for various piping components and accessories. The illustrations shall be in sufficient detail to serve as a guide for assembly and disassembly.
2. Fully dimensioned layout of pipe, fittings, couplings, sleeves, expansion provisions, anchors, harnessing, valves, and equipment. Label pipe size, type and materials on drawing and include schedule. Piping layout drawings shall indicate information on pipe supports, location, support type, hanger rod size, insert type and the load in pounds.
3. Cross sections showing elevations of pipe, fittings, sleeves, couplings, supports, anchors, harnessing, valves, and equipment.
4. Locations where pipe and valve identification signs will be placed.
5. Other piping appurtenances.

6. Certificates: Submit certificate of compliance with referenced standards.

C. When special designs or fittings are required, show the work in large detail and completely describe and dimension the special or fitting.

D. Submit expansion/contraction analysis.

E. Provide field assembly instructions.

F. Submit copies of the system installation, operation and maintenance manual prior to delivery.

G. Submit copies of all quality control testing documentation, and written warranty to the commissioner at time of documentation completion.

1.3 QUALITY ASSURANCE

A. Refer to DDC General Conditions Section 01 33 00 "Submittal Procedures."

B. Manufacturer shall have a minimum of 3 years experience in producing similar equipment.

C. Installer shall be a licensed NYC installer having a minimum of 3 years experience in installing similar equipment.

D. Installer must have completed, if applicable, manufacturer's instruction courses on installation of piping.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Use every precaution to prevent damage to the equipment during transportation and delivery to the site.

1. Do not allow equipment to be dropped, bumped, dragged, pushed, rolled or moved in any way which will cause damage.
2. If, in the process of transportation or handling, any equipment is damaged, replace or repair such equipment or accessories. Make all required repairs.

B. Provide temporary storage on site prior to installation in a dry, enclosed area, off the ground and away from all possible contact with water, ice or snow. Materials shall be protected from extreme heat and direct sunlight.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Ipex.
2. Uponor

3. Zurn Industries
4. Or approved equal

2.2 GENERAL REQUIREMENTS

A. Both the pipe and fittings shall be from the same manufacturer, to ensure both material and dimensions compatibility.

B. All double containment pipe components shall be listed with Underwriters Laboratories (UL) for use with petroleum products, alcohols, and alcohol-gasoline mixtures.

C. Each contained pipe system shall consist of Schedule 40 T304L Stainless Steel primary piping system supported within a Schedule 10 T304L Stainless Steel secondary containment housing. Each system shall be provided with suitable drains and vents and be designed to provide complete drainage of both the primary and secondary containment piping. Interstitial supporting devices shall be made from Polypropylene clips and shall be provided within the secondary containment pipe, and shall be designed to allow continuous drainage in the annular space to the drain point. Drain fittings shall be designed to allow a valve attachment to be made so that the secondary containment compartment may be readily drained and manually checked for leaks.

2.3 MATERIALS

A. Piping:
1. The primary pipe and fittings shall be manufactured from Schedule 40 Type 304L stainless steel materials as listed by ASTM and ANSI.
2. The secondary containment pipe and fittings shall be Schedule 10 Type 304L stainless steel.
3. All listed primary pipe and containments shall be Schedule 40 materials. Pipe shall have Schedule 40 steel pipe thickness according to ANSI. All listed pressure fittings shall be Schedule 40 according to ANSI. All other unlisted components that are intended for use as pressure retaining components shall have sufficient thickness and reinforcement so as to be able to maintain the same pressure ratings as the equivalent Schedule 40 steel pipe.
4. Interstitial supporting devices used to center and support the primary piping within the secondary containment piping shall be manufactured from Polypropylene clips, according to ASTM and ANSI.
5. All listed secondary containment pipe and fittings shall be Schedule 10 thickness. Containment fittings shall have carrier components pre-assembled, supported and tested. Carrier fittings shall be pre-beveled ready for field welding. Containment fittings shall have spigot ends to allow for a closure coupling to be installed after primary system is pressure tested. All other unlisted components that are intended for use as pressure retaining components shall have sufficient thickness and reinforcement so as to be able to maintain the same pressure ratings as the equivalent Schedule 10 Type 304L stainless steel pipe and fittings.

2.4 FACTORY TESTING

A. All fittings shall be pre-assembled and pre-tested by the manufacturer.

B. All primary and secondary piping shall be proof tested at or above field test conditions.

PART 3 – EXECUTION

3.1 EXECUTION REQUIREMENTS

A. Refer to DDC General Conditions for execution requirements.

3.2 INSTALLATION

A. All equipment shall be installed in strict accordance with the most recent manufacturer's guide- lines and NFPA code.

B. Double containment piping shall be supported as described in Section "Hangers and Supports."

C. Double containment piping shall be installed in accordance with the manufacturer's instructions especially regarding linear expansion due to temperature differentials. Contractor shall consider the linear expansion of the pipelines when installing them and provisions shall be made to com- pensate for such changes in length.

D. Piping runs shown on contract drawings depict essentially straight runs of piping. Offsets, bends, expansion loops shall be provided to accommodate the necessary expansion/contraction needed in accordance with manufacturer's instructions. The contractor shall prepare expansion/contraction analysis which identifies differential expansion, pipe stresses and thrust loads on fixed supports. Expansion/contraction analysis shall include sketches demonstrating that pipe deflection will not cause interference between pipe and any other object.

E. Piping shall slope back toward tanks or sumps. Annular space shall be allowed to drain into tank containment collar or sumps for leak detection.

F. Fittings and piping shall be joined together per manufacturer's recommendations and as specified herein.

G. All primary piping welds shall be made using gas arc welding (GAW, TIG or MIG) techniques according to ASME B31.3. All welding shall be performed by a certified pipe welder and shall be subject to 100% visual inspection prior to testing.

H. Secondary containment joints shall be slip style closure couplings using (GAW) techniques according to ASME B31.3. The splitting and re-welding of fittings shall not be permitted. Flanges, unions, couplings or other methods of disassembly shall be provided at connections to equipment, dissimilar piping and at other locations suitable for inspection or dismantling of a system.

I. All contractor personnel that will prepare gas welded stainless steel field welds shall be qualified to do so according to the requirements of the ASME Boiler and Pressure Vessel Code, by sufficient experience, or by some other agreed to method.

J. All contractor personnel that will prepare stainless steel joints shall be qualified for such welding practices according to the welding qualification procedures described in ASME B31.3, Chapter VII for welding of metal piping.

3.3 FIELD TESTING

A. Field testing shall be done by pneumatic means and shall be done where complete adherence to the manufacturer's installation instructions and use of manufacturer's testing equipment are observed.

B. Upon completion of installation, the primary piping system shall be pressure tested at 150% of the system design pressure for a period of one hour. Additionally, the system may be tested during the installation at intervals to be determined by the manufacturer. Both the preliminary and final tests shall be done in strict accordance with recommendations of the manufacturer including the sequence of duration of such tests.

C. Upon completion of the installation, the secondary containment piping system shall be pneumatically tested at a minimum duration of 2½ hours. The external joints should be soaped and visually inspected for leaks. Both the preliminary and final tests shall be done in strict accordance with the recommendations of the manufacturer, including the sequence and duration of such test.

D. Following installation of the system, the primary piping system shall be flushed clean. The contractor shall check the operation of all valves, leak detection devices and appurtenances.

E. The annular space shall be purged of moisture containing air by replacing the volume of air with clean, dry nitrogen.

F. Plan field tests carefully and carry them out with all due precautions. Pressurizing equipment should be suited to the size of the system and the pressure required and shall be operated by qualified and experienced personnel only. Pressure sources shall be capable of approaching test pressure gradually. Use gauges with a full-scale reading of no more than twice the test pressure. Use reliable gauges calibrated against a dead weight tester zeroed for atmospheric pressure. Should gauge reading fail to remain stable, a soap solution shall be used to locate leakage.

G. Manufacturer's Services: The Contractor shall retain the services of the supplier to supervise and/or perform testing and start-up of all system components. As part of these services, the supplier shall include for those equipment items not manufactured by him, the services of an authorized manufacturer's representative to check the equipment installation and place the equipment in operation. The manufacturer's representative shall be thoroughly knowledgeable about the installation, operation and maintenance of the equipment.

END OF SECTION 335213.16

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SECTION 335614
Underground Storage Tanks

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The following documents apply to all required work for the Project: (1) the Contract Drawings, (2) the Specifications, (3) the General Conditions, (4) the Addendum and (5) the Contract (City of New York Standard Construction Contract).

1.2 SUMMARY

A. Work Included:

1. Underground storage tanks (UST) shall be provided to store diesel fuel, unleaded gasoline, and fuel ethanol (E85) for the fuel dispensing system supplying fuel to department vehicles and trucks as well as motor oil, hydraulic oil, and waste oil for the fluid dispensing system supplying the maintenance bay.
2. Contractor shall furnish and install NYC approved tanks, anchor straps, risers, pump containment sumps, backfill, and all required trim for a complete and operational system. Contractor shall provide materials specified or implied as being necessary to complete work, unless specifically noted otherwise.

B. Related Sections:

1.	Section 22 15 13.10	"Motor Fuel Dispensing System."
2.	Section 22 15 13.20	"Fluid Dispensing System."
3.	Section 26 31 13	"Engine Generators."
4.	Section 33 52 13.13	"Fiberglass Double Containment Piping."
5.	Section 33 52 13.16	"Stainless Steel Double Containment Piping."

C. Governing Standards:

1.	ASTM Specification D4021	- Glass Fiber Reinforced Polyester Underground Petroleum Storage Tanks.
2.	NFPA 30	- Flammable and Combustible Liquids Code
3.	NFPA 30A	- Code for Motor Fuel Dispensing Facilities and Repair Garages
4.	NFPA 31	- Installation of Oil-Burning Equipment
5.	UFC	- Unified Fire Code
6.	UL 1316	- Underwriters Laboratories (UL) Glass Fiber Reinforced Plastic Underground Storage Tanks for Petroleum Products.
7.	UL 2080	- Underwriters Laboratories (UL) Standard for Fire Resistant Tanks for Flammable and Combustible Liquids

1.2 SUBMITTALS

A. Refer to DDC General Conditions Section 01 33 00 "Submittal Procedures."

B. Submit shop drawings and accessory cut sheets for approval. The UST design drawings shall show principal dimensions, size, type and locations of all connections and fittings and locations of all options/ accessories. Design drawings shall also include UST catalog cuts, and vendor cuts for associated accessory items and subassemblies.

C. Submit copies of the system installation, operation and maintenance manual prior to UST delivery.

D. Submit copies of all quality control testing documentation, installation inspection documentation, and written warranty to the Commissioner at time of documentation completion.

1.3 QUALITY ASSURANCE

A. Refer to DDC General Conditions Section 01 40 00 "Quality Requirements."
B. Manufacturer shall have a minimum of 3 years experience in producing similar equipment.
C. Installer shall be a licensed NYC tank installer having a minimum of 3 years experience in installing similar equipment and shall show evidence of at least 5 installations in satisfactory operation.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Use every precaution to prevent damage to the equipment during transportation and delivery to the site.

1. Do not allow equipment to be dropped, bumped, dragged, pushed, rolled or moved in any way which will cause damage.
2. If, in the process of transportation or handling, any equipment is damaged, replace or repair such equipment or accessories. Make all required repairs.

B. Handling of UST shall be moved by lifting lug only – chains or cables shall not be wrapped around tank.

C. Provide temporary storage of UST on site prior to installation in a dry, enclosed area, off the ground and away from all possible contact with water, ice or snow. Materials shall be protected from extreme heat and direct sunlight.

D. Damage to materials during storage shall be prevented primarily by minimizing the amount of time they are stored at the job-site before being incorporated into the work.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Underground Storage Tanks:

a. Xerxes.
b. Containment Solutions.
c. Fibrelite

d. Or approved equal

2. Leak and Inventory Control System:

a. Veeder-Root
b. Varec
c. Franklin Fueling System
d. Or approved equal

3. Accessories:

a. Xerxes.
b. Containment Solutions
c. Fibrelite
d. Or approved equal

2.2 UNDERGROUND STORAGE TANKS

A. General:

1. Provide ten (10) NYC approved double wall underground storage tanks, as shown and specified herein. Tanks storage volume shall as shown in Contract Drawings and shall be engineered for underground storage of flammable and combustible liquids.
2. Tanks shall be approved for listing by Underwriters Laboratories (UL). Tanks shall comply with UFC and NYC standards.
3. The tanks, including all accessories, shall be installed in strict accordance with the manufacturer's recommendations and applicable fire and environmental codes.
4. Tanks shall be manufactured with either glass-fiber reinforced resin or glass-fiber reinforced polyester.
5. All tanks shall be compatible with E85 and B20 fuels.
6. Tank shall be capable of being buried in ground with seven (7) feet of overburden over the top of the tank, the hole fully flooded and a safety factor of 5:1 against general buckling.
7. Tank shall withstand surface H-20 axle loads.
8. Tanks shall support accessory equipment such as drop tubes, submersible pumps, heating coils, stick ports etc.
9. Tanks shall have an interstitial space between the primary and secondary walls to allow for the free flow and containment of leaked product from the primary tank. The tank shall accommodate a leak detector through a dedicated monitoring fitting.
10. Interstitial space shall be dry to prevent possible product contamination. Hydrostatic monitoring of interstitial space is not acceptable.
11. Tanks shall include 22" manways as shown on contract drawings, complete with UL- listed gaskets, bolts and cover.
12. Tanks shall have an integral 42" containment collar encircling each manway.
13. Tanks shall be enclosed in vaults as shown in contract drawings. Space between tanks and vaults shall be filled with backfill per manufacturer's recommendations.

B. Accessories:

1. Anchor Straps:

a. Straps shall be FRP anchor straps as supplied by tank manufacturer.
b. Number and location of straps shall be as specified by tank manufacturer.

2. Collar Riser:

a. A 42" containment collar riser shall be installed to house submersible pumps, leak detectors, heating coils, and other equipment specified in Sections 22 15 13.10 "Motor Fuel Dispensing System" and "Fluid Dispensing System."
b. Risers shall be of water tight design.
c. Risers shall be cut to length per manufacturer's installation instructions.

3. Gauge Plates shall be installed under each service fitting and manway opening and be supplied by tank manufacturer.
4. NPT Threaded Fittings:

a. All standard threaded fittings shall be half-couplings and shall be 4" or 6" diameter. Reducers shall be used to connect to smaller diameter pipes.
b. NPT fittings shall withstand a minimum of 150 foot-pounds of torque and 1000 foot-pounds of bending, both with a 2:1 safety factor.

5. Spill Containment Fill Box Assembly:

a. Spill containment fill box assemblies (SCFBA) shall be provided as shown on contract drawings. SCFBAs shall be constructed of 304 stainless steel, capable of withstanding a 150 psi line test, have no less than fifteen (15) gallons capacity for containment of product spilled during the coupling and uncoupling of the fill hose. Each SCFBA shall include an automatic drain, test plug assembly, lockable cap, bronze fill adapter, and a No. 20-mesh brass screen.
b. A tank/product identification tag shall be provided with each spill containment fill box assembly. At a minimum, each identification tag shall include product type, actual tank capacity in US gallons, and tank number (i.e. Tank #1, Tank #2, etc.). Identification tag shall be securely attached to the inside of the fill box (spot tack welding of the tag is not acceptable).

2.3 LEAK AND INVENTORY CONTROL SYSTEM

A. Provide a complete monitoring system with combined inventory control for at least ten (10) tanks, interstitial leak sensing, sump leakage detection, and emergency generator applications.

1. Monitoring Console:

a. Shall be wall-mounted as shown in contract drawings.
b. Shall be equipped to communicate with fuel management system.
c. The console shall be equipped with an auxiliary contact for remote signaling. The auxiliary contact shall relay all alarm conditions as a single grouped "trouble" alarm signal. Contacts shall be SPDT, Rated at a minimum of 5A at 120 VAC.
d. Shall include the following alarm conditions:

1). Fuel tank low level.

2). Leak at fuel tank (interstitial probe).
3). Leak at fuel tank containment collar.
4). Oil tank low level.
5). Leak at oil tank (interstitial probe).
6). Leak at oil tank containment collar.
7). Leak at dispenser sump.
8). Waste oil tank high level.
9). Leak at waste oil tank.
10). Leak at waste oil tank containment collar.
11). Generator day tank low level.
12). Leak at generator day tank.
13). Leak at pump set transition sump.
14). Leak at fluid pump transition sump.
15). Leak at fluid transition sump.

e. The unit shall include the following options:

1). Integrated report printer with built-in take-up spool for hard copy documentation of inventory, leak detection and alarm information.
2). Internal modem for direct data transmission over phone lines, hard wired.
3). 4-relay module, programmable to alarm limits and capable of actuating external alarm devices.

2. Sensors:

a. At a minimum, the following sensors shall be provided. Additional sensors shall be furnished per manufacturer's recommendations.

1). Fuel tank level.
2). Fuel tank interstitial leak sensor.
3). Fuel tank containment collar leak sensor.
4). Oil tank level.
5). Oil tank interstitial leak sensor.
6). Oil tank containment collar leak sensor.
7). Waste oil tank level sensor.
8). Waste oil tank interstitial leak sensor.
9). Waste oil tank containment collar leak sensor.
10). Dispenser sump leak sensor.
11). Containment sump leak sensor.

b. System shall be tied to the emergency generator level and leak detection sensors per Section "Packaged Engine Generator System."

3. Overfill Alarm and Acknowledgement Device:

a. Each tank shall be equipped with an overfill alarm. Alarm shall be connected to an alarm relay in the system monitoring panel. System monitoring panel shall activate alarm when fuel tank level reaches a preset level to warn of a potential tank bulk delivery overfill. Alarm trigger

level shall be settable from the system monitoring panel. Alarm device shall include both audible and visual alarms. Audible alarm shall be adjustable to have duration of 0 to 60 seconds and a noise level of 78 to 103 dB (at 10 feet).

b. Each overfill alarm shall include an acknowledgement device allowing delivery personnel to shut off audible alarm. Visible alarm shall remain illuminated until system monitoring panel prints an inventory increase report.

c. Overfill alarms and acknowledgement devices shall be located near fill port locations and by each waste oil disposal.

PART 3 - EXECUTION

3.1 EXECUTION REQUIREMENTS

A. Refer to DDC General Conditions or execution requirements.

3.2 INSTALLATION

A. All equipment shall be installed in strict accordance with the most recent manufacturer's guidelines, and NFPA codes.

3.3 TESTING

A. Tanks shall be tested according to manufacturer's guidelines at time of installation.
B. Contractor shall individually test tanks for leakage prior to installation.
C. Tanks shall be tested to 20-psi and witnessed by FDNY
D. Manufacturer's Services: The Contractor shall retain the services of the supplier to supervise and/or perform checkout and start-up of all system components. As part of these services, the supplier shall include for those equipment items not manufactured by him, the services of an authorized manufacturer's representative to check the equipment installation and place the equipment in operation. The manufacturer's representative shall be thoroughly knowledgeable about the installation, operation and maintenance of the equipment.
E. A factory instructed representative shall be present at the first tank filing.

END OF SECTION 335614

SECTION 43 41 16
Petroleum Bulk Storage (PBS) Tank Systems

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The following documents apply to all required work for the Project: (1) the Contract Drawings, (2) the Specifications, (3) the General Conditions, (4) the Addendum and (5) the Contract (City of New York Standard Construction Contract).

B. LEED / Environmentally Preferable Purchase (EPP) General Requirements:
   1. Refer to DDC General Conditions and the Addendum to the General Conditions
   2. LEED requirements apply to all Phase II work with the exception of the Existing Building scope. EPP requirements apply to the project's Existing Building scope only.

1.2 SUMMARY

A. Work includes:
   1. This section includes all labor, material, and equipment required for providing/installing underground PBS Tank Systems as indicated on Contract Drawings or as directed by the Commissioner.

B. Related Sections
   1. Section 43 41 17 - Petroleum Bulk Storage (PBS) Product Piping
   2. Section 43 41 18 - Petroleum Bulk Storage (PBS) Instrumentation

1.3 APPLICABLE STANDARDS

A. Work performed under this section shall comply with following standards and all other applicable Federal, State and local standards, including revisions, to the date of contract.
   1. ASME American Society of Mechanical Engineers
   2. NFPA National Fire Protection Association
   3. UL Underwriters' Laboratories
   4. NEC National Electrical Code
   5. NYCEC The New York City Electrical Code
   6. ANSI American National Standards Institute
   7. IEEE Institute of Electrical and Electronic Engineers
   8. The Board of Standards and Appeals NYC
   9. The Building Code NYC
   10. The Fire Code NYC
   11. New York City Fire Law Handbook
   12. AWS: American Welding Society

1.4 REFERENCES

A. Department of Environmental Conservation, Petroleum Bulk Storage Unit

47-40 21st Avenue

Long Island City, NY 11101-5407

Phone: 718 482-6453; Fax: 718 482-4098

http://www.dec.state.ny.us/website/der/bulkstor/forms/index.html

B. FDNY Bureau of Fire Prevention (FDNY BFP)

9 Metro Tech Center, 5th floor

Brooklyn, NY 11201-3857

Phone: 718 999-2541

1.5 SUBMITTAL PROCEDURES

A. Refer to DDC General Conditions Section 01 33 00 "Submittal Procedures".

1.6 SUBMITTALS

A. Contractor Shop Drawings submittals shall include, but not be limited to, following:
1. Manufacturer's descriptive, technical literature and catalog cuts, including installation instructions.
2. Piping layout drawing.
3. Tanks and appurtenances.
4. Catalog cuts, as appropriate.
5. Any deviations from Contract Drawings because of physical interferences, substitutions, or field verifications shall be clearly indicated on shop drawings.

B. Submit the following closure documents as applicable at project completion. Contractor shall not receive final payment until all close out documents are submitted.
1. PBS Applications
2. NYCDOB completion letter
3. FDNY BFP A-111 letter of completion
4. FDNY BFP Storage Use Permit, if required
5. NYCBEC (Bureau of Electrical Control) Certificate of Electrical Completion
6. As-Built Drawings

1.7 GENERAL TESTING AND RESPONSIBILITY

A. Installation of tanks and equipment for the petroleum storage systems shall be performed by Contractor who shall be a New York City Licensed Installer for storage tank systems. Contractor shall have minimum of three (3) years of proven experience in installation of petroleum storage tank systems.

B. Purchase petroleum storage systems components from manufacturer approved by the Commissioner and FDNY BFP. Manufacturer shall maintain a service depot within proximity of the site with parts and service personnel available for servicing of parts at any time. The Commissioner reserves the right to check the contractor's instruments or to furnish its own instruments.

C. Whenever these Specifications make mention of items/details not indicated on Contract Drawings, or where items/details are indicated on Contract Drawings and not mentioned in these Specifications, items/details will be deemed included in systems.

1.8 ALTERATIONS TO ACCOMMODATE EQUIPMENT

A. Contract Drawings indicate typical installation based on certain type of equipment, and are not to be construed as representing layout for any other type. Any alterations which are necessary to adequately and satisfactorily accommodate the equipment to be installed under this Contract shall be made by Contractor at his own expense, in accordance with the Contract and Specifications and subject to approval by the Commissioner.

1.9 QUALITY ASSURANCE

A. Refer to DDC General Conditions Section 01 40 00 "Quality Requirements".

PART 2 - PRODUCTS

2.1 NEW UNDERGROUND FUEL STORAGE TANKS (USTS)

A. Provide and install new USTs as shown on Contract Drawings and per manufacturer's recommendations. Tanks shall be New York City approved double wall fiberglass underground storage tanks. Basis of Design Product: as manufactured by Containment Solutions or a comparable product as manufactured by:
   1. Modern Welding Company, Inc.
   2. Highland Tank & Manufacturing Company, Inc.
   3. or approved equal

B. Tanks shall be double wall fiberglass in conformance with UL and API codes and standards and so labeled.

C. Tanks shall be secured to a concrete hold down slab as per manufacturer's recommendations.

D. Contractor shall provide and install deflector plates centered under all tank openings.

E. Product Storage:

1. Diesel tanks shall be compatible with and capable of storing diesel fuel containing up to 20% biodiesel (B20).
2. Gasoline tank shall be compatible with and capable of storing gasoline-ethanol blends with up to 15% ethanol content (E15).

2.2 SHALLOW BURIAL SPILL CONTAINMENT FILL MANHOLES

A. Spill containment fill manhole assemblies shall be furnished and installed where indicated on Contract Drawings. Each spill containment manhole shall be FDNY BFP approved, for shallow burial.

B. All fill caps shall have sign that labels type of product stored in tank. Signs to be per API color-coding for the product stored in the tank.

C. Below grade spill containment fill box shall be constructed of 300 grade stainless-steel, capable of a 150 psi line test, with a capacity of 15 gallons. Each spill containment box shall be provided with an automatic drain, test plug assembly, watertight and lockable cap, bronze adapter, No. 20-mesh brass screen, and grounding rod.

D. Each spill containment manhole shall have cover permanently marked according to tank contents and painted to conform with the American Petroleum Institute Color and Symbol Code.

2.3 FUEL DISPENSERS

A. Each fuel dispenser shall consist of a single fuel dispensing system. Each fuel dispenser shall come equipped with cc option, 10-1 wheel pulser, and solenoid., and shall include but not be limited to following:

1. Register: Non-computer, mechanical type register with power reset interlock that is displayed on both front and back, reading in gallons up to 999.9

2. Totalizer: Non-resettable totalizer that is displayed on front, reading in gallons up to 999,999.9 and rolls over

3. Pump: Gear-type pumping unit with built-in air eliminator. Pump shall be driven by 3/4 hp, 115/230 volt, 60 Hz AC motor

4. Meter: Three piston, positive displacement-type meter, tested and calibrated for accuracy at any speed or pressure

5. Product hose: 3/4 inch by 10 foot long hose

6. Diesel Nozzle, Basis of Design: OPW model 7HB-0100 or a comparable product by one of the following manufacturers:
    1) Fill-Rite
    2) Catlow
    3) or approved equal

7. Gasoline Nozzle

a. Basis of Design: OPW model 7HB-0400 or a comparable product by one of the following manufacturers :
   1) Fill-Rite
   2) Catlow
   3) or approved equal

8. Cabinet: All stainless steel

9. Filter, Basis of Design: Cim-Tek Standard flow, 400-HS10 Hydro-sorb or a comparable product by one of the following manufacturers:
   1) Petroclear
   2) Aeromotive Inc
   3) or approved equal

10. Brand panel: Brand panel shall read type of fuel being dispensed

11. Fuel islands: Size as indicated on Contract Drawings: Steel island form
   a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      1) Formex Permanent Steel Forms
      2) OPW
      3) Burtco Metal Systems
      4) or approved equal

B. Basis of Design Product (dispenser): Gasboy 9100 Series, Gasboy 9153KTW1M for dual hosed dispensers and Gasboy 9153K for single hosed dispensers, or comparable products by one of the following manufacturers:
   1) Wayne Fueling Systems
   2) Gilbarco Veeder-Root
   3) or approved equal

2.4 EMERGENCY SHUTOFF SWITCH

A. Emergency pump shut-off switches shall be installed for each pump as shown on Contract Drawings. Switches shall be of a type that must be reset manually. Basis of Design: Eaton Catalog No. 10250T5B62-S108 as manufactured by Eaton Corporation or comparable product by one of the following manufacturers:
   1. Federal Signal
   2. Pilla Electrical
   3. or approved equal.

2.5 TANK SYSTEM IDENTIFICATION

A. Mount permanent stencils, labels, or plates on tanks, fill ports and equipment. Include following information:

   1. Manufacturer's statement that tank conforms with Bulk Storage Regulation 6 NYCRR Part 614
   2. Standard of design by which tank was manufactured
   3. List of products and additives which may be permanently stored in tank

4. Year tank was manufactured
5. Unique identification number
6. Dimensions, design, working capacity and tank model number
7. Name of tank manufacturer
8. Date of installation
9. C of A Label for each dispenser, fill box and leak detection/inventory control system

2.6 SIGNS

A. Supply and install all signs required by New York City Fire Code including:
   1. "Caution: When Alarm Sounds, Tank Filled To Capacity. Do Not Overfill" adjacent to overfill alarm.
   2. "No Smoking While Refueling" adjacent to, or on, fuel dispensing island.
   3. "Shut Off Engine While Refueling" adjacent to, or on, fuel dispensing island.
   4. "Emergency Shut-Off Switch" adjacent to fuel dispensing shut-off switch.

2.7 THREADS

A. Threads for threaded fittings shall be American Standard Taper Pipe Thread, in accordance with ANSI B-2.1.

2.8 FITTINGS

A. All product fittings shall be heavy duty steel threaded flanges (NPT) or raised-face-slip-on weld flanges (RFSO).

B. Threaded cast iron fittings shall comply with ANSI B-16.4

C. Steel welded fittings shall be of same weight as piping in which used and comply with ANSI B-16.9 and ASTM A-234

D. Threaded malleable iron fittings shall be banded type ANSI B-16.3 for standard weight, and ANSI B-16.9 for extra heavy weight

2.9 TESTING REQUIREMENTS

A. Hydrostatically test tanks at 20 psi, in accordance with New York City requirements

B. Test tank and piping after erection of piping but prior to final connection

C. The Commissioner reserves right to approve all tests

D. Repair any leaks or defects detected during testing and retesting

E. All tests and retests shall be conducted in presence of The Commissioner

F. The Commissioner may require tests when installation, or any part thereof, is complete. Contractor shall furnish all necessary labor and equipment for testing. If installation fails test, Contractor shall take all necessary corrective actions and retest to satisfaction of the Commissioner.

2.10 OPERATION AND MAINTENANCE (O&M) MANUALS

A. Contractor shall provide three (3) O&M manuals in 3 ring vinyl binders incorporating all manufacturer's information describing operations and maintenance schedules for the system installed. O&M manuals shall include wiring diagrams, detailed equipment list and spare parts required.

PART 3 - EXECUTION

3.1 EXECUTION REQUIREMENTS

A. Refer to DDC General Conditions for execution requirements.

3.2 GENERAL

A. Maintain site in a neat and workmanlike manner. Remove debris, dirt, rubbish, etc. from site at end of each day.

B. Contractor is responsible for verifying all dimensions in field and for insuring that interferences do not exist between Contractor's work and that of surrounding work.

C. Initiate a safety program to prevent injury to residents, employees and visitors. Do not block streets, exits, or onsite traffic routes that are scheduled to remain in use during the work.

D. Provide and maintain any structures or lighting and take all measures required by law for protection of public and facility employees.

E. Perform contract work so that no injury or damage will occur to public, structures and property including streets, paving, monitoring wells, recovery wells, sewers, water, electric or any other pipes, mains, conduits. Should any damage or injury be caused by Contractor or anyone in his employ, or by improper or defective workmanship under this contract, Contractor shall repair such damage and assume all responsibility for such injury without cost to the City of New York.

F. At excavations, provide barriers on same day that excavation is made and check barrier integrity daily so that protection is provided at all times.

3.3 INSTALLATION

A. Equipment installed by Contractor shall be in accordance with manufacturer's instructions and applicable codes and regulations including but not limited to 6 NYCRR Parts 612-614, Environmental Conservation Law (ECL) Article 17 Title 10, and EPA 40 CFR Part 280.

3.4 TESTING

A. Shop Tests: Shop testing of tanks shall conform to testing methods and procedures established in referenced standards. Where leaks are detected, tank must be repaired as recommended by standards.

B. Field Tests: Field testing shall conform to requirements of manufacturer, FDNY BFP, equipment manufacturer, and Contract Drawings.

END OF SECTION 43 41 16

SECTION 43 41 17
Petroleum Bulk Storage (PBS) Product Piping

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The following documents apply to all required work for the Project: (1) the Contract Drawings, (2) the Specifications, (3) the General Conditions, (4) the Addendum and (5) the Contract (City of New York Standard Construction Contract).

B. LEED / Environmentally Preferable Purchase (EPP) General Requirements:
   1. Refer to DDC General Conditions and the Addendum to the General Conditions
   2. LEED requirements apply to all Phase II work with the exception of the Existing Building scope. EPP requirements apply to the project's Existing Building scope only.

1.2 SUMMARY

A. Work includes:
   1. This Section specifies requirements for procurement and furnishing of all labor, material and equipment required to install all piping, valves, fittings and appurtenances for installation of systems indicated on Contract Drawings or as directed by the Commissioner.

B. Related Sections
   1. Section 43 41 16 "Petroleum Bulk Storage (PBS) Tank Systems"
   2. Section 43 41 18 "Petroleum Bulk Storage (PBS) Instrumentation"

1.3 APPLICABLE STANDARDS

A. The following publications form a part of this Specification to extent referenced. Publications shall be latest published version:
   1. American Society for Testing and Materials (ASTM) A 53 Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless.
   2. ASTM D 2996 Standard Specification for Filament-Wound "Fiberglass" Glass-Fiber-Reinforced Thermosetting-Resin) Pipe.
   3. Piping and accessories shall comply with ANSI, ASME, AWWA, ISA, and all other applicable federal, state, and municipal codes including revisions to date of Contract.

1.4 REFERENCES

A. Department of Environmental Conservation, Petroleum Bulk Storage Unit

47-40 21st Avenue

Long Island City, NY 11101-5407

Phone: 718 482-6453; Fax: 718 482-4098

http://www.dec.state.ny.us/website/der/bulkstor/forms/index.html

B. FDNY Bureau of Fire Prevention (FDNY BFP)

9 Metro Tech Center, 5th floor

Brooklyn, NY 11201-3857

Phone: 718 999-2541

1.5 SUBMITTAL PROCEDURES

A. Refer to DDC General Conditions Section 01 33 00 "Submittal Procedures".

1.6 SUBMITTALS

A. Submit manufacturer's specifications, installation instructions, and pipe test results.

1.7 QUALITY ASSURANCE

A. Refer to DDC General Conditions Section 01 40 00 "Quality Requirements".

PART 2 - PRODUCTS

2.1 UNDERGROUND PIPING AND FITTINGS

A. All buried piping, unless otherwise specified, shall be double-walled pipe with black steel primary carrier pipe surrounded by a fiberglass outer containment pipe. Piping shall be capable of handling fluid for which it is intended and shall be UL-listed and approved for use in New York City by FDNY BFP. In addition, piping shall be capable of handling 100% methanol and B5 to B20 biodiesel.

B. All secondary containment piping shall be fiberglass secondary containment system. All fiberglass piping and fitting joints shall be bonded. Basis of Design: Red Thread IIA as manufactured by NOV Fiberglass Systems or a comparable product by one of the following:
   a. Dualoy 3000 LCX as manufactured by NOV Fiberglass Systems
   b. Dualoy 3000L as manufactured by NOV Fiberglass Systems
   c. Or approved equal.

C. Outer containment piping shall be non-permeable pipe designed to retain any leakage and to channel such leakage as appropriate to a location equipped with a continuous automatically monitored leak detection

system. Piping shall provide 100% containment of primary piping, including flexible connectors. Leak detection system shall be as specified in 43 41 18 on Instrumentation and Control.

D. Aboveground vent piping shall be galvanized steel.

2.2 FILL PIPE

A. Furnish and install submerged drop tube in fill line of each storage tank as indicated on Contract Drawings. Basis of Design of drop tube: Universal valve model 39-0508 or a comparable product by one of the following manufacturers:
1. Franklin Fueling
2. OPW
3. Morrison Bros.
4. Or approved equal

2.3 ABOVEGROUND PIPING

A. All aboveground pipe, unless otherwise specified, shall be hot-dipped full weight black steel pipe, ASTM A 53, Grade B welded. Vent riser piping shall be standard weight, Schedule 40, hot-dipped galvanized steel pipe, ASTM A 53, Grade B welded.

B. Each length of pipe shall be stamped with trademark of its manufacturer.

C. Pipe to be installed shall be free of flaws, blisters, cracks, and all other imperfections or defects which would impair its quality. All pipe shall be tested by manufacturer under standard test pressure.

D. All pipe threads shall be NPT standard, accurately and cleanly cut, and perfect in every aspect.

E. Nipples shall be of same material and weight as pipes installed. Use of running nipples will not be permitted.

F. Pipe sleeves shall be standard weight galvanized steel pipe, provided as required.

2.4 ABOVEGROUND PIPE FITTINGS

A. All fittings and connections shall be screw-type except where indicated on Contract Drawings, or specified herein.

B. All fittings, unless otherwise specified, shall be malleable iron, Class 150, with working pressure of 300 psi at 150 degrees Fahrenheit.

C. Manufacturers: Subject to compliance with requirements, provide valve products by one of the following:
1. Stockham Valves and Fittings
2. Wieland Kessler
3. American Cast Iron Pipe Company
4. Or approved equal.

D. Unions shall have bronze to bronze seats and shall be furnished and installed adjacent to, and on, the downstream side of each threaded-end valve and as shown on Contract Drawings, or as directed by the Commissioner.

E. Flanged connections may be used where indicated on the Contract Drawings and where necessary with approval of the Commissioner.

2.5 VALVES

A. Furnish and install check valve with shear groove in suction line beneath fuel dispensers to prevent suction line from draining.

B. Furnish and install emergency shear valve in product line beneath DEF dispensers.

C. Furnish and install overfill valve in fill line entering storage tanks. Fill line overfill valve shall be set to close when liquid level in tank reaches 90% of the tank capacity.

2.6 VENT CAPS

A. Install vent caps with 2" thread-on connections at end of each vent riser. Vent caps shall be all metal construction, contain flame-retardant 40 mesh bronze screen and conform to NFPA 30. Vent caps shall prevent water and contaminants from entering tank and shall assure easy runoff from precipitation.

B. Vent caps shall assure even pressure in tank during filling and pumping operations.
   1. Diesel vent caps shall be up-flow vent caps:
      a. Model 45-20 as manufactured by Universal Valve
      b. Model 354-0200 AV as manufactured by Morrison Bros. Co.
      c. Model 23-0033 as manufactured by OPW
      d. or approved equal
   2. Gasoline tank vent caps shall be pressure/vacuum vent cap:
      a. Model 46CS-2080 as manufactured by Universal Valve
      b. Model 723V-2230 as manufactured by OPW
      c. Model 748A-0100 AV as manufactured by Morrison Bros. Co.
      d. or approved equal.

PART 3 - EXECUTION

3.1 EXECUTION REQUIREMENTS

A. Refer to DDC General Conditions for execution requirements.

3.2 PIPING INSTALLATION

A. All underground piping shall be installed in pea gravel, in accordance with Manufacturer's recommendations, applicable codes, and as shown on Contract Drawings.

B. Slope all suction and return lines towards tank sump at minimum of 1 inch per 8 foot of pipe, or as approved by the Commissioner.. Flexible connectors acceptable to the FDNY BFP shall be provided in suction, discharge, vent and fill piping.

C. Provide each tank with separate vent pipe not less than 2 inches diameter, terminated outdoors in non-hazardous location, well braced in position, at least 10 feet from nearest building opening, and provided with vent covers as indicated. Except as approved by the Commissioner. to permit vapor recovery, vent pipes shall not be obstructed by devices that reduce its capacity thus causing excessive back pressure. Vent pipes shall be run from tank to at least 15 feet above adjacent ground level.

D. All pipes and valves, except where otherwise indicated, shall be arranged so as to be easily accessible for maintenance and restorations, and no change in the general arrangement indicated on Contract Drawings will be allowed unless approved by the Commissioner.. Where lengths of pipe are finally assembled, fittings shall be in correct alignment without forcing them into position.

E. All pipes shall be accurately cut. Deformed or damaged pipe shall in no case be used. All bends shall be made with standard elbows and fittings. All threads shall be cleaned thoroughly and covered with suitable joint compound before joints are made. Every piece of pipe, valve and fitting which is part of pipe work shall be cleaned thoroughly before and, whenever possible, after installation.

F. All aboveground piping shall be installed true to line and grade and be supported by suitable supports, spaced not more than 8 feet on centers. All such supports, anchors, clamps or other devices shall be of standard design, simple in installation, and of an approved manufacturer.

G. Hangers, brackets, supports, anchors, clamps and other devices shall be hot-dip galvanized after fabrication and before assembly and installation. They shall be installed to make entire aboveground pipe system self-supporting and rigid. Defective or inaccurately constructed hangers, brackets, supports, clamps, and other hardware shall not be used. Machine bolts, 5/8 inch in diameter and of proper length shall be used throughout for securing hangers, brackets, clamps, and supports for pipes larger than 3 inches, and ½-inch diameter bolts for pipes 3 inches and smaller.

H. Where expansion bolts are required for securing supports and hangers, holes in masonry shall be drilled to exact size of bolts or sleeves. No packing shall be used. Expansion bolts shall be an approved type, diameter and length.

I. All flanged and mechanical coupling connections shall be made with bolts and nuts of length and diameter required for particular flange size as determined by American National Standard Institute.

J. Proper allowance for expansion and contraction shall be made. Wherever required pipe lengths are to exact dimensions, and where lengths of pipe are finally assembled, flanges and fittings shall be in correct alignment without forcing into position.

K. Gate valve stems shall be vertical where possible and in no case below horizontal position.

L. Pipe to be installed shall be free of flaws, blisters, cracks and all other imperfections or defects which would impair its quality. All pipe shall be tested by manufacturer under standard test pressure.

3.3 CUTTING OF MASONRY

A. Where necessary for proper installation of piping, cut away or break through concrete or brick masonry and, after installation, replace and refinish masonry to satisfaction of the Commissioner..

3.4 CUTTING OF GRADE BEAMS

A. Where necessary for proper installation of piping, core drill through grade beams for necessary piping penetrations. All piping passing through grade beams shall be provided with sleeves of suitable size schedule 40 Galvanized steel piping. All penetrations shall be restored to satisfaction of the Commissioner.

3.5 TESTING

A. Test piping systems in this Specification as indicated on Contract Drawings and as required by applicable codes, equipment manufacturers, and regulations. Perform each test in presence of the Commissioner. Provide water, air and all labor, equipment and accessories to perform tests at no additional cost to the City of New York.

B. Replace defective pipes and fittings at Contractor's expense with sound material. All joints examined during tests and found to be leaking, shall be caulked or otherwise made satisfactory in the opinion of the Commissioner. Tests shall continue until a passing test is achieved.

C. All test gauges shall be certified for accuracy. All instruments other than test instruments shall be disconnected during testing to prevent damage.

END OF SECTION 43 41 17

SECTION 43 41 18
Petroleum Bulk Storage (PBS) Instrumentation and Control

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The following documents apply to all required work for the Project: (1) the Contract Drawings, (2) the Specifications, (3) the General Conditions, (4) the Addendum and (5) the Contract (City of New York Standard Construction Contract).

B. LEED / Environmentally Preferable Purchase (EPP) General Requirements:
   1. Refer to DDC General Conditions and the Addendum to the General Conditions
   2. LEED requirements apply to all Phase II work with the exception of the Existing Building scope. EPP requirements apply to the project's Existing Building scope only.

1.2 SUMMARY

A. Work includes:
   1. This Section specifies requirements for instrumentation and control equipment to be used for Petroleum Bulk Storage (PBS) system operation, control, and monitoring.
   2. All instrumentation and control equipment shall be furnished and installed in system, completed, tested, and placed in operation as indicated on Contract Drawings, as specified herein, or as directed by the Commissioner.

B. Related Sections
   1. Section 43 41 16 - Petroleum Bulk Storage (PBS) Tank Systems
   2. Section 43 41 17 - Petroleum Bulk Storage (PBS) Product Piping

1.3 APPLICABLE STANDARDS

A. All instrumentation and control equipment shall comply with following standards and all other applicable federal, state, and New York City Building Codes including revisions to date of Contract:
   1. ANSI American National Standards Institute
   2. ASTM American Society of Testing Materials
   3. ASME American Society of Mechanical Engineers
   4. NEC National Electric Code
   5. ISA Instrumentation Society of America

1.4 REFERENCES

A. Department of Environmental Conservation, Petroleum Bulk Storage Unit

47-40 21st Avenue

Long Island City, NY 11101-5407

Phone: 718 482-6453; Fax: 718 482-4098

http://www.dec.state.ny.us/website/der/bulkstor/forms/index.html

B. FDNY Bureau of Fire Prevention (FDNY BFP)

9 Metro Tech Center, 5th floor

Brooklyn, NY 11201-3857

Phone: 718 999-2541

1.5 SUBMITTAL PROCEDURES

A. Refer to DDC General Conditions Section 01 33 00 "Submittal Procedures".

1.6 SUBMITTALS

A. Shop Drawings: Shop drawing submittals shall include, but not be limited to the following:
   1. Wiring and schematic diagrams and any other details required to demonstrate that system has been coordinated and will function properly as a unit.
   2. Equipment list, including size, input/output types, expected range of operation, utility requirements, and materials of construction. A List of Materials also shall be included and keyed to drawings. List of Materials shall provide sufficient information to determine compliance with Contract Drawings and Specifications.
   3. Drawings showing proposed layout and anchorage of equipment and appurtenances, and equipment relationship to other parts of work, including clearances for maintenance and operation.
   4. Manufacturers' descriptive and technical literature, including catalog cuts.
   5. Legends for name plates.
   6. Control panel and enclosure drawings providing arrangements, dimensions, cabinet door swing radii and terminations for all panels.
   7. Equipment certifications and test reports.

B. Spare Parts Data: Within 30 days of Shop Drawings approval, furnish spare parts data for each different item of material and equipment specified. Data shall include a complete list of parts and supplies, with current unit prices and a source of supply. A list of all special tools required for installation, maintenance or restoration of equipment shall be provided. Furnish those spare parts and special tools recommended by manufacturers. Provide 12-month supply of any expendable items and frequently replaced parts as identified by manufacturer.

C. Provide Operating and Maintenance (O&M) instructions for each different type of control, instrument and system, as directed by the Commissioner.
   1. Furnish to the Commissioner 3 complete copies of operating instructions outlining procedures required for equipment and system start-up, operation and shut-down. Instructions shall include manufacturer's

name, model number, service manual, parts list and brief description of all equipment and their basic operating features.

2. Furnish to the Commissioner 3 complete copies of maintenance instructions listing routine maintenance procedures, possible breakdown and repairs, and troubleshooting guide.

D. Performance Test Reports: Upon completion and testing of installed system, submit test reports in booklet form showing all field tests performed to adjust each component and all field tests performed to prove compliance with specified performance criteria. Each test report shall indicate final position of controls.

1.7 MANUFACTURER'S SERVICES

A. Provide services of manufacturer's representative experienced in installation, adjustment, and operation of specified instruments and controls. Representative shall supervise installation, adjustment and testing of equipment.

1.8 FIELD INSTRUCTION

A. Provide field instruction course for designated operating staff for a total of the City of New York's 24 hours of normal working time (for each shift). Complete instruction prior to system's final acceptance by The City of New York. Instruction shall cover all items contained in operating and maintenance manuals.

1.9 QUALITY ASSURANCE

A. Refer to DDC General Conditions Section 01 40 00 "Quality Requirements".

PART 2 - PRODUCTS

2.1 GENERAL

A. General instrumentation requirements are identified on Contract Drawings. All instruments and control equipment shall conform with the following general provisions.

B. All equipment in a system shall be compatible in function and appearance. Provisions shall be made, where necessary, for signal dampening to suppress noise and spurious electrical signals in order to provide desired degree of performance.

C. All instrument supports and interconnecting wiring and conduit shall be as recommended by manufacturer and approved by the Commissioner.

D. Identifying tag number for each instrument shall be permanently etched or embossed onto a durable tag which shall be fastened to the device housing with stainless steel rivets or self-tapping, stainless-steel screws of appropriate size. Where neither of the above fastening can be accomplished, tag number nameplates shall be permanently attached to device by a circlet of stainless-steel wire.

E. All instruments and devices furnished under this Section requiring electrical power shall be suitable for operation on a 120 Volt ±10%, 60 Hertz ±2 Hertz supply.

F. All instruments shall return to accurate measurement upon restoration of power after a power failure.

G. Unless otherwise noted, all instruments in contact with a process stream shall be furnished with diaphragm seals.

H. Instruments shall be guaranteed to maintain the characteristics listed herein, under conditions listed and shall meet following specifications, except where otherwise noted:
   1. Accuracy ±1% of span
   2. Repeatability: ±0.1% of span
   3. Dead Band: ±1% of span (where applicable) in accordance with ISA Standard S50.1
   4. All signal generators and transmitters shall be capable of operating at a load of 600 ohm in accordance with ISA Standard S50.1, higher when specified. Signals shall be output isolated
   5. All electronic instruments shall be solid-state and capable of operating throughout temperature range of 10 degrees Fahrenheit to 110 degree Fahrenheit, unless otherwise specified
   6. Temperature effect on calibration shall be equal or less than 1% over a temperature change of 100 degrees Fahrenheit

I. Ranges and scales shall be per Contract Drawings or approved by the Commissioner.

J. Where separate measuring elements and transmitters are required, they shall be fully matched and any special cables or equipment required must be supplied for installation.

K. Contractor shall be responsible for matching of electrical characteristics of instruments and shall supply transmitters with ample signal output capacity. Additional signal generators or repeaters shall be avoided if possible, but must be supplied if necessary.

L. Furnish all equipment, unless otherwise specified, in manufacturer's standard enclosure for service, indicated by equipment location.

M. Include all miscellaneous necessary work required to complete installation, including but not limited to bolts, nuts, studs, gaskets, pipe tapping, holes through walls, and restoration.

N. Electrical control conductors shall be No. 14 AWG or larger. Use conductors larger than No. 14, where herein specified or where indicated on Contract Drawings.

O. Size of conductors and other current-carrying parts of switches and control equipment shall be ample for rating of devices to which they are connected for service, without undue heating. In no case shall current density exceed 1,000 amperes per square inch of cross-section. At contacts, current density shall not exceed 150 amperes per square inch.

2.2 LEAK DETECTION/INVENTORY CONTROL SYSTEM

A. Furnish and install leak detection/inventory control system which shall include all parts, equipment and software necessary for a complete system. Leak detection/inventory control system shall include, but not be limited to following:

1. One (1) monitoring system controller
2. One (1) magnetostrictive technology type, inventory control and in-tank leak testing probe assembly per tank (3 total)
3. One (1) annular space discriminating liquid sensing probe for interstitial space of each UST (3 total)
4. Two (2) discriminating liquid sensing probe per dispenser pan (12 total)
5. One (1) discriminating liquid sensing probe per tank piping sump (6 total)
6. One (1) discriminating liquid sensing probe per tank fill port (3 total)
7. One (1) overfill alarm
8. One (1) overfill alarm acknowledgment switch
9. One (1) stick gauge calibrated in inches

B. Basis for Design Product: Veeder Root System components as listed in 2.2C through 2.2Hor a comparable product from the following manufacturers:
   1. Franklin Fueling Systems
   2. Pneumercator
   3. or approved equal

C. Controller shall be capable of performing in-tank leak detection functions and external leak detection functions. Controller shall be completely compatible with all probes, sensors, and dispensers. Controller shall have LCD light groups identifying inventory, system status, setup, and diagnostics. Controller shall be supplied with an integral printer. Controller shall include all software and interface modules required for probes, sensors, dispensers, alarms, and other input/output devices required for a complete system. Controller shall be model TLS-450 Plus, manufactured by Veeder-Root.

D. Inventory control and in-tank testing probe assemblies shall be magnetostrictive technology type. In-tank probe shall be capable of measuring product level in tank in inches, and detecting presence of water in tank. Probe shall be capable of performing 0.1 gallon per hour volumetric tank tightness testing and 0.2 gallon per hour automatic tank gauging in tank system. Probe shall meet NEC, NFPA, and UL requirements for hazardous locations. Probe electronics shall be capable of operating from -20 Celsius to +50 Celsius. In-tank probe assembly shall include 4-inch floats and 4-inch sealed riser cap and ring. Each probe shall be completely compatible with fluid stored in tank. Probe shall be MAG Plus Probe with 4-inch Float Kit, Model No. 847391, as manufactured by Veeder-Root. Probe assembly shall also include Magnetostrictive Probe Installation Kit, Model No. 849600 or approved equal, and Riser Cap and Ring Kit, Model No. 312020-952, manufactured by Veeder-Root. Controller shall be equipped with Four-Input Probe Interface Module, Model No. 329356-002 as manufactured by Veeder-Root.

E. Annular space liquid sensing probe shall be capable of detecting and differentiating between liquid hydrocarbons and other liquids in interstitial space between tank walls. Probe shall meet NEC, NFPA and UL requirements for hazardous locations. Probe electronics shall be capable of operating from -20 Celsius to + 70 Celsius. Annular space (or dike) sensor shall be series 7943 Discriminating Interstitial Sensor, as manufactured by Veeder-Root. Controller shall be equipped with Eight-Input Type A Sensor Interface Module, Model No. 329956-001 as manufactured by Veeder-Root.

F. The dispenser pan sensing probes shall be capable of detecting and differentiating between liquid hydrocarbons and other liquids in dispenser pan. Probe shall meet NEC, NFPA, and UL requirements for hazardous locations, and shall be capable of withstanding the harsh environment and wide temperature ranges possible in intended location. Dispenser pan sensor shall be Series 7943 Solid-State Discriminating Containment Sump Sensor, Model No. 794380-320, as manufactured by Veeder-Root. Controller shall be

equipped with Six-Input Type B Sensor Interface Module, Model No. 329950-001 manufactured by Veeder-Root.

G. The piping containment sump probes and tank fill port probes shall be capable of detecting and differentiating between liquid hydrocarbons and other liquids in the sumps. Probes shall meet NEC, NFPA, and UL requirements for hazardous locations, and shall be capable of withstanding the harsh environment and wide temperature ranges possible in intended location. Sensor shall be Series 7943 Solid-State Discriminating Containment Sump Sensor, Model No. 794380-320, as manufactured by Veeder-Root Controller shall be equipped with Six-Input Type B Sensor Interface Module, Model No. 329950-001, manufactured by Veeder-Root.

H. Overfill alarms shall be audible horn and flashing light type. Overfill alarms shall be supplied with one alarm acknowledgment switch. Alarm electronics shall be capable of operating from -40 degrees Fahrenheit to +150 degrees Fahrenheit. Alarm and acknowledgment switch shall be Series 7900 Overfill Alarm and Alarm Acknowledgment Switch, Models No. 790091-001 or approved equal and 790095-001, manufactured by Veeder-Root. Controller shall be equipped with Four-Relay Output Interface Module, Model No. 329359-001 manufactured by Veeder-Root.

PART 3 - EXECUTION

3.1 EXECUTION REQUIREMENTS

A. Refer to DDC General Conditions for execution requirements.

3.2 GENERAL

A. Installation of all equipment shall be in accordance with the NYC Fire Code and the NYC Electrical Code. All electrical work in Class 1 areas shall conform to New York City Electrical Code. Furnish and install all required conduit sealing fittings, explosion-proof accessories, and NEMA Type 7 enclosures where indicated on Contract Drawings, or where required by Code.

B. Install instrumentation and control equipment as indicated on Contract Drawings. All power and control wiring and connections not specifically indicated on Contract Drawings, but required for proper operation of equipment shall be made by Contractor in accordance with these Specifications and New York City Electrical Code. Install all electrical control and instrumentation equipment installed in Class 1 hazardous locations in NEMA Type 7 enclosures. Conduits and wireways leading to and from these areas shall be provided with sealing fittings. All non-conducting metal parts of switches and control shall be rust-proofed by galvanizing, cadmium plating, baked enamel or by use of a non-corroding metal. Springs, wherever used, shall be a phosphor bronze. Contacts shall close fully at a line voltage of 10% below normal.

C. Provide all necessary labor and equipment to print out tank calibration chart at completion of calibration process. Shall submit a minimum of three (3) charts to the Commissioner.

3.3 TESTING

A. General: All equipment (hardware and software) shall be factory and field tested to demonstrate that it provides specified functions. Submit factory and on site test procedures for approved prior to starting actual tests. On site testing shall include checking of cables, testing of system subassemblies and checking of connections for each component and for entire instrumentation and control system. Notify the City in writing when ready to start onsite system testing. The Commissioner will authorize start of testing on mutually-agreed starting date.

B. Shop Testing: All activating devices, instruments, and assemblies furnished under this item shall be set up in shop of manufacturer and tested over the full range of the equipment. Equipment shall satisfactorily perform all functions within requirements of specifications.

C. Field Testing: All instruments and systems shall be tested to ensure conformance with Specifications.
   1. Control systems shall receive dynamic loop tests that conform to intent of ANSI: MC4.1 (ISA-S26). Control systems and equipment shall include provisions for such testing.
   2. Input signals for equipment control shall be simulated for at least 5 signal values from 0 to 100 percent signal, with corresponding equipment response manually recorded, and adjustments made as required. Output signals from equipment shall be read for at least 5 signal values from 0 to 100 percent of meaningful process values, and adjustments shall be made as required.
   3. All instruments used for control functions shall be tested with final elements in circuit in addition to simulated control methods. Adjust instruments and/or final elements to obtain best working conditions for dynamic system.

END OF SECTION 43 41 18

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SECTION 481400
Solar Energy Electrical Power Generation System

PART 1 - GENERAL

1.1. RELATED DOCUMENTS

A. The following documents apply to all required work for the Project: (1) the Contract Drawings, (2) the Specifications, (3) the General Conditions, (4) the Addendum and (5) the Contract (City of New York Standard Construction Contract).

1.2. DESCRIPTION

A. This section specifies the furnishing, installation, connection, testing, and commissioning of solar energy electrical power generation systems.

B. The requirements of this Section apply to all sections of Division 48 related to solar energy electrical power generation systems.

1.3. RELATED WORK

A. Section 13 05 41, Seismic Restraint Requirements for Non-Structural Components: Requirement for seismic restraint for nonstructural components.

B. Section 26 05 11, Requirements for Electrical Installations: Requirements that apply to all sections of Division 26.

C. Section 26 05 19, Low-Voltage Electrical Power Conductors and Cables: Requirements for low-voltage conductors.

D. Section 26 05 26, Grounding and Bonding for Electrical Systems: Requirements for personnel safety and requirements for providing a low impedance path for possible ground fault currents.

E. Section 26 05 33, Raceways and Boxes for Electrical Systems: Requirements for boxes, conduits, and raceways.

F. Section 26 08 00, Commissioning of Electrical Systems: Requirements for commissioning the electrical system, subsystems, and equipment.

G. Section 26 29 16, Enclosed Switches and Circuit Breakers: Requirements for enclosed disconnect switches.

1.4. DEFINITIONS

A. Unless otherwise specified or indicated, electrical and electronics terminology used in these specifications, and on the drawings, shall be as defined in IEEE 100 CD.

B. Unless otherwise specified or indicated, solar energy conversion and solar photovoltaic energy system terminology used in these specifications, and on the drawings, shall be as defined in ASTM E772.

1.5. QUALITY ASSURANCE

A. Refer to DDC General Conditions Section 01 40 00 "Quality Requirements."

B. Installer Qualifications:

1. The contractor or subcontractor performing the work of this section must, within the last five (5) consecutive years prior to the bid opening, have successfully completed in a timely fashion at least three (3) projects similar in scope, size and type to the required work. In addition, the contractor or subcontractor performing the work must be approved by the New York State Energy Research and Development Authority (NYSERDA).

C. Manufacturer Qualifications:

1. The manufacturer providing the material or equipment specified in this section must, for the past five (5) years, have been regularly engaged in the manufacture of material or equipment similar in type to that required for this Project. Such similar material or equipment provided by the manufacturer must have been in satisfactory service for not less than five (5) years.

D. Supports and racking for solar photovoltaic system designs shall be prepared under the seal of a licensed Professional Structural Engineer (PE) retained by Contractor. Where applicable, such as roof top installations, the engineer shall also provide adequate review and structural analysis of the existing structure that will be supporting the proposed solar photovoltaic system. Among the documents that shall be submitted by the engineer are environmental loading analyses (including wind, snow, hail, and where applicable, seismic) and the rack and substrate's ability to withstand these environmental forces. In the instance where the rack is installed on the ground, adequate information shall be presented to demonstrate the earth's ability to support the proposed design.

E. The system shall have anti-islanding capability such that it is incapable of exporting power to the utility distribution system in the absence of utility power.

F. Warranties: The solar energy electrical generating system shall be subject to the terms of FAR Clause 52.246-21, except that the warranty period shall be as noted for the items below:

1. Solar photovoltaic modules and inverter: 10 year manufacturer's warranty against defects in materials and workmanship.
2. Power output: 25 year manufacturer's power output warranty, with the first 10 years at 90% minimum rated power output and the balance of the 25 years at 80% minimum rated power output.

1.6. SUBMITTALS

A. Refer to DDC General Conditions Section 01 33 00 "Submittal Procedures."

B. Where proposed system shall be a Net Meter project, prepare appropriate applications and submittals to the Commissioner. In all cases, the serving electric utility may have a requirement for further electrical studies, which may include or not be limited to power factor analysis, short circuit protection studies, grid wiring adequacy, or capacities of upstream equipment. If such requirements exist and are required by the serving electric utility, these requirements shall be fulfilled by the Contractor. Provide written documentation confirming the utility's approval of the interconnection of the solar energy electrical power generation system with the utility system.

C. Submittals shall comply with the following requirements:

1. Shop Drawings:

a. Submit sufficient information to demonstrate compliance with drawings and specifications.
b. Include electrical ratings, dimensions, mounting details, materials, required clearances, terminations, weight, wiring and connection diagrams, accessories, and nameplate data.

c. Include shop drawings for foundations and other support structures.

2. Product Data:

a. Include detailed information for components of the solar energy electrical generation system.

1) Wiring.
2) Inverter.
3) Photovoltaic modules.
4) Rack and support assemblies.
5) Instrumentation.
6) Switchgear.
7) DC and AC disconnects.
8) Combiner boxes.

b. Certification from the manufacturer that the system has been seismically tested to International Building Code requirements. Certification shall be based upon simulated seismic forces on a shake table or by analytical methods, but not by experience data or other methods.

3. Manuals:

a. Submit, simultaneously with the shop drawings, complete maintenance and operating manuals including technical data sheets, wiring diagrams, and information for ordering replacement parts.

1) Safety precautions.
2) Operator restart.
3) Startup, shutdown, and post-shutdown procedures.
4) Normal operations.
5) Emergency operations.
6) Environmental conditions.
7) Preventive maintenance plan and schedule.
8) Troubleshooting guides and diagnostic techniques.
9) Wiring and control diagrams.
10) Maintenance and repair procedures.
11) Removal and replacement instructions.
12) Spare parts and supply list.
13) Parts identification.
14) Testing equipment and special tool information.
15) Warranty information.
16) Testing and performance data.
17) Contractor information.

b. If changes have been made to the maintenance and operating manuals originally submitted, then submit updated maintenance and operating manuals two weeks prior to the final inspection.

4. Certifications: Two weeks prior to final inspection, submit the following.

a. Certification by the manufacturers of all major items of the solar energy electric generation system that the system conforms to the requirements of the drawings and specifications, and that they have jointly coordinated and properly integrated their equipment and controls to provide a complete and functional installation.

b. Certification by the Contractor that the solar energy electric generation system has been properly installed, adjusted, tested, commissioned, and warrantied. Contractor shall make all necessary field measurements and investigations to ensure that the equipment and assemblies meet contract requirements.

5. Estimated Annual Power Output: Submit calculated annual power output for each of the proposed solar photovoltaic systems. Provide independent calculations for each fixed, single-axis tracking, or double-axis tracking system.

D. If equipment submitted differs in arrangement from that shown on the drawings, provide drawings that show the rearrangement of all associated systems. Approval will be given only if all features of the equipment and associated systems, including accessibility, are equivalent to that required by the contract and acceptable to the Commissioner.

E. Submittals and shop drawings for independent but related items shall be furnished together and complete in a group. Coordinate and properly integrate materials and equipment in each group. Final review and approval will be made only by groups.

F. Apply for the NYSERDA NY-Sun rebate under PON 2112 (Residential & Nonresidential) at the start of construction. Application shall be filed on behalf of the City of New York - Department of Citywide Administrative Services (DCAS) so that DCAS shall receive rebate directly from NYSERDA. Submit all paperwork to NYSERDA on DCAS behalf through to completion of rebate receipt.

1.7. APPLICABLE PUBLICATIONS

A. Publications listed below (including amendments, addenda, revisions, supplements and errata) form a part of this specification to the extent referenced. Publications are referenced in the text by the basic designation only.

B. American Society for Testing and Materials (ASTM):

1. E772-15 Standard Terminology of Solar Energy Conversion
2. E1038-15 Standard Test Method for Determining Resistance of Photovoltaic Modules to Hail by Impact with Propelled Ice Balls

C. Institute of Electrical and Electronics Engineers (IEEE):

1. 100 CD-13 The Authoritative Dictionary of IEEE Standards Terms
2. 519-14 Practices and Requirements for Harmonic Control in Electric Power Systems
3. 937-07 Recommended Practice for Installation and Maintenance of Lead-Acid Batteries for Photovoltaic (PV) Systems
4. 1013-07 Recommended Practice for Sizing Lead-Acid Batteries for Stand-Alone Photovoltaic (PV) Systems
5. 1361-14 Guide for Selection, Charging, Test and Evaluation of Lead-Acid Batteries Used in Stand-Alone Photovoltaic (PV) Systems
6. 1526-03 Recommended Practice for Testing the Performance of Stand-Alone Photovoltaic

Systems

7. 1547-03 Standard for interconnecting Distributed Resources with Electric Power Systems
8. 1561-07 Guide for Optimizing the Performance and Life of Lead-Acid Batteries in Remote Hybrid Systems
9. 1562-07 Guide for Array and Battery Sizing in Stand-Alone Photovoltaic (PV) Systems
10. 1661-07 Guide for Test and Evaluation of Lead-Acid Batteries Used in Photovoltaic (PV) Hybrid Power Systems

D. International Code Council (ICC):
1. IBC-15 International Building Code
2. IFC-15 International Fire Code

E. National Electrical Manufacturer's Association (NEMA):
1. 250-14 Enclosures for Electrical Equipment (1,000 Volts Maximum)

F. National Fire Protection Association (NFPA):
1. 70-17 National Electrical Code (NEC)

G. Underwriters Laboratories (UL):
1. 6-07 Electrical Rigid Metal Conduit – Steel
2. 94-13 Tests for Flammability of Plastic Materials for Parts in Devices and Appliances; Ed 6
3. 797-07 Electrical Metallic Tubing – Steel
4. 969-17 Standard for Marking and Labeling Systems
5. 1242-14 Standard for Electrical Intermediate Metal Conduit – Steel
6. 1703-02 Standard for Flat-Plate Photovoltaic Modules and Panels
7. 1741-10 Standard for Inverters, Converters, Controllers and Interconnection System Equipment for use with Distributed Energy Resources

PART 2 - PRODUCTS

2.1. MANUFACTURERS

A. Basis of Design: Subject to compliance with requirements, provide SunPower photovoltaic panels or comparable product by one of the following:

1. LG
2. Solaria Power
3. Longi

4. Or approved equal

2.2. GENERAL

A. Provide materials to fabricate functioning photovoltaic system in accordance with ASTM, IEEE, NEMA, NFPA, and UL, as specified in this section, and as shown on the drawings.

B. Factory-prefabricated solar equipment packages which include photovoltaic modules, batteries or other energy storage, inverters, and controls and which meet the requirements of this section are acceptable.

2.3. GROUNDING

A. All applicable components of the solar energy electrical power generating system must be grounded per latest NEC requirements.

B. DC Ground-Fault Protector:

1. Shall be listed per UL 1703.
2. Shall comply with requirements of the NEC.

2.4. PHOTOVOLTAIC ARRAY CIRCUIT COMBINER BOX

A. Shall be listed to UL 1741.

B. Shall include internal overcurrent protection devices with dead front.

C. Shall be contained in non-conductive NEMA Type 4X enclosure.

D. Up to 48 volts DC: Shall use UL-listed DC breakers that meet NEC requirements for overcurrent protection.

E. Up to 600 volts DC, paralleling system: Shall use fuses instead of breakers.

F. Ground and pole-mounted arrays shall have a separate combiner box mounted to the pole itself.

G. Where applicable, combiner box shall be a disconnecting combiner box.

2.5. SWITCH/DISCONNECTING MEANS

A. Shall be UL-listed, in accordance with the NEC, as shown on the drawings, and as specified.

B. Utility External Disconnect Switch (UEDS): Refer to Commissioner, as several states do not require UEDS for small solar photovoltaic systems if the inverter provides the same function per NEC. Coordinate requirements with serving electric utility.

2.6. WIRING SPECIALTIES

A. Direct Current Conductors:

1. If Exposed: Shall be USE-2, UF (inadequate at 60°C [140°F]), or SE, 90°C [194°F] wet-location rated.
2. If in Conduit: Shall be RHW-2, THWN-2, or XHHW-2 90°C [194°F], wet-location rated.

B. Conduits and Raceways:

1. Shall use steel conduit listed per UL 6, UL 1242, UL 797 (as appropriate), except for tracking modules. Weathertight EMT installations shall be allowed for DC wiring in weather-protected areas.

2. Shall use expansion joints on long conduit runs.
3. Shall not be installed on photovoltaic modules.

C. Enclosures subject to weather shall be rated NEMA 3R or better.

D. Cable Assemblies and Junction Boxes:

1. Shall be UL-listed.
2. Shall be rated to 5VA flammability per UL 94.

E. Prohibited Wiring Materials: Those which are not UL-listed, or listed materials used in environments outside those covered in their listing.

2.7. DC-AC INVERTER

A. Shall be listed to UL 1741.

B. Shall comply with IEEE 519 and IEEE 1547.

C. Shall be listed per FCC Part 15 Class A.1.

D. Shall have stand-alone, utility-interactive, or combined capabilities.

E. Shall include maximum power point tracking (MPPT) features.

F. Shall include anti-islanding protection if paralleling arrangement is required.

2.8. SOLAR PHOTOVOLTAIC (PV) MODULES

A. Minimum Performance Parameters as per IBC 1509.7.4, IRC M2302.3, UL 1703.

B. Photovoltaic Panel Types:

1. Monocrystalline (1,900): Listed to UL 1703.

C. Module and System Identification

1. Module or Panel:

   a. Listed to UL 969 for weather resistance.
   b. Listed to UL 1703 for marking contents and format.

2. Main Service Disconnect: per NEC.
3. Identification Content and Format: per NEC.
4. Identification for DC Conduit, Raceways, Enclosures, Cable Assemblies, and Junction Boxes: IFC 605.
5. Identification for Inverter: per NEC.

D. Bypass diodes shall be built into each PV module either between each cell or each string of cells.

E. Other Components: per UL 1703.

F. Hail Protection: Compliant with testing procedure per ASTM E-1038.

G. Lightning Protection: Shall ground according to manufacturer instructions per UL 1703.

H. Access, Pathways, and Smoke Ventilation: Per IFC 605.3, access and spacing requirements must be observed in order to: ensure access to the roof, provide pathways to specific areas of the roof, provide for

smoke ventilation opportunities area, and, where applicable, provide emergency access egress from the roof.

I. Fire Classification:

1. IBC 1505.8 for building-integrated photovoltaic and solar shingles.
2. IBC 1509.7.2: Although not technically enforceable, every effort shall be made to ensure the solar photovoltaic module is not combustible.

2.9. COLLECTOR SUPPORTS

A. Wind Resistance Requirement:

1. For rack-mounted: per IBC 1509.7.1.
2. For building-integrated photovoltaic and solar shingles: IBC 1507.17.3.

B. Mechanical Load Requirement: per UL 1703.

C. Ground and Pole Mount:

1. Foundations shall be engineered by a licensed Professional Structural Engineer (PE) retained by Contractor.
2. Where possible, combiner boxes shall be mounted directly to the pole itself.

2.10. INSTRUMENTATION

A. Meters: If applicable and system is grid-connected, use net smart meter provided by the serving electric utility.

B. Sensors:

1. Temperature sensor shall be a component in the MPPT control system.
2. May install additional data acquisition sensors to measure irradiance, wind speed, and ambient and PV module temperatures. Any additional sensors shall require a conduit separate from the current conductor conduit.

C. Data logger/Monitoring System: Shall be a packaged system capable of string-level monitoring or in the case of micro-inverters, capable of monitoring and logging an individual module's information.

PART 3 - EXECUTION

3.1. EXECUTION REQUIREMENTS

A. Refer to DDC General Conditions for execution requirements.

3.2. INSTALLATION

A. Install the solar photovoltaic system in accordance with the NEC, this section, and the printed instructions of the manufacturer.

B. Prior to system start-up, ensure no copper wire remains exposed with the exception of grounding wire as allowed in certain circumstances per manufacturer's instructions.

C. In seismic areas, systems shall be adequately anchored and braced per details on structural contract documents to withstand seismic forces at the locations where installed.

D. Wiring Installation: Workers shall be made aware that photovoltaic modules will be live and generating electricity when there is any ambient light source and shall take appropriate precautions. Utilize on-site measurements in conjunction with engineering designs to accurately cut wires and layout before making permanent connections. Locate wires out of the way of windows, doors, openings, and other hazards. Ensure wires are free of snags and sharp edges that have the potential to compromise the wire insulation. All cabling shall be mechanically fastened. If the system is roof-mounted it shall have direct current ground fault protection according to NEC. Ensure breakers in combiner box are in the off position (or fuses removed) during combiner box wiring.

E. Instrumentation: Install instruments as recommended by the manufacturer. Locate control panels inside a room accessible only to qualified persons.

F. Building-Integrated Photovoltaic Installations: Building-integrated photovoltaic modules/shingles shall be installed in accordance with the manufacturer's installation instructions.

G. Rack-Mounted Photovoltaic Installations: Rack-mounted photovoltaic modules shall be installed in accordance with the manufacturer's installation instructions.

H. Ground and Pole-Mounted Photovoltaic Installations: If structure is used as equipment grounding conductor, ensure compliance with NEC. Wiring shall not be readily accessible.

I. Provide safety signage per NEC.

3.3. FIELD QUALITY CONTROL

A. Field Inspection: Perform in accordance with manufacturer's recommendations. Prior to initial operation, inspect the solar energy electrical power generation system for conformance to drawings, specifications, and NEC. In addition, include the following:

1. Visual Inspection and Tests:

    a. Compare equipment nameplate data with specifications and approved shop drawings.
    b. Inspect physical, electrical, and mechanical condition.
    c. Verify required area clearances.
    d. Verifying tightness of accessible bolted electrical connections by calibrated torque-wrench method, or performing thermographic survey after energization.
    e. Verify the correct operation of all sensing devices, alarms, and indicating devices.
    f. Verify that all cable entries from top of junction boxes are sealed per junction box rating.
    g. Verify all connections and integrity of printed circuit boards in all applicable junction boxes.

B. Tests: Provide equipment and apparatus required for performing tests. Correct defects disclosed by the tests and repeat tests. Conduct tests in the presence of the Commissioner.

1. Module String Voltage Test: Prior to connecting wiring to the combiner box, use a digital multi-meter to ensure each series string's polarity is correct.
2. Operational Tests: Perform tests in accordance with the manufacturer's written recommendations. Tests for stand-alone systems shall be performed per IEEE 1526.

3.4. FOLLOW-UP VERIFICATION

A. Upon completion of acceptance checks, settings, and tests, the Contractor shall show by demonstration in service that the solar photovoltaic electrical power generation system is in good operating condition and properly performing the intended function.

3.5. COMMISSIONING

A. Comply with the requirements of Section 01 91 00, General Commissioning Requirements.

B. If the system is grid-tied, the Contractor shall coordinate with the serving electric utility to establish an interconnection agreement.

C. Connect the solar photovoltaic electrical power generation system to the serving electric utility grid only after receiving prior approval from the utility company.

D. Only qualified personnel shall connect the solar photovoltaic electrical power generation system to the serving electric utility grid.

3.6. INSTRUCTION

A. A complete set of operating instructions for the solar photovoltaic electrical power generation system shall be laminated or mounted under acrylic glass and installed in a frame near the equipment.

B. Furnish the services of a factory-trained technician for one, 4-hour training period for instructing personnel in the maintenance and operation of the solar photovoltaic electrical power generation system, on the date requested by the Commissioner.

END OF SECTION 481400

FMS ID: **S136-367**

THE CITY OF NEW YORK
DEPARTMENT OF DESIGN AND CONSTRUCTION
DIVISION OF PUBLIC BUILDINGS
30-30 THOMSON AVENUE LONG ISLAND CITY, NEW YORK 11101-3045
TELEPHONE (718) 391-1000 WEBSITE www.nyc.gov/buildnyc

Department of Design and Construction

Contract for Furnishing all Labor and Material Necessary and Required for:

CONTRACT NO. 1 **GENERAL CONSTRUCTION WORK**

Staten Island 1 & 3 Garage - Phase 2

LOCATION: **1000 West Service Road**
BOROUGH: **Staten Island, NY 10314**
CITY OF NEW YORK

Contractor

Dated _____ , 20 _____

Entered in the Comptroller's Office

First Assistant Bookkeeper

Dated _____ , 20 _____